Teaching and Learning in Second- Level Schools at the Advent of High-Speed Broadband

Selina McCoy, Seán Lyons, Bryan Coyne and Merike Darmody

ESRI

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Acknowledgements

Table of Contents

List of Tables

List of Figures

Glossary

BECTA	The British Educational and Communications Technology Agency
CPD	Continuous professional development
DAE	The European Commission Digital Agenda
DCENR	The Department of Communications, Energy and Natural Resources
DCG	Digital Computer Graphics
DEIS	Delivering Equality of Opportunity in Schools
DES	Department of Education and Skills
ECDL	The European Computer Driving Licence
ETBI	The Education and Training Boards Ireland
FETAC	Further Education and Training Awards Council
ICT	Information and Communications Technology
LCA	The Leaving Certificate Applied
LCVP	The Leaving Certificate Vocational Programme
NAPD	The National Association of Principals and Deputy Principals
NCB	National Computer Board
NCCA	The National Council for Curriculum and Assessment
OECD	The Organization for Economic Co-operation and Development
PDST	Professional Development Service for Teachers
PDST-TIE	Professional Development Service for Teachers - Technology in Education
TCD	Trinity College Dublin
VLE	Virtual Learning Environment

Executive Summary

PURPOSE OF THIS STUDY

As part of Ireland's National Digital Strategy, the Irish government has invested substantially in a national roll-out of high-speed broadband to all second-level schools in the country. This investment signals a move from a slow and often unreliable broadband connection that inhibits the use of ICT[1] within education (Coyne et al., 2016), to high-speed broadband connection with connectivity support. With this higher quality broadband connection comes a new set of challenges: how can ICT support enhance or transform teaching and learning in schools? This report presents the findings of a large-scale mixed methods study drawing on surveys of school principals and teachers before and after broadband roll-out in 436 schools, and in-depth case-study research in ten schools, including interviews with school principals, ICT co-ordinators, teachers and focus groups with students. It addresses five main research questions:

1. How is ICT used in teaching and learning across schools following high-speed broadband installation?

2. What role do school processes like culture, leadership, staff collaboration and technical support play in the extent and nature of ICT integration across school contexts?

3. What are the key challenges facing teachers in using ICT? How do teachers view the types of ICT and online resources available to them and what role does ICT-related professional development play?

4. How do students view different teaching methodologies and to what extent do they see ICT-based approaches as enhancing their engagement?

5. How do students reflect on the ICT skills and competencies they are gaining while at school and to what extent does current curricular provision, particularly relating to computer studies, facilitate the development of these skills?

The Department of Education and Skills has recently published a Digital Strategy for Schools (DES, 2015c), setting out a range of broad policy objectives

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[1] In this study, ICT (Information and Communication Technology) is defined as any electronic hardware or software which is used for the purpose of teaching, learning and administration in schools. This includes equipment such as computers, internet infrastructure, projectors and computer software.

addressing: teaching, learning and assessment using ICT; teacher professional development; leadership, research and policy; and ICT infrastructure. As the Department commences the process of implementing the Strategy, this research provides an evidence base to help inform such developments. The following sections detail the key findings emerging from the study and some implications for policy implementation and development.

KEY FINDINGS

Perceptions of Broadband Impact

Principals' and teachers' reactions to the high-speed broadband programme were highly positive, with the vast majority reporting 'high' or 'significant' impact on teaching and learning. Moreover, principals who received broadband earlier were significantly more likely to report that it had an impact on teaching and learning. Teachers' views of the programme's effect did not differ significantly by time since installation in their schools. In line with a theory of educational change, the change process through which broadband affects teaching and learning seems to be slow and incremental. Our research took place within a relatively narrow time window around the broadband upgrade, so it is likely that some effects of improved broadband connectivity will take longer to become clear.

Overall, the findings provide some evidence of a shift towards more student-centred ICT usage and methodologies between the pre- and post-installation surveys (ranging six to 24 months). While there is clearly widespread use (and benefits) of ICT and online resources in school administration and communication, usage in the classroom is highly variable across teachers and schools. Principals and students distinguish between early adopters, 'reluctant' teachers and those who are risk-averse. School structural and climate factors play an important role in shaping and supporting change, particularly change relating to teaching and learning methodologies.

School Climate, Leadership and Technical Support

The findings show the centrality of school leadership in directing and shaping policy development in schools. Schools differed in the extent to which they had developed technology-specific policies. While having a formal ICT policy was important in some schools, others preferred a more ad hoc approach, whereby each subject department decided its own procedures. However, many principals felt that guidance on the integration and use of ICT from the Department of Education and Skills had not kept pace with developments in technology. Further, principals and ICT co-ordinators highlighted challenges around the maintenance and upkeep of equipment. With inadequate technical support, many schools felt

their teaching staff was over-burdened with technical issues and troubleshooting. Further, ICT co-ordinators were often limited to a technical role rather than guiding future developments in ICT integration and pedagogical change.

Teaching and Learning

School principals and teachers pointed to benefits of ICT on student learning ranging from enhanced student participation and achievement, greater collaboration among students, to the development of higher order thinking skills and transversal skills. Teachers spoke about particular advantages in terms of meeting diverse student needs, allowing greater differentiation and tailoring of approach. The potential for ICT and online resources to support and expand social learning was noted. However, the case-study evidence also underlines structural constraints on the scope to use ICT in teaching and learning. In particular, the centrality of the high stakes Junior and Leaving Certificate examinations serves to limit opportunities for more interactive teaching approaches drawing on ICT and online resources, particularly in the pre-examination period. The current junior cycle reforms may well address some of these challenges, in particular in placing digital technology as central to many of the statements of learning and key skills comprising the programme (DES, 2015a).

Factors Shaping ICT Usage

The deployment of high-quality broadband connectivity has eliminated one of the biggest barriers constraining ICT integration in schools, but teachers emphasise that other infrastructural deficits remain. These include limitations on Wi-Fi and hardware quality and reliability, and insufficient technical support. Moreover, teachers raised concerns over school organisational issues, including the requirement for teachers to move between classrooms, classroom design issues and restrictions imposed through content filtering. Teachers across a broad range of subject domains reported a high level of reliance on online teaching resources, both national and international. These included supports offered by PDST and subject-specific support services, including Scoilnet.ie, as well as international resource sites like TES (an online community of teachers). Within and across schools, teachers varied with regard to their confidence in using ICT and in their participation in (different types of) professional development opportunities. The findings suggest that professional development (both initial and continuous) will play a key role in embedding broadband and ICT within teachers' pedagogical practices, increasing teachers' competence, skill and confidence in using ICT, and achieving the desired teaching and learning outcomes.

The Student Voice

The reflections of junior and senior cycle students provide a unique and important contribution to the study. Overall, students highlight the importance of active engagement in enhancing their learning. The introduction of high-speed broadband has given teachers another avenue through which to actively engage students. ICT-based teaching methods can be valuable, providing teachers can use them effectively and the barriers to seamless use are minimised. Students noted that teachers should be supported in their role as educators by equipping them with the skills to utilise ICT-based teaching methods effectively. Students are broadly receptive to most of the ICT-related changes that have occurred in classrooms, and feel they receive quality information regarding online responsibility at school.

Students were generally positive about the benefit and convenience that personal devices provided. However, they highlighted some issues with devices, ranging from the poor quality of some educational applications ('apps') to the significant financial cost associated with the initial purchase, maintenance and eventual replacement of devices. Students mention the importance of internet access (both at home and in school) to maximise the functionality of their device.

POLICY IMPLICATIONS

The findings of this study have implications for a broad range of policy issues and provide an evidence base to help inform the implementation of the Digital Strategy for Schools (DES, 2015a). Here we focus on outlining the implications for three key areas: supporting school leaders and ICT co-ordinators in ICT-integration; investment in infrastructure; and addressing structural and curricular constraints.

Effective leadership is crucial to the smooth and effective integration of ICT within schools. School leaders need support and clear guidelines/information, in terms of the types of ICT options and resources available, the value of planning and whole-school collaboration, the requirements in relation to infrastructure and teacher professional development. The newly established Centre for School Leadership[2] should play an important role in meeting these needs for school

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[2] The Centre's responsibilities will cover the continuum of professional development for school leaders, from pre-appointment training and induction of newly appointed principals, to continuing professional development throughout careers. The Centre is operating on a partnership basis between the Department of Education and Skills, the Irish Primary Principals' Network (IPPN) and the National Association of Principals and Deputy Principals (NAPD). For further details see http://cslireland.ie.

leaders. Ongoing investment in continuous professional development for teachers is also a key requirement.

While the roll-out of high-speed broadband has removed a significant barrier for schools, namely inadequate and unreliable internet connection, other infrastructural issues have now become more salient (such as internal school network reliability, ICT equipment quality, the availability and accessibility of online resources, capacity to meet the requirements of the reformed junior cycle and technical support). There will be a need for ongoing investment in schools to address these issues.

Finally, the study has highlighted many structural constraints that discourage the use of ICT, such as rigid class timetables and structured syllabi for State Examinations. The reform of junior cycle education involves a shift away from an exam-dominated mode of assessment, a focus on embedding key skills in teaching and learning and more innovative approaches to teaching and learning where digital technologies are central (NCCA 2011, DES, 2015a). It remains to be seen whether similar measures will be applied to senior cycle education. In any case, lessons can be learned from the Transition Year programme, where innovative teaching and learning methodologies incorporating ICT are encouraged. Finally, additional Departmental advice and guidance may be helpful for specific IT courses/subjects in second-level education.

Chapter 1

The Role of ICT in Education

1.1   INTRODUCTION

This research examines the attitudes, behaviours and expectations of school principals, teachers and students regarding the use of ICT in teaching and learning in an age of high-speed broadband. Findings from the first phase of this study, recently published in Coyne et al. (2016), highlight survey findings showing the enthusiasm of teachers and principals for access to high-speed broadband and the opportunities it may provide for improving teaching and learning methods and outcomes. This report builds on the first phase by examining survey data before and after broadband service was upgraded and also incorporating qualitative research, to provide a more in-depth understanding of the role of ICT across different school and classroom contexts. A theory of educational change suggests that change processes which affect teaching and learning tend to be slow and incremental (Fullan, 1991). This research aims to investigate the extent to which this theory holds for changes in teaching and learning approaches after the upgraded broadband connection is installed. A mixed methods approach is adopted in this study, as the combination of quantitative and qualitative data has been increasingly used in social science research as of late. This methodology provides both the breadth and depth of understanding across key dimensions of school organisation, climate, teaching methodologies and student experience within and across schools. Research at primary school level (Hyland et al., 2015), and internationally (Orlando, 2013), shows that the benefits of improved connectivity may take time to embed fully, particularly in terms of teaching and learning methodologies. In this context, the authors recognise that the timing of the second survey and case-study fieldwork, shortly after installation of high-speed broadband, captures experiences and behaviours in the early days and more fundamental changes in teaching and learning behaviours (particularly for teachers, see Hyland et al., 2015) are likely to require a longer period of time to become fully embedded.

Internationally, the importance of improving internet connectivity has been a major focus of policy. The European Commission Digital Agenda (DAE) focuses on the importance of a connected society. The Agenda outlines a series of targets which will help to 'foster innovation, economic growth and progress' through digital technologies across the European Union (EU) by 2020 (European Commission, 2015). In Ireland, the Department of Communications, Energy and

Natural Resources (DCENR) acknowledges the importance of implementing the DAE targets, many of which involve different governmental departments (DCENR, 2015b). As part of Ireland's National Digital Strategy, the Irish government has invested substantially in a national roll-out of high-speed broadband (100Mbps) to all second-level schools in the country.

This investment signals a move from a slow and often unreliable broadband connection that inhibits the use of ICT within education to a high-speed reliable broadband connection with technical support. With this higher quality broadband connection comes a new set of challenges; how can ICT support, enhance or transform teaching and learning in schools? Over the years researchers have noted the increase in the importance of ICT in schools (Becker and Ravitz, 1999). Scheuermann and Pedró (2009) argue that schools have a role to play in preparing students for adult life, and must therefore provide students with skills necessary to participate in a society where technology-related competencies are becoming increasingly indispensable. In the school context new technologies are argued to introduce flexibility for both teachers and learners (Heppel et al., 2004). Recent research has started to focus on the mechanisms by which ICT may make a difference and for whom these investments may matter most. Hammond (2011) distinguishes between the use of technology 'retrospectively' to accommodate the existing curriculum and a more forward looking approach leading to radical changes in teaching and learning. Conversely, Underwood et al. (2009) point to the concept of personalisation whereby ICT allows students to have more autonomy and ownership. Further ICT may make the curriculum more accessible through the use of multimedia or interactivity (Passey et al., 2004).

1.2   RESEARCH QUESTIONS

The study is guided by five central research questions:

1. How is ICT used in teaching and learning across schools following high-speed broadband installation?
2. What role do school processes like culture, leadership, staff collaboration and technical support, play in the extent and nature of ICT integration across school contexts?
3. What are the key challenges facing teachers in using ICT? How do teachers view the types of ICT and online resources available to them and what role does ICT-related professional development play?
4. How do students view different teaching methodologies and to what extent do they see ICT-based approaches as enhancing their engagement?
5. How do students reflect on the ICT skills and competencies they are gaining while at school and to what extent does current curricular

provision, particularly relating to computer studies, facilitate the development of these skills?

Although the student voice is often absent from research regarding the role of ICT in education, this research includes qualitative evidence from student focus groups to address the final two research questions.

1.3   STATE SUPPORT OF ICT IN IRISH EDUCATION

The roll-out of broadband to second-level schools is an important component of Ireland's National Digital Strategy, assisting in the 'development of a more digitally literate workforce and encouraging students to opt for digital and ICT as a career choice' in concert with other initiatives such as Project Maths and the new junior cycle (DCENR, 2013). The Department of Education and Skills' (DES) main mission is to contribute to Ireland's social, cultural and economic development through a high-quality education system which supports inclusion and a modern, flexible education system (DES, 2015d). In terms of ICT in education the most recent development has been the launch of the Digital Strategy for Schools: 2015-2020. This Digital Strategy outlines anticipated developments over the next five years, which are 'designed to embed ICT more deeply across the system to enhance the overall quality of Irish education' (DES, 2015c). This research studies changes in schools that receive a 100Mbps broadband connection as part of the Schools 100Mbps Project, which is jointly co-ordinated by DCENR and DES.

Other organisations such as the National Council for Curriculum and Assessment (NCCA), Professional Development Service for Teachers (PDST) and HEAnet[3] all play an important role in facilitating the implementation of ICT across schools in Ireland. The National Council for Curriculum and Assessment (NCCA) is the statutory body in the Republic of Ireland responsible for advising the Minister for Education and Skills 'on curriculum and assessment from early childhood to the end of second level' (NCCA, 2015), developing the curriculum and assessment across primary and second-level schools across the country. Recently, the NCCA has described the role of ICT as being 'invisible', embedded across the entire curriculum (NCCA, 2008).

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[3]   HEAnet provides internet connectivity and associated ICT services to education and research organisations throughout Ireland, including all primary and post-primary schools and acts as a second-level support service for the Broadband Service Desk to help resolve any connectivity-related issues. See www.heanet.ie.

The latest Department of Education and Skills Digital Strategy highlights the importance of providing a Computer Studies course which develops 'discrete' ICT skills, providing learners an opportunity to develop critical and strategic learning skills (DES, 2015c). The NCCA has already made progress in accommodating ICT and digital skills into the junior cycle curriculum through short courses[4] in Coding and Digital Media Literacy.

In addition to evaluating these courses over the coming years, the NCCA has been asked to

> provide advice and options, to the Minister for Education and Skills, on further developing the provision for digital learning in the senior cycle... within and across subjects. (DES, 2015c)

This will involve assessing the feasibility of a Leaving Certificate subject in digital learning. The important role of the NCCA in developing the ICT-related aspects of the curriculum is one avenue which will help to foster change in the Irish education system.

The Professional Development Service for Teachers (PDST) is the state agency responsible for teacher professional development, acting as 'the largest single support service offering professional learning opportunities to teachers and school leaders in a range of pedagogical, curricular and educational areas' (PDST, 2015). Within PDST, there is a subdivision focused on the role of technology in education. PDST-Technology in Education (PDST-TIE) is tasked with promoting the integration of ICT in primary and second-level education in Ireland. This is achieved through two main avenues:

- Providing a range of ICT-related support services to schools

- Engaging with policy development and strategy on a national level.

The first category involves providing advice to schools on appropriate methods of ICT adoption. PDST-TIE co-ordinates the Schools Broadband Programme[5] for primary and second-level schools and manages the Broadband Service Desk, the first point of contact for schools who request support regarding broadband-related issues. PDST-TIE also helps to deliver professional development to teachers to assist them in integrating ICT into their teaching. PDST-TIE facilitates

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[4] See www.curriculumonline.ie/Junior-cycle/Short-Courses.

[5] The Schools Broadband Programme is an integrated set of services provided to schools. It includes broadband connectivity, content filtering and security services such as antivirus. See www.pdsttechnologyineducation.ie/en/Technology/Schools-Broadband.

and supports digital teaching content which is relevant to Irish teachers through the management of Scoilnet.ie, the state website featuring resources which are reviewed by Irish teachers. PDST-TIE also helps schools develop Acceptable Usage Policies (AUP) for ICT in schools and provides assistance in supporting schools who wish to develop their e-Learning planning (PDST-TIE, 2015).

The other main purpose that PDST-TIE serves is to contribute to developing policy proposals on the use of ICT across the Irish education system. This involves consulting with the Department of Education and Skills and providing information to other educational bodies on the implementation of ICT in schools. In addition to this, PDST-TIE also encourages the use of ICT in education across other organisations, promoting curriculum innovations which enhance learning through ICT. In addition to consultation with Irish agencies, PDST-TIE is also involved with research and discussions on the use of ICT in education on both a European and global level (PDST-TIE, 2015).

Another significant development in schools is the use of cloud-based administration software. The cloud-based nature of the software relies on a fast, stable internet connection to operate. Software tools such as VSware[6] allow teachers and principals to electronically monitor attendance and record assessment results. It can also assist school management in timetabling and providing online payment tools. Software platforms like this are designed to help improve school organisation and ease the burden of administrative tasks.

Recent discussions surrounding the appropriate use of ICT in primary education by the Joint Committee on Education and Social Protection underscore the importance of this topic at the highest levels of Government (Houses of the Oireachtas, 2015). Other agencies involved in promoting and furthering the use of ICT in Irish schools are the Joint Managerial Body (JMB) which represents 400 voluntary secondary schools in Ireland, the Education and Training Boards Ireland (ETBI) which represent vocational schools and community colleges in Ireland, the Association of Community and Comprehensive Schools (ACCS) which represents 95 such schools, and the National Association of Principals and Deputy Principals (NAPD).

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[6] VSware is a design-led, cloud and mobile-based school administration platform which securely handles all core school data from attendance, assessments, and behaviour to the mandatory September and P-POD returns. As of September 2013, 400 second-level schools had signed up to VSware. See http://vsware.ie/about-vs.

1.4   ADDITIONAL POLICY DEVELOPMENTS IN IRISH EDUCATION

A range of additional policy areas place a prominent focus on the role and potential of ICT in teaching and learning in second-level schools. Most recent of these is the reformed junior cycle, where ICT features in several of the 24 statements of learning and most of the key skills underpinning the programme. For example, of the eight key skills required for successful learning, 'using digital technology' features prominently in seven: communicating, working with others, being creative, being numerate, managing information and thinking, staying well and managing myself (DES, 2015a). Hence, the new curriculum places a central focus on ICT in teaching and learning and has led to concerns regarding effective infrastructure and resources being available in schools, as raised by a range of management bodies.[7] This also emerged as an issue among some of the case-study schools (see Section 7.3).

Since 2011/12 second-level teachers are required to work an additional 33 hours per year as part of the Croke Park Agreement. This can be used for a range of activities including school planning, continuous professional development and policy development (DES, 2011). According the *First Report of the Implementation Body* (2014), ICT has been a key focus of school activities in relation to these so-called 'Croke Park Hours':

> *Many schools have arranged to work some of the additional hours in full day blocks to provide for teacher training for all staff by outside experts/facilitators in areas that have been identified as priorities by school management such as ICT. (Implementation Body, 2014)*

ICT also plays a central role in the Transition Year (TY) Programme, the first year in senior cycle education. According to the Department of Education and Skills, 'Information Technology should permeate the entire curriculum' within TY:

> *Within available resources, it [TY] offers the opportunity to maximise the use of new technology equipment in a way which may not always be possible in examination courses. In particular, emphasis should be placed on keyboarding skills and the use of the computer as a tool for working and learning. Depending on the resource available within the school/community, practical uses and applications of the computer could be explored for activities involving:*[8]

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[7]   This includes the Joint Managerial Body (JMB), representing secondary schools www.jmb.ie/images/pdf/events/Conference/Press-Release-Conference-JC-Reform.pdf.

[8]   For further detail see Guidelines for Schools www.education.ie/en/Schools-Colleges/Information/Curriculum-and-Syllabus/Transition-Year-/ty_transition_year_school_guidelines.pdf.

- *word processing, spreadsheets and databases;*
- *computer graphics and computer-aided design (CAD);*
- *computer-aided manufacture (CAM) and computer control;*
- *communications links and systems.*

Schools are also encouraged to adopt (or develop) transition units, some of which place a central focus on ICT skills,[9] such as the media and communications unit.

Provision for students with special educational needs also places a strong emphasis on ICT infrastructure, particularly relating to assistive technology (AT). AT includes a broad range of educational supports for students with a diversity of disabilities, ranging from 'low tech' supports such as a laptop stand, through to 'high tech' supports entailing sophisticated communication and computer control systems.[10] The National Council for Special Education (NCSE) oversees applications from school principals for AT supports for students. The Special Education Support Service (SESS) provides information, guidance and training for schools and teachers in the use of different forms of AT for students.

Finally DEIS schools[11] received targeted additional funding under the ICT Grant Scheme launched by the Department of Communications, Energy and Natural Resources in 2008. Additional funding was provided to assist DEIS second-level schools, and up to 100 DEIS primary schools, to achieve digital status.[12] Findings from the first phase of this study highlighted some variation in ICT usage and the perceived barriers to ICT integration between DEIS and non-DEIS schools (Coyne et al., 2016).

The next chapter will discuss relevant literature which investigates the use and importance of ICT in education, featuring research conducted both in Ireland and across the world.

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[9]   http://ncca.ie/en/Curriculum_and_Assessment/Post-Primary_Education/Senior_Cycle/Overview-of-Senior-Cycle/Transition_Year/Transition_Units/Sample_Transition_Units.html.
[10]   For further details see www.sess.ie/resources/assistive-technology-overview.
[11]   The Delivering Equality of Opportunity in Schools (DEIS) programme was introduced in 2006 to provide additional funding, access to literacy programmes and assistance with school planning to socio-economically disadvantaged primary and second-level schools.
[12]   See www.education.ie/en/Press-Events/Press-Releases/2008-Press-Releases/PR10-07-08.html.

Chapter 2

An Overview of Relevant National and International Research

2.1   INTRODUCTION

Over recent decades the place of information and communications technology (ICT) in schools has received growing attention across Europe and further afield. However, the prominence of ICT in schools in Europe has been uneven with differences apparent between countries, as well as between schools within countries. A survey for the European Commission (2013) shows overall widespread use of technology in schools at a school organisational level. However, the study finds wide differences in the proportions of students in *digitally supportive schools* (with clear policies and supports in place), the proportions being higher in the Czech Republic, Denmark, Norway and Slovenia and lower in Croatia, France and Greece. While cross-nationally students' ICT usage at school lags far behind their use out of school, higher proportions of digitally confident students are found in Denmark and Norway. Further, the *ways* in which ICT is utilised in the classroom shows wide diversity within and across countries. Teachers' confidence levels, as well as their technical competence, were found to be key in shaping the level and nature of ICT usage across schools and countries. Overall, the most recent OECD report (2015) observes that while new technologies for teaching and learning exist, schools tend to lag behind other institutions in adopting and using them.

Research in the area of ICT use in education falls into a range of categories:

- Large-scale impact studies (e.g. Balanskat, 2007b; Condie and Munro, 2007);

- Evaluations of national ICT programmes, initiatives or interventions (e.g. NCCA, 2007; Rodríguez et al., 2010);

- National inspection reports (OFSTED, 2011);

- National research studies (Papaioannou and Charalambous, 2011; Krumsvik and Jones, 2013; Fredriksson et al., 2008);

- International comparisons (OECD, 2015; European Commission, 2013; see also Balanskat, 2007a). While some studies focus on the use of specific devices (Rikala et al., 2013), others consider a diversity of factors influencing ICT integration into teaching and learning (Polizzi, 2011).

National research studies on ICT use in schools typically draw on either a qualitative or quantitative approach. Some small-scale studies combine a number of qualitative methods: case studies combining approaches such as interviews with teachers, drawing up specific lesson plans, teacher reflections and class observation (Sweeny-Burt, 2014).

Other studies, typically drawing on large-scale survey data (such as TIMSS) explore quantitatively the relationship between ICT and student outcomes (De Witte and Rogge, 2014). Even where computers are used in the classroom, their impact on student performance tends to be mixed, largely reflecting the way technology is used (and the filtering systems in place), the methodologies employed in different studies and the way in which impact is measured (see Hyland et al., 2015; Coyne et al., 2016, for a detailed discussion). One recent OECD study (2015) finds no notable improvements in student achievement in Reading, Mathematics or Science in the countries that had invested heavily in ICT for education. Results are obtained from analysis of the 2012 Programme for International Student Assessment (PISA) study. Furthermore, technology was found to be 'of little help in bridging the skills divide between advantaged and disadvantaged students' (OECD, 2015). However, this OECD study has been heavily debated in Ireland and internationally, with one Irish expert noting that the OECD analysis is based on cross-sectional PISA data and the result is an association between computer usage and performance at one point in time. Hence 'the inference that computer usage can have negative effects on performance is inappropriate'. Further, he cites studies showing that lower achieving students, who spend more time on computers in many countries, can benefit most from carefully structured interventions in literacy and numeracy delivered on computer (Shiel, 2015).

The following sections discuss a range of issues emerging in the research literature on the integration of ICT in schools. The first considers the role of school culture and leadership, the second the place of ICT in teaching and the third presenting evidence on student learning. We then place a specific focus on recent Irish studies examining the role of ICT in schools. We conclude the chapter with a discussion of the School Improvement Theory, which serves as a theoretical framework for the study.

2.2   ICT INTEGRATION AND SCHOOL CULTURE

There is now an extensive body of research on organisational culture in schools. Researchers have put forward various definitions of organisational culture,

generally recognising that it is a system of shared values and norms that give it a distinct identity (Schein, 1992). All schools have their own distinctive identities and culture that is shaped by their history, context and people as well as by the external context of a school (Stoll, 1998). School culture is found to have an impact on the work and wellbeing of individuals who work and study in these institutions (Keup et al., 2001). It has the potential to enhance organisational performance and individual satisfaction (Hellriegel el al., 2004; Kruger, 2003), or act as a barrier to change (Deal and Kennedy, 1982). To foster teaching and learning, a collaborative school culture that supports high levels of collegiality, teamwork and shared vision is essential (Edmonson et al., 2002).

School principals have an important role to play in establishing school culture by building a vision and setting a direction as well as supporting teaching and learning and providing teachers with opportunities for high-quality professional development (Kruger, 2003; Singh and Lokotsch, 2005; Waters and Kingston, 2005; Kapp, 2000; Leithwood et al., 2008; McLeskey, 2011). As the leader of an organisation, the school principal's actions and leadership style are likely to have an impact on the work and behaviour of the teachers in the school (Mintzberg, 1983). In this context, effective ICT integration depends on the perceptions and vision of school principals since they can promote the use of ICT at a strategic level (Pelgrum and Law, 2003; Polizzi, 2011).

Research shows that principals need to consider a range of issues in making decisions on the future direction regarding ICT integration; these include budgeting, staffing, building and managing infrastructures, and developing skills and strategies among staff (Polizzi, 2011; Schiller, 2003). Additional challenges may be imposed on principals by a school culture emphasising competition and high stakes testing which can dissuade teachers from integrating technology into their classrooms and using it for teaching (Chen, 2008). In addition to contextual variables that shape principals' dispositions towards ICT integration, there are also individual-level variables including keeping up with new technology and the related terminology, their participation in ICT-related training courses and their own perceptions of their competence in using ICT (Polizzi, 2011; Papaioannou and Charalambous, 2011).

2.3   USING ICT IN TEACHING

Research spanning four decades suggests that new technologies have a potential to make teaching and learning more flexible as new pedagogies and teaching methods increasingly involving the use of educational technology are emerging (Tamim et al., 2011). Over the years an increasing number of studies have

explored teachers' attitudes towards using ICT in schools, factors impacting on their use of ICT, and teaching methodologies. Despite the widespread use of ICT at many levels of education, there is substantial evidence that computer use is not well integrated into teaching and learning (Voogt et al., 2013; OECD, 2015; Orlando, 2013; Sipilä, 2013; Meyer et al., 2011; Olofsson et al., 2011; Orlando, 2014). Teachers who do not integrate technology into their classroom activities are often labelled as 'resistant' to change. Yet, considerable uncertainties remain about the appropriate uses and actual value of technology in teaching and learning, which can hinder integration and change (Howard, 2013). In addition, decisions to integrate technology in teaching are influenced by negative attitudes to technology and general risk-aversion in teaching (ibid). Being engaged in the planning process and having opportunities to avail of high-quality in-service are likely to make teachers less apprehensive of using technology in teaching and support goals promoted by the school (Howard, 2013). This is likely to have significant implications for school leadership, particularly in relation to establishing clear and well-communicated expectations for technology integration throughout the school. Haydn (2012) argues that it is important to acknowledge that ICT skills are not enough; teachers need to be sufficiently prepared to use these skills in a 'pedagogically effective way', which improves students' commitments to learning and learning outcomes.

According to Fraillon et al. (2014), additional factors that were important in promoting teachers' ICT use included their levels of confidence about their own expertise and having adequate resources. Approaches most frequently used by the teachers included word processing and presentation software, as well as computer-based information resources such as websites, wikis, and encyclopaedias. The authors conclude that in general, the teachers appear to have been using ICT most frequently for relatively simple tasks rather than for more complex tasks (Fraillon et al., 2014). Further, Orlando (2013) in the Australian context on the use of ICT in teaching notes that while ICT became more integrated into teaching, school and systemic factors, as well as teachers' core beliefs about learning, contributed to their maintaining of teacher-centred practices. Bingimlas (2009) conducted a meta-analysis of schools and found evidence that teachers faced a variety of school-level barriers to implementing ICT in their class. Barriers ranged from limited access to ICT equipment, poor hardware quality and maintenance and inadequate software.

Classroom design has also featured in a number of research studies. Some research identifies challenges associated with computer use which include lighting and problems with individual workspaces (Zandvliet and Straker, 2001). Together with ergonomically designed furniture, these factors affected learning

behaviour and co-operation (ibid). Chandra and Mills (2015) also found that classroom design is a relevant factor in the effectiveness of ICT integration. Two classrooms were renovated to accommodate the newly acquired computer hardware. The first classroom adopted a one-to-one desktop model with all the computers with internet access arranged in a front-facing pattern. The second classroom had computers arranged in small groups. The students also used Blackboard[13] to access learning materials after school hours. The results showed that the design influenced teachers' pedagogical approaches and the types of learning activities they designed and implemented.

2.4 STUDENTS AND LEARNING

ICT has become an integral part of the fabric of most primary and secondary students' lives across Europe. Most young people today tend to use a variety of technologies on a daily basis (McCoy et al., 2012). At the same time schools seem to have been slower in keeping pace with these developments (Traxler, 2010; Klopfer et al., 2010). Existing pedagogical approaches are likely to be challenged by the increasing capabilities of personal digital devices and other technology (Male and Burden, 2014; Burden et al., 2012). In particular, the nature and portability of technology has shifted the accessibility of information to any-time access (Male and Burden, 2014). It has also been noted by some researchers that student demand to use such devices in school (and parental acceptance of such devices) is on the increase, yet school management is reluctant to allow such use (Heinrich, 2012).

The integration of ICT is also likely to change the roles of teachers and learners, with the teacher no longer being the sole channel to knowledge (Burden et al., 2012, p. 56). In modern schools, knowledge is no longer separate to the learner, but instead can be challenged and shaped by a 'participatory culture' in classrooms (Male and Burden, 2014). Adopting ICT and changing teaching approaches moves responsibility for learning (and engagement) beyond the confines of school and classroom and into the student's personal life. Researchers in the US found that students in their study perceived technology in school as limited and restrictive; recognised that teachers' ICT skills determined classroom instruction; and many experienced a disconnect between ICT use in school and out of school (Stefl-Mabry et al., 2010). High and middle school students also voiced frustration with restricted internet access and the ban on personal ICT devices at a district level. The authors argue that although there are valid reasons to restrict internet access, 'a unilateral digital lock-down' across all grades

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13 Blackboard is a virtual learning environment and course management system.

prevents older students from learning 'to negotiate and evaluate information online' (ibid). Students in the study noted that teachers often substituted PowerPoint for chalkboard notes, but students became tired of what sometimes became a sole reliance on PowerPoint.

O'Hara (2011) suggests that a less well-defined area of investigation is the interface between children's home-school technology use. A focus of this work is on the notion of a 'digital-disconnect' between home and school. Today many students find that the technology they have access to outside of school is newer, faster, and far less restrictive than the technology they have access to in school. This dichotomy is creating a situation where, for the first time, students have greater access to information and resources out of school than they do in school. Literature about children's capacity to use digital technologies involves studies on digital avatars[14] (Liu et al., 2012) and use of game consoles (Miller and Robertson, 2011), indicating that young children are often very skilful technology users. While some studies differentiate between technology use at school and at home, Gronn et al. (2013) found that the siblings participating in their study (in the 5-12-year-old range) reported using similar technologies (internet and iPod Touch™) for learning in both their home and school environments in similar functions. These functions included information retrieval, rote practice of skills, and entertainment purposes. Selwyn (2013) proposes that a more in-depth understanding about how technologies are used across social settings is necessary to move educational technology research beyond an 'endless focus' on how technologies should be used to 'improve' learning (such as by narrowing the 'gap' between home and school use). He argues that educational technology research should adopt a more critical orientation to thinking about the relationship between technologies, education, and micro/macro social and cultural experiences.

In recent years only a few studies have drawn on the student's voice in exploring ICT integration in schools. Räihä et al. (2014) explored students' views of an ICT-based learning environment in health learning. The study was a part of the wider European Network of Health Promoting Schools programme (ENHPS; since 2008, Schools for Health in Europe, SHE) in Finland. The results showed that students' opinions about the ICT-based learning environment were fairly positive. Students felt that ICT resources were easy to use and supported co-operative learning. They found that computing and internet skills positively supported students' favourable attitudes towards such ICT-rich environments.

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[14]   In Liu et al. (2012), digital avatars refer to 'physical digitally augmented puppets whose behaviour is determined in real time by children' which are used as part of a collaborative storytelling platform.

An earlier study in the UK (Deaney et al., 2003) explored students' views of the use of ICT within subject teaching and learning (Years 8, 10 and 12) in six secondary schools. Students saw computer-based tools and resources as helping not just to effect tasks and improve presentation, but also to refine work and trial options. They associated the use of such tools and resources with a more positive working ambience and classroom relations, as well as with raised interest and increased motivation on their part. Finally, while students welcomed opportunities for independent working mediated by ICT in which they could engage more directly with appropriately challenging tasks, they were concerned that this reshaping of learning might be displacing valuable teaching.

Wall et al. (2005) in the UK examine students' views of interactive whiteboards (IWBs) and the impact these tools can have on teaching and learning. In this study students were encouraged to talk about learning in different contexts. The results showed that overall feedback from the students was positive, with the resulting themes encompassing how the IWB can facilitate and initiate learning and impact on preferred approaches to learning. The students described how different elements of software and hardware can motivate, aid concentration, and keep their attention. Of the negative feedback received, much of the sentiment related to the technical reliability of the boards and the associated equipment.

Frustration with available technology is also evident in a study in the UK (Selwyn et al., 2010) which found that 'high-tech' primary school students felt disappointed by the 'low-tech' nature of their schools. The year-long study of over 600 students in primary schools across England asked children how they would prefer technology to be used in their learning. The majority of the respondents wanted the occasional chance to bring their own devices into school. They also wanted a greater say in the rules and regulations that surround ICT use in schools. The study also found that more than 80 per cent of children regularly played computer games, and more than one-in-five made regular use of social networking sites such as Bebo, Habbo or MySpace in their spare time. In contrast, the most frequent school ICT uses were word processing and internet searching. Regarding internet safety, the study found that only one third of the students surveyed were knowledgeable about staying safe when using the internet. Similarly, more than 60 per cent wanted more help from their teachers in terms of learning about 'e-safety'.

2.5   IRISH RESEARCH ON ICT IN SCHOOLS

In Ireland, there is now a growing body of research focussing on ICT use in schools. Research studies that draw on large-scale national survey data are relatively rare in Ireland. Most studies on various aspects of ICT use tend to be small-scale studies, many of which adopt a qualitative approach. One of the few recent large-scale studies is that by Hyland et al. (2015), which combined data from a government programme providing broadband access to primary schools in Ireland with anonymised survey microdata on schools', teachers' and students' use of the internet (the *Growing Up in Ireland* study). The study aimed to identify the factors associated with internet use in the classroom and students' scores on standardised reading and mathematics tests. The authors found that provision of broadband service under the government scheme was associated with teachers' use of the internet in class after about a two-year lag. Better computing facilities in schools were associated with higher internet use but advertised download speed was not found to be statistically significant. Internet use in class was found to be associated with significantly higher average mathematics and reading scores on standardised tests.

International literature has highlighted the importance of technology maintenance in schools, particularly in allowing the seamless integration of ICT into teaching and learning. In Ireland, ICT co-ordinators have an important role to play in this respect. Drawing on data collected from a sample of Irish second-level schools, McDonagh and McGarr (2015) found that ICT co-ordinators tended to see the evolution of ICT as something beyond their control and perceived 'progress' only in relation to hardware acquisition. The authors suggest that the shift from 'electronic janitor' to 'pedagogical leader' is in its infancy in Irish schools. They argue that educators need to define their collective vision for ICT, rather than placing sole responsibility on a single agent of change.

Principals have also been found to play a key role. In a small-scale study on teaching principals, McGarr and Kearney (2009) found that while principals had enthusiastically responded to the national ICT in schools initiative (Schools IT2000), they found that it had significantly added to the demands of their positions. While the lack of up-to-date resources, poor levels of technical support and time were identified as the main impediments, a lack of familiarity with the ways in which the technology could be integrated across the curriculum impacted on the quality of pedagogical leadership provided by them.

ICT use in schools also depends on teachers' willingness and skills to include ICT in their classrooms. Challenges involved in attempts to integrate an ICT-based

resource (a Virtual Chemistry Laboratory) into some second-level Science teachers' practice are described in a study by Donnelly et al. (2011). According to the authors, many potential barriers revolve around the individual teacher and hence they are an important starting point in understanding the change process in schools. They developed a working framework to describe teachers' level of ICT integration into their practice and the factors underpinning this. Their work raises important questions around how teachers may be effectively supported to move between descriptions within the framework. How teachers use ICT in teaching is also discussed in Marcus-Quinn and McGarr (2015) and Donnelly et al. (2011).

The *Teaching and Learning International Survey for Ireland* (Shiel et al., 2009) also provides evidence on the orientation of Irish teachers and principals regarding ICT and teaching methodologies in lower second-level education. Irish teachers show a preference for structured teaching practices, with less focus on student-centred approaches than in all other comparison countries. Teachers also reported high levels of unmet professional development needs, particularly relating to ICT teaching skills (34 per cent in Ireland relative to 24 per cent across TALIS countries). Finally, a majority of principals reported a shortage or inadequacy of computers for instruction.

The surveys used in this research expand on the work of Cosgrove et al. (2014), who study the ICT resources in Irish primary, post-primary and special schools for the purpose of drafting the current DES Digital Strategy for Schools (DES, 2015c). Principals and teachers are surveyed across a range of ICT-related areas and identify areas for improvement in the provision of ICT in the Irish education system from ensuring the quality of broadband connectivity to all schools, emphasising how ICTs can be incorporated into curriculum areas and the importance of providing ICT-related professional development opportunities.

Coyne et al. (2016), drawing on the first round of national survey data (of second-level school principals and teachers) just prior to the roll-out of high-speed broadband in second-level schools, found that integrating ICT into teaching and learning is a gradual process for most teachers and is influenced by a complex mix of socio-technical factors. While attitudes towards the potential of high-speed broadband and use of ICT are consistently positive across sub-groups of schools and teachers, perceived barriers to ICT usage differ. Overall, teachers' use of ICT to date appears to be largely outside of the classroom in more effectively preparing for their lessons; teachers state a much smaller proportion of students use ICT within the classroom. The findings resonate with UK researchers who argue that ICT policy has tended to focus on the provision of new hardware, and an attempt to keep up with changing technological capabilities, rather than

pedagogic understanding (Rushby and Seabrook, 2008; Hammond, 2014). Finally, in terms of teachers' current usage of ICT in teaching and learning, teacher professional development variables stand out as having a significantly positive association with current usage (Coyne et al., 2016).

2.6 THEORETICAL FRAMEWORK: SCHOOL IMPROVEMENT

This report takes school improvement theory as a starting point. School improvement theory can be seen as a practice and policy-oriented approach to strengthen schools' capacity for change management. In contrast to 'school effectiveness', 'school improvement' focuses on how schools can change in order to improve, whereas school effectiveness is concerned with what is to be changed in schools in order to become more effective (Reynolds et al., 2000). According to Hopkins (2001) school improvement is a distinct approach to educational change with a view to enhancing student outcomes as well as strengthening the school's capacity for managing change. School improvement aims to determine and provide conditions under which the staff and students promote and sustain learning among them (Barth, 1990). In short, the purpose of school improvement is to impact on the relationship between the teaching and learning process and the conditions that support it. The change should not just reflect an implementation of policies, but should be aimed at improvements or adaptations of practice which transform the learning process to achieve the maximum impact on students, teachers and schools, (Hargreaves, 1994; Hopkins, 2001). It is beyond the scope of this report to discuss in any detail the very expansive literature that exists on school improvement (for more detailed discussion see Stoll and Riley, 1999). The report discusses school improvement through the lens of technology integration in schools.

There are many ways in which ICT can contribute to processes of school improvement. This can occur through the use of new technology as an aid to independent learning, as a motivator of students of all abilities, as a set of tools for professional development and as a set of innovative mechanisms for assessment and monitoring (Rudd, 2001). Although there has been some discussion on the key characteristics of successful schools, recent research on ICT as one of these characteristics in a drive towards improving school and student performance has remained sparse. Furthermore, although the ICT literature has examined the links between ICT and student motivation, the role of ICT as a direct factor in bringing about improvements in school and student performance has been under-researched (Rudd, 2001). Some larger-scale studies of the effects of ICT upon teaching and learning have been initiated, however, notably the IEA study mentioned above, the *IMPACT* studies funded by the British Educational and Communications Technology Agency (BECTA, 2001) and ongoing evaluations

of the UK *National Grid for Learning* (Furlong et al., 2000). While many authors highlight the positive potential of ICT integration, other authors tend to be more cautious in seeing ICT integration as a driving force for change in schools. Notland et al. (2001) argue that it is difficult to state whether the introduction of ICT to schools is a catalyst for change in pedagogical practices. They argue that ICT contributes with additional resources and is not a necessary condition for the reform to work in itself. While highlighting the capacity of ICT to affect the quality and efficiency of education, they express concern that as the implementation of technology in schools tends to be uneven, that unevenness may lead to inequities in school quality and student learning.

It is important to note that school improvement is influenced by a number of factors. While it is expected that the investment of ICT resources in schools, and the development of accompanying teacher and student skills, should enhance the overall effectiveness of a school and should also improve levels of academic performance, this will only happen if certain conditions are in place (Barrett, 2009). Barrett argues that in order to achieve improvements in learning, it is necessary to integrate ICT tools into the curriculum as well as to tailor pedagogy according to the social environment. Teachers have an important role to play as the 'agents' of change (OECD, 2001). In Sweden, agencies responsible for teacher education promote the use of ICT in education by developing user-friendly ICT tools for in-service competence development and school improvement as well as by stimulating educationalists to increase their knowledge and competence (European Schoolnet, 2011). It is important, they argue, that practitioners do not see the integration of ICT into subject teaching as the need to 'tick the right box', but that they see the potential to promote more interactive teaching and learning experience. By embedding technology into teaching, learning and management, schools are likely to move towards whole-school improvement.

This chapter has provided a thorough review of research which has investigated the role of ICT in education and other important research which is relevant to this study. The next chapter will provide an overview of the methodological approach adopted in this study.

Chapter 3

Research Methodology

3.1 INTRODUCTION

The previous chapter highlighted the use of mixed-method approaches in ICT studies internationally. This chapter details how a mixed method approach has been applied in the current study. The discussion begins with the survey methodology adopted, in the pre- and post-broadband installation period, followed by a discussion of the qualitative research undertaken in a selection of case-study schools. Finally, a number of potential limitations, which have been identified by the research team, are discussed.

3.2 QUANTITATIVE RESEARCH

The quantitative data being used as a part of this research encompasses two rounds of surveys which were administered to second-level principals and teachers. Each survey[15] aims to capture attitudes towards the use of ICT in teaching and learning and the barriers restricting the (effective) use of ICT in the classroom.

The initial round of survey data (pre-installation) was collected at two separate time periods due to the phased roll-out of the high-speed broadband connection. A pilot programme consisted of 78 schools (DCENR, 2015a). The next two phases of upgrades consisted of 436 second-level schools (Coyne et al., 2016), known as Group 1 schools for this study, and remaining second-level schools, Group 2 schools, in the rest of the country have been since connected. All second-level schools (approximately 730) now have a 100Mbps connection (DCENR, 2015a). Group 1 schools are based in Dublin, Kildare and Meath. Group 2 schools are based in Waterford, Wexford, Cork, Kerry, Kilkenny and Limerick (Coyne et al., 2016). Surveys were administered to principals and teachers in schools shortly before the installation of their high-speed connection. Schools in Group 1 received service in the second half of 2013 and schools in Group 2 received service in the second half of 2014. A second round of survey data (post-installation) was collected during the second half of 2015 (summer) for both groups simultaneously, giving a time lag ranging from six to 24 months.

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[15] An example of one of the pre-installation surveys administered is presented in Appendix 1.

When comparing the changes in principal and teacher views of the benefits and barriers to ICT usage, it must be noted that Group 1 schools have had more time since their connection was upgraded to observe changes. If the benefits of an improved internet connection take time to be observed, it could be reasonable to expect Group 1 schools to have reported more change than those in Group 2, especially when both were interviewed during the same period for the post-installation survey round.

The pre-installation survey (used in Coyne et al., 2016) consisted of 1,152 survey responses from 436 second-level schools across the country. The second round survey provides an opportunity to examine changes (if any) in attitude among school principals and teachers since the installation of high-speed broadband. There were 538 survey responses from 303 second-level schools in the second round survey. The surveys are almost identical in their questions and structure, which allows the change in responses over time to be analysed. From the analysed responses, 303 schools participated in both rounds of the survey.[16] Similar to Coyne et al. (2016), the survey in this data is a purposive sample, where the pre-installation profile of sample schools closely matches the national population of schools across categories of school type, size and designated disadvantaged (DEIS) status.

TABLE 3.1   Response to Pre- and Post-Installation Survey

	Targeted (#)	Responses (#)	Response Rate (%)
Pre-Installation			
Teacher	1,573	880	55
Principal	434	272	62
Total	2,007	1,152	57
Number of Schools		436	
Post-Installation			
Teacher	775	380	49
Principal	400	158	40
Total	1,175	538	46
Number of Schools		303	

Source: Analysis of pre- and post-installation survey data.

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[16]   Schools may have sent a different number of responses during each round. For example, a principal and teacher response may be present for the pre-installation survey, but a principal and two teachers may have completed the post-installation survey. In total, 303 schools responded, in some capacity, to both survey rounds.

This report will provide an in depth perspective into the opinions expressed by participants in the qualitative analysis while also enhancing the analysis, where relevant, with the quantitative findings of the surveys administered to principals and teachers nationwide. The next section will detail the qualitative phase of the research, followed by a discussion of how case-study schools were classified as part of this qualitative research.

3.3   QUALITATIVE RESEARCH

The qualitative component of this research provides in-depth insights into the use of ICT during the day-to-day operation of second-level schools. The research team constructed a theoretical sample of ten second-level schools, selected from schools that participated in the first round survey (Coyne et al., 2016) which gathered the views of principals and teachers on the (potential) impact of broadband on teaching and learning in their school. The sample was designed to capture schools of varying size, composition (DEIS status) and orientation towards ICT. It was important to select a balanced cohort of schools with more and less positive attitudes towards ICT usage, not just those who were positively (or negatively) disposed to ICT use in school. The case-study schools are not intended to be in any way representative of the population of schools, but in selecting schools of differing characteristics and orientation, the study aims to understand experiences and attitudes across a diversity of school contexts.

As part of this study, semi-structured face-to-face interviews were conducted with school principals, ICT co-ordinators (where possible) and teachers. Student interviews with groups of fifth and second year students were conducted in the form of focus groups. The focus group interview format was chosen for students for a number of reasons. It has been argued that 'the greater anonymity of the group environment can help individuals disclose their opinions more freely' (Smyth et al., 2011). Also, a group interview setting eliminated the pressure for individuals to answer every question, so the opinions that the group provide as a whole are likely to be more genuine (Vaughn et al., 1996; Frederickson et al., 2004). Most focus groups comprised an average of five pupils. In total, 32 student focus groups were conducted across the ten case-study schools.

Across the ten case-study schools, two teachers per school were interviewed by the research team. The interviews followed a semi-structured format, with an interview schedule guiding the questions. The teachers were largely selected by school principals, which (as noted in Section 3.6) the researchers acknowledge may have led to a bias towards more ICT-oriented teachers being chosen. Many of the teachers interviewed were also in the younger age brackets, with the vast

majority (of the 20 teachers) under the age of 40.[17] The case-study interviews captured a wide spectrum of curricular areas across junior and senior cycle in the ten schools, including Mathematics, Sciences, Geography, History, Technical Graphics/DCG, Art, Business, Accounting, Languages, Physical Education, Career Guidance and Resource teaching.

The interviews were digitally recorded and transcribed and were later analysed using NVivo, a software package which is utilised for data management and manipulation in order to facilitate analysis (Darmody and Byrne, 2006). The responses from the interviewees were imported into the software and coded (providing labels for data) under specific themes to aid thematic analysis. Themes are patterns across the dataset that are important to the description of a phenomenon; in this case ICT integration in Irish schools. Braun and Clarke (2006) identifies various steps involved in thematic analysis including: familiarisation with data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and producing the final report. These phases were also followed in this study. Data coding can follow an inductive or deductive approach. The former approach uses the data to generate ideas, the latter method starts with an idea or theoretical framework and uses the data to verify or disprove the idea (Tesch, 1990; Patton, 2002). This study used a combination of approaches to identify the topics that school principals, teachers and students consider important. We started with inductive coding, attempting to identify patterns in the data; this was followed by recoding of the data once the patterns became clear and support was found from existing literature.

3.4   CASE-STUDY SCHOOLS

Table 3.2 details the key characteristics of the ten case-study schools. Four schools are vocational, three are either community or comprehensive and there are three voluntary secondary schools: two single sex (one boys, one girls) and one coeducational. Four schools contain at least 600 students, one school is in the 400-599 range, three schools have between 200-399 students and two schools have less than 200 students. We also differentiate the schools in terms of socio-economic composition, based on DEIS status.[18] From the ten case-study schools, six are included in the DEIS programme and four are not. Exactly half of the schools in each DEIS category received broadband in Group 1 and Group 2. In analysing the quantitative and qualitative evidence, for the most part the

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[17]   This compares to half of the teachers who responded to the survey being over the age of 40.
[18]   DEIS stands for Delivering Equality of Opportunity in Schools and is a programme designed 'around addressing the educational needs of children and young people from disadvantaged communities' (DES, 2005).

evidence did not reveal notable differences across school type and size in the level and nature of ICT integration. For this reason, much of the focus of the analysis examines variation across schools classified as 'high', 'medium' and 'low ICT' schools, which is discussed in the next section.

TABLE 3.2   Profile of Case-Study Schools

School ID	School Type	DEIS	Size	Group 1	Group 2
Alder Lane	Coeducational Secondary		400-599		✓
Beech Street	Community/comprehensive	✓	200-399	✓	
Cedar Avenue	Community/comprehensive	✓	0-199		✓
Daisy Road	Vocational	✓	200-399		✓
Elm Road	Boys' Secondary		600+		✓
Fern Avenue	Community/comprehensive		600+	✓	
Green Lane	Girls' Secondary	✓	200-399	✓	
Holly Road	Vocational	✓	0-199	✓	
Ivy Lane	Vocational	✓	600+		✓
Juniper Avenue	Vocational		600+	✓	

Source: Department of Education.

3.5   MEASURING SCHOOL ICT INTEGRATION

In undertaking interviews with school management, teachers and students across the ten schools, and from early thematic analysis of the data, it emerged that three inter-linking sets of factors played an important role in shaping the level and nature of ICT integration within and across schools. For the purposes of this study, these three sets of factors or 'pillars' are labelled: Vision, Connectivity and Equipment. As shown in Table 3.3, these three pillars comprise important dimensions of ICT orientation and infrastructure in a school. In the case of Vision, for example, the orientation of school management, the role of ICT planning and the extent and nature of professional development for teachers and management are key dimensions. Schools vary in the extent and way in which they display each of these features. Despite this heterogeneity, these three attributes are central features of schools which appear to exhibit more ICT-based teaching and learning methods. The absence of any one of these pillars can hinder the overall effectiveness of the usage of ICT in the classroom. The research team considers the role of each of these themes in terms of the attitudes towards, and behaviours regarding, ICT usage at the school and classroom levels. This evaluation is based on the perspectives of school management, teachers and students in each case-study school. The next section describes in detail the characteristics outlined above, with evidence from the relevant literature where appropriate.

TABLE 3.3   Measures of School ICT Integration

Vision	Management
	ICT Planning
	Professional Development
Connectivity	Internet Connection
	Internal Network Reliability
Equipment	Hardware
	Equipment Maintenance

3.5.1   Vision

Management

Literature highlights the important role that the school principal has in creating a vision for the direction of their school and in helping teachers to achieve the desired outcomes (Leithwood et al., 2008; Pelgrum and Law, 2003; Polizzi, 2011). The attitude of school leadership towards the use of ICT in school is very influential in fostering the culture of ICT at the local school level. Leadership in the school regarding ICT policies is typically provided by the principal, ICT co-ordinator or teachers who are interested in the ICT direction of the school. In the absence of school leadership providing a roadmap for future school ICT development, staff may not feel encouraged to adopt more ICT-based teaching methods. A lack of whole-school vision regarding ICT typically leads to a divide across classrooms, where only the teachers who wish to adopt ICT-based methods will do so.

ICT Planning

ICT planning by school management (typically principals and ICT co-ordinators) is an important aspect of the development of ICT adoption and infrastructure in a school over time. Given the funding and time constraints faced by schools, it is essential that any investment in ICT equipment, infrastructure or professional development is allocated as efficiently as possible in order to maximise the value. These decisions are made even more complex for management given the rapidly changing technologies in the ICT sector. It has become increasingly difficult to decide how to invest school resources when it is difficult to predict if this technology will continue to provide value in future years. A lack of ICT planning can result in suboptimal investments on equipment which may ultimately be detrimental to any expected increase in effective teaching and learning through ICT-based methods. Polizzi (2011) highlights how the principal is important to strategic planning at the school level and is therefore influential in the level of technology that is integrated into teaching.

Professional Development

It has been noted above how school management plays an important role in ensuring that there is not a divide in the level of ICT use being adopted within their school. One important aspect of this is the role of management in encouraging professional development. This is important as, in any given school, there is typically a broad range in the age of teachers. It is natural to expect that different teachers, especially from different generations, have their own preferred way of teaching. For example, younger teachers who completed college with the use of a laptop could be more comfortable using this technology in a classroom setting, while a teacher who is not so familiar with using this equipment might be less inclined to do so. International research (Enyedy, 2014; Balanskat et al., 2006) examines the role of school management in providing professional development opportunities to teachers in addition to new technological infrastructure. Professional development opportunities would achieve two objectives: showing teachers innovative uses of technology in the classroom which they might not have previously been aware of and also helping teachers to become more comfortable with technology. If teachers become more comfortable with ICT, technology has an opportunity to be embedded effectively into classrooms by teachers who wish to do so.

3.5.2   Connectivity

Internet Connection

Effective ICT integration in school relies on an adequate internet connection. The majority of teachers who were interviewed consider a reliable internet connection to be important for the use of ICT-based teaching purposes. The limited time that a teacher has to conduct a class requires a reliable, seamless internet connection if technology is to be used in the class. Issues with the speed or quality of an internet connection will lead to frustration as online content cannot be accessed easily. The DCENR Schools 100Mbps Project aims to provide a high-quality internet connection to the school building which will remove one of the major barriers to more ICT-based teaching and learning in classrooms.

Internal Network Reliability

In addition to a suitable internet connection being vital to school connectivity, an equally important issue is how that connection is reliably delivered to each classroom. Although the DCENR project delivered an internet connection to the school, it is often the case that a high-quality connection is not available in every classroom. An unreliable network can be caused by a variety of reasons, such as out-of-date networking equipment (routers or LAN cable) or the walls of a school building being too thick for signal to travel effectively. This poses issues for

teachers who move between rooms, as they must factor in the condition of the classroom when preparing their lessons. Underwood et al. (2005) state that the quality of educational experiences is enhanced by embedded, reliable and high capacity broadband in the classroom. This implies that broadband must be reliable throughout the entire school building in order to benefit all students and not act as a disincentive for teachers who use rooms with poor connectivity.

3.5.3   Equipment

Hardware

ICT equipment should be suitable for a teacher to use it seamlessly during class, without the need for a complicated setup. The type of ICT equipment can vary across and within schools. Some rooms might rely on interactive whiteboards (IWB), others on a computer and projector, or a spectrum of other alternatives. Regardless of the type of technology being used in a classroom, it needs to be fit for the purpose of teachers to facilitate and encourage ICT-based teaching material. Research has found that teachers face a range of school-level barriers which limited the extent to which ICT could be adopted in their teaching (Bingimlas, 2009).

Maintenance

Another aspect of having suitable equipment is the issue of maintaining the current equipment that is in the school. Equipment like computers and projectors tends to age quickly. Williams and Hatanaka (2005) conducted a survey of 1,000 houses in Japan and found that on average, a household computer is used for approximately three years. They are typically stored for another three years before being donated or recycled. For schools, it is important to get the most value from investments in equipment. It is very important to have ongoing maintenance to deal with issues of obsolescence such as ageing hardware or technical faults. In the absence of appropriate maintenance, machines become slower and turn from being a tool for aiding teaching and learning to becoming an impediment to ICT-based teaching methods.

Each of these 'pillars' of ICT integration rely on each other in order for ICT to work as well as envisioned. From an early stage of this research it became clear that different schools in the case study used different techniques in achieving their ICT goals. This speaks to the unique nature of schools and the decisions made by leadership at the school level. When classifying our theoretical sample we award schools a discrete rating from 0-2 in each category. The higher the rating, the better that particular school was considered to fulfil the criteria in the categories outlined above.

TABLE 3.4   ICT Integration Rating Scale

Cumulative Score	Ranking	Schools in category
0-3	Low	3
4-5	Medium	4
6	High	3

Source: Analysis of interview data.

It is possible for two schools to obtain the same rating in a category although they achieve it by different methods. The method of ranking schools is outlined in Table 3.4. The lowest possible score is 0 and the highest total score is 6. Case-study schools are grouped into categories of 'Low' 'Medium' or 'High' ICT readiness. For confidentiality reasons, our selected schools have been given pseudonyms, which are applied throughout this report. Figure 3.1 provides a visual profile of how each school performed in terms of Vision, Equipment and Connectivity.

FIGURE 3.1   Case-Study School ICT Integration Rating
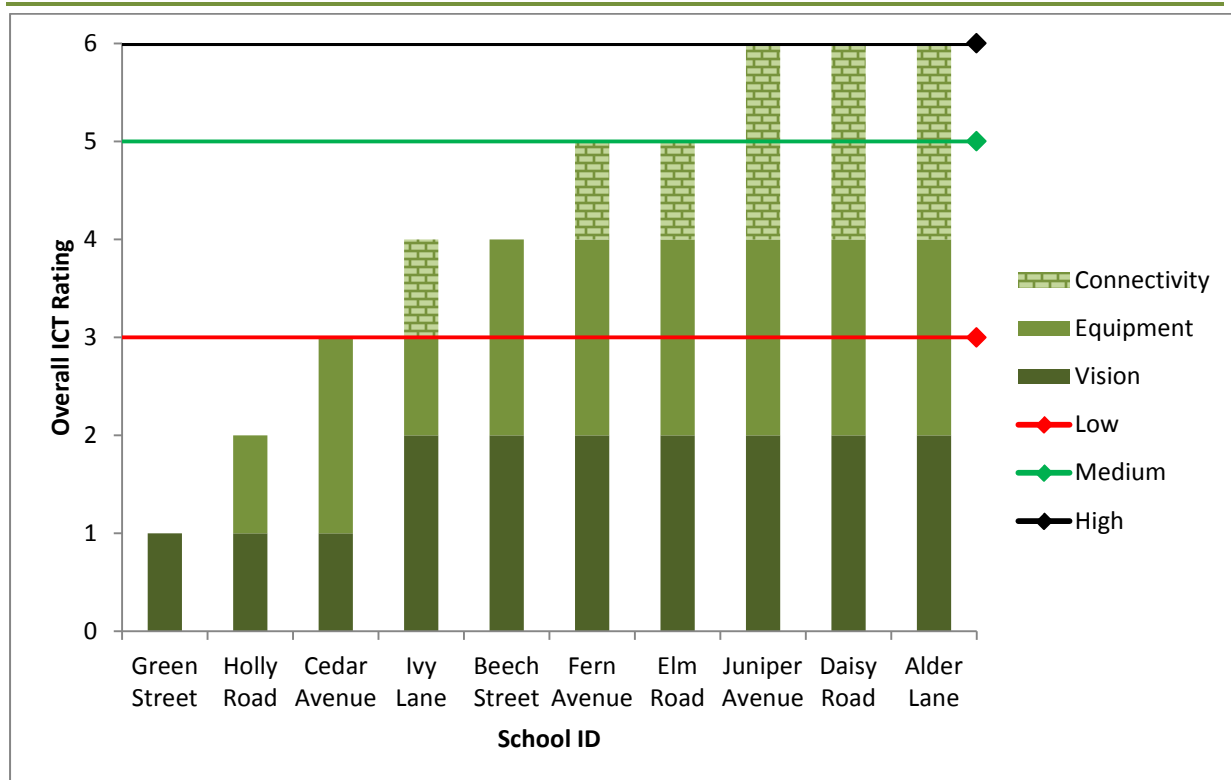
Source: Analysis of interview data.

3.6   LIMITATIONS OF RESEARCH

This report aims to provide insights into the teaching and learning processes in Irish second-level schools in light of the recent DCENR initiative to provide every

second-level school with high-speed broadband connection. The mixed methods approach incorporates a number of different research techniques to provide a rich and in-depth understanding of the issues. However, it is important to provide an outline of some of the limitations of the study for the purpose of clarity.

The pool of schools contacted for this research was based on the sample of principals who responded to the initial pre-installation survey in Coyne et al. (2016). There is scope for a selection bias, as schools who did not respond to the initial survey were omitted from the list of eligible schools to be chosen to participate in the interview phase. However, the research team worked to construct a theoretical sample of case-study schools across a range of characteristics such as school type and composition, as well as the extent to which principals and teachers were positively oriented towards ICT integration. Of the twenty-one schools contacted to participate in this phase of the project, ten agreed to facilitate the research. The research team considers the theoretical sample of ten case-study schools captures the variety of second-level schools in Ireland across these criteria.

For the most part, principals (or the ICT co-ordinator who hosted the researcher) selected the teachers to be interviewed. Although there is potential for a bias in the teachers who were chosen to be interviewed, time constraints during the school day often resulted in whatever teacher was available participating in the interview. Considering the time constraints and the variation of sentiment between staff within schools expressed during interviews, the research team is satisfied that any potential bias has been minimised as teachers (in general) provided a diverse range of opinions and appeared to convey genuine perspectives and experiences.

The central focus of this research is to investigate attitudes and behaviours regarding the use of ICT in second-level schools in Ireland. However, the semi-structured interview format often resulted in interviews discussing related topics such as cyber-bullying. Some of these issues are complex and beyond the scope of this analysis, but highlight that ICT (and the internet) have become important across almost every aspect of day-to-day life for the current generation of students. Finally, as noted in Chapter 2, this study is not focused on the effects of ICT usage on student outcomes, such as examination performance or cognitive gains.

3.7   REPORT OUTLINE

The remainder of the report is outlined as follows: Chapter 4 will present some of the main quantitative findings from the survey of teachers and principals. Chapters 5-9 of this report will provide a detailed thematic analysis from the perspectives of school management, teachers and students. A thematic approach is ideal for this research as it allows the views of different groups (e.g. principals and teachers) to be represented together to provide a richer insight.

Chapter 4

The Perceived Effect of the DCENR Schools 100Mbps Project

4.1   INTRODUCTION

Previous research has shown that the use of technology has the potential to improve teaching and learning in schools. ICT can have direct benefits and may also influence pupils' learning indirectly, for example via improved self-esteem, engagement and desire to learn (Sammons, 2008).

This chapter examines the views of principals and teachers on how much of an impact improved broadband connectivity has had on schools during the relatively short period since the 100 Mb/s service was introduced. It starts with an analysis of the post-installation survey data for both principals and teachers. Following this, qualitative evidence from interviews in the ten case-study schools is used to consider broader aspects of the perceived benefit from broadband. Finally, this chapter investigates how the time elapsed since upgrade is associated with opinions about the perceived impact of the upgrade.

4.2   PERCEIVED OVERALL IMPACT OF HIGH-SPEED BROADBAND

This section features data from the post-installation survey round which has been administered to principals and teachers in schools that received a high-speed broadband connection as part of the School 100Mpbs programme (DCENR, 2015a). The post-upgrade survey was administered to schools between two and 18 months after broadband access was upgraded to provide significantly higher speed and reliability. It must be noted that differences in perceived impact of broadband are based on school type are not discussed in this report. However, we highlight the differences found in relation to the ICT integration level (discussed in the previous chapter). One particular question asks principals and teachers what impact they felt that high-speed broadband had on teaching and learning in their school. The question is categorical, with four possible options (1= high impact, 2= significant, 3= low, 4= no observed impact). The reaction to the upgrade was positive with almost 80 per cent of principals and 70 per cent of teachers reporting 'high' or 'significant' impact on teaching and learning (Figure 4.1). The average score for this rating among principals (2.05) was slightly more positive than that of teachers (2.18), but this difference is marginally significant (P-value =0.08).

FIGURE 4.1   Perceived Impact of Upgraded Broadband Connection
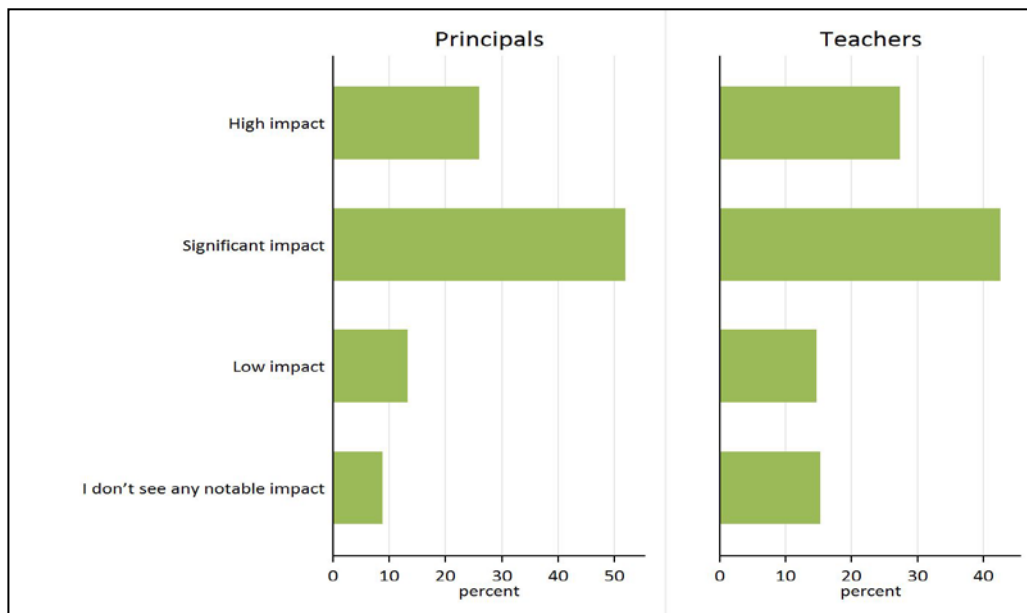
Source: Analysis of post-installation survey responses. (N=158 principals, N=380 teachers).

The next section will aim to provide richer context for some of the differences that exist between teacher and principal perceptions through the use of interview data from the sample of ten case-study schools.

4.3   PERCEIVED IMPACT OF HIGH-SPEED BROADBAND – CASE-STUDY SCHOOLS

In this section we extend the discussion of the early experiences of schools after their broadband access was upgraded, using responses to quantitative and qualitative survey questions answered by principals and teachers. We then outline some observations on attitudes to ICT and uses made of it for teaching and learning, as well as perceived barriers to using ICT more effectively in Irish schools.

4.3.1   Principals' Views on Impact of Improved Broadband

Views expressed in the case-study schools indicate that the introduction of high-speed broadband helped facilitate administrative work as well as teaching in the school. For example, since the introduction of broadband, recording attendance had become considerably easier, taking less time:

> *But with broadband, we decided, you know, we wanted to keep a closer eye on attendance, so now it is every forty minutes... the roll returns were taking two or three minutes in every class. Now they're only taking thirty seconds. (Alder Lane, High ICT, Principal)*

Using a universal recording system also meant that all teachers needed to become familiar with the technology:

Since VSware, I suppose when our attendance software came in. Everybody had to get on board then. Whereas before you'd have different teachers going at different rates. Some of them wouldn't be as keen as others. But they'd, they'd be happy out, filling out their books but and sending it down. But now everybody has to get up to speed. (Alder Lane, High ICT, ICT Co-ordinator)

With regard to teaching, the improved internet facilities also enabled some schools to introduce new programmes. For example, in Alder Lane, programming was introduced for Transition Year students:

I decided to introduce programming into Transition Year. So in our computer room, so thirty computers using Scratch, or Python... So these are all online based programming tutorials apps. That would've been impossible really; it would've been too clunky before broadband. (Alder Lane, High ICT, Principal)

The difference between 'now' and 'then' was also highlighted by another principal who noted that having a more reliable system makes it easier for teachers to plan lessons and enables them to organise different activities:

It [high-speed broadband] definitely does [make an impact]... they know it's a safer bet. That they can actually log on to their school accounts, get on to these resources straight away.... whereas, before I suppose you had to plan a lesson around, okay, will it download, will it not download. What happens if it doesn't download it, plan the second lesson... But because we have high-speed broadband and our iPads, we can actually do a range of different, different things. (Juniper Avenue, High ICT, Deputy Principal)

While the overall impression of the effect of broadband is positive in these schools, the principal of a low ICT integration school argued that in order to reap the full benefits the schools themselves needed to put in their own resources:

The Department have given us this wonderful high-speed broadband. But you know, we didn't have the capacity really to, or we wouldn't have had the capacity to deal with it, if I hadn't been able to get that voluntary support, you know. (Cedar Avenue, Low ICT, Principal)

In the surveys, principals were asked about the availability of ICT in their schools, ranging from computing hardware (Computer, tablet, interactive whiteboard) to other ICT infrastructure (quality of internet connection, presence of Wi-Fi, online content filtering). In most cases, the answers did not change significantly between the two surveys. However, there was an improvement in the perceived adequacy of internet access for both teachers and students after high-speed broadband was installed (Figure 4.2). Nevertheless, a minority of principals still felt that internet access was inadequate after the upgrade to their schools' connectivity, particularly for students. As discussed later, this may relate in part to limitations of networking (e.g. Wi-Fi) within many schools.

FIGURE 4.2   Principals' View of School Internet Adequacy for Teachers and Students
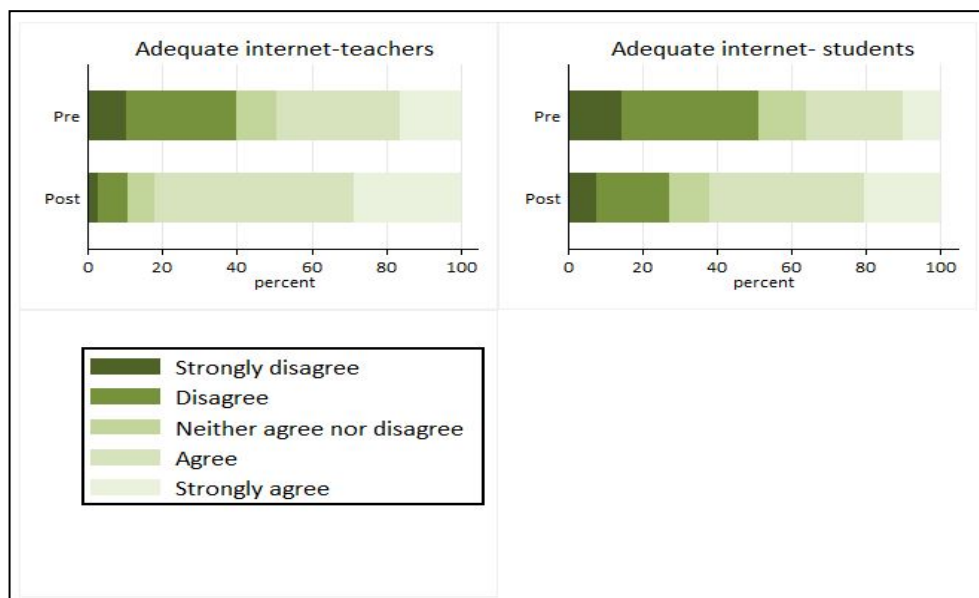
Source: Analysis of survey data (N=272 principals pre-installation, 158 principals post-installation).

4.3.2   Teachers' Views on Impact of Improved Broadband

The study also explored teachers' perspectives on the impact of high-speed broadband. Like principals, there was generally a positive disposition among teachers across different kinds of schools. Case-study teachers spoke of the high-speed broadband allowing more reliable, seamless integration of ICT:

> *I'm much more comfortable using ICT in the classroom now [with high-speed broadband]. (Alder Lane, High ICT, Teacher)*

Many highlighted its impact in terms of speed and reliability:

> *A huge increase in speed, reliability. It's just we take it for granted*

now that it'll be there and it'll be done so quickly. Whereas before we'd serious, serious problems with breakdowns and... it was so slow. (Fern Avenue, Medium ICT, Teacher)

Sometimes we have problems with [internet access in] certain rooms or at certain times, but I must say it has improved since we went on this hundred meg thing. (Holly Road, Low ICT, Teacher)

A number of interviewees also pointed to the essential role of Wi-Fi coverage in the school, which needed to be of high quality:

We wouldn't be able to rely on the technology in classrooms otherwise [without broadband]... but again the infrastructure of the wireless system that we put in as well had to fit and it does... so the high-speed broadband has been absolutely fantastic. (Juniper Avenue, High ICT, ICT Co-ordinator)

Overall high-speed broadband was noted to be particularly important for more 'reluctant' teachers, who needed the certainty provided by highly reliable broadband before they would incorporate ICT into their lessons:

With the teachers who aren't au fait with technology... if they thought there was a twenty or fifteen per cent chance that their internet wouldn't be working that day, they just wouldn't bother. (Juniper Avenue, High ICT, Teacher)

Further, high-speed broadband was seen as a requirement for certain types of activities, particularly online:

I do a bit of coding with Transition Year students. I wouldn't have been able to do that last year with the speed of the internet... I found last year if we were trying to research anything, just basic websites, they'd crash. It was a case of whoever got online first was lucky. (Alder Lane, High ICT, Teacher)

I use Netflix, and if we hadn't got that broadband as fast, I wouldn't be able to do that. I used to try it before, through the TV and it was very slow, it didn't work. And it was cutting in and cutting out and that frustrates students and it frustrates me as well. (Ivy Lane, Medium ICT, Teacher)

4.4   TIMING OF IMPROVEMENTS IN BROADBAND

We suggested earlier that the effect of improving broadband connectivity or other ICT facilities may take time to be embedded in attitudes and practices within schools. Because there was some variation in the time between schools in our sample being provided with 100 Mb/s service and the post-installation survey, we can explore this time-effect relationship.

Figure 4.3[19] splits principals into groups depending upon how they responded to the question 'What impact has the high-speed (100Mbps) broadband had on teaching and learning in your school?' in the post-installation survey. For each group, from 'high impact' to 'I don't see any notable impact', it then displays how long principals in the group had between broadband installation and the survey (this is represented on the x-axis). Comparing these groups, it seems that principals in the high and significant impact groups tended to be from schools that had broadband service for longer, whereas those with lower perceived impact have a more uniform distribution of time since upgrade.

FIGURE 4.3   Perceived Impact by Time since Broadband Upgrade: Principals
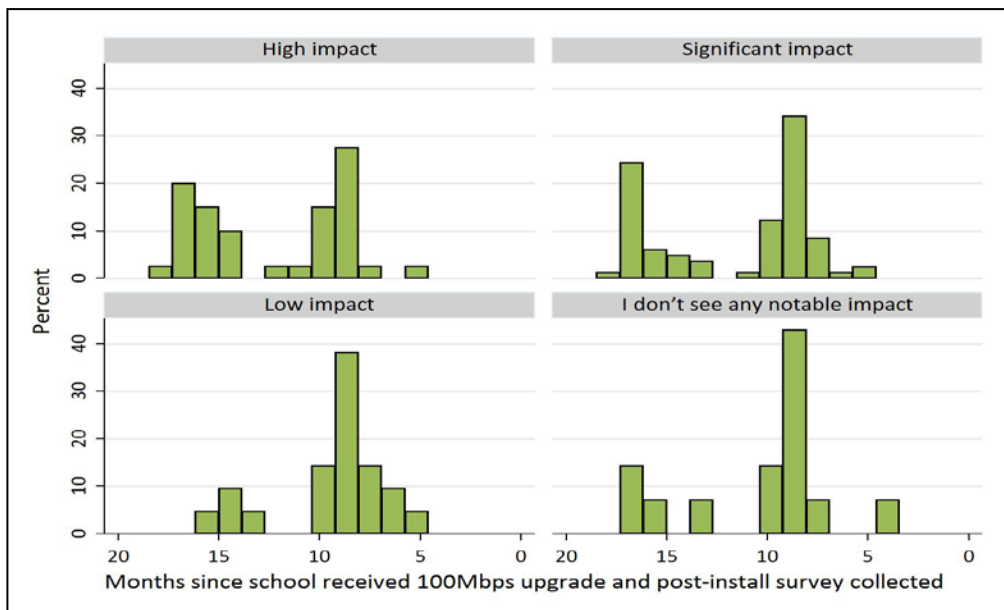
Source: Analysis of survey data (N=272 principals pre-installation, 158 principals post-installation).

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[19]   The x-axis shows the length of time that a school has had the upgraded connection before being surveyed for the post-installation round. For example, a school who received the upgrade 15 months before the post-installation survey will have their response located where x=15. The particular chart they are displayed in depends on how the principal responded to the particular question (High impact, significant impact, low impact, no notable impact).

A more formal way to test this relationship is to see if the correlation between time since upgrade (in months) and perceived impact (on a scale of 1-4) is statistically significant. It is, with principals having had 100 Mb/s service for longer reporting a significant impact (P-value=0.0081).

However, if we do the same exercise for the impact perceived by teachers there is no statistically significant relationship with time. This is illustrated in Figure 4.4[20] below, with little sign of systematic differences in the distributions of time since upgrade for the various impact categories.

FIGURE 4.4   Perceived Impact by Time since Broadband Upgrade: Teachers
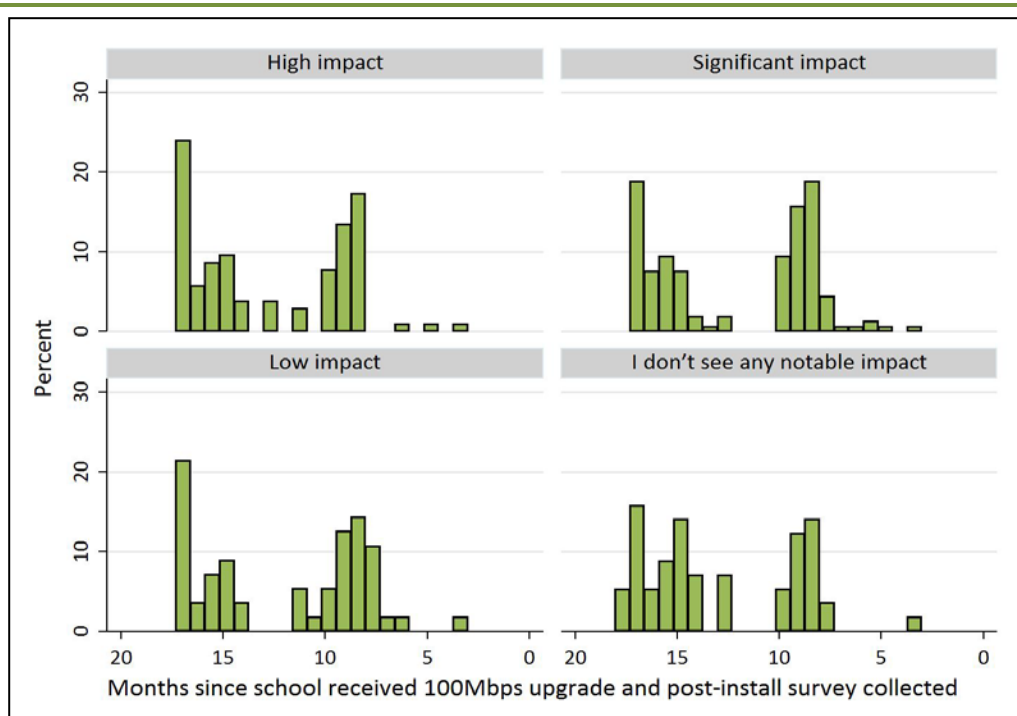
Source: Analysis of survey data (N=880 teachers pre-installation, 380 teachers post-installation).

Thus, in addition to slightly higher shares of principals reporting high or significant impact than teachers overall, the time elapsed since upgrade seems to have reinforced principals' generally positive perceptions. Teachers' perceptions vary significantly, but these variations do not seem to be associated with whether they have had fast broadband for longer or not.

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[20]   The x-axis shows the length of time that a school has had the upgraded connection before being surveyed for the post-installation round. For example, a school who received the upgrade 15 months before the post-installation survey will have their response located where x=15. The particular chart they are displayed in depends on how the teacher responded to the particular question (High impact, significant impact, low impact, no notable impact).

Of course, the time variation in our sample between the shortest and longest periods is only about 16 months. That may simply be too short a time for teachers' perceptions of the impact to show much development. Nevertheless, some principals' perceptions do seem to have changed during that relatively short period.

4.5   SUMMARY

This chapter has discussed principals' and teachers' perceptions of how better broadband connectivity has affected teaching and learning. Most participants report positive and often significant effects, both in the survey data and case-study interview reflections. There is some evidence that principals felt these effects to be more significant than teachers did, and having had upgraded broadband connectivity for a longer period was associated with stronger perceived effects among principals (but not teachers). This suggests that benefits may take time to manifest fully (as suggested by theory and previous research). However the time since the earliest schools in the sample received broadband is still rather short compared to the annual academic cycle, so it is not possible to say much about the temporal dimension. Finally, many participants mentioned barriers to further use of ICT, and these perceived barriers seem to vary among and between the principals and teachers interviewed.

Chapter 5

School Leadership, Culture and Technical Support

5.1   INTRODUCTION

School culture has been found to influence a range of processes within schools, including teaching and learning (DuFour and Mattos, 2013). School culture is influenced by the interaction of various factors including the attitudes and beliefs of school leadership, the cultural norms of the school, and the relationships between staff and students. Each of these factors may present barriers to change or a bridge to sustainable implementation of school improvement.

School leadership and a whole-school approach to developing ICT strategies have been identified as crucial in the effective integration of ICT in schools. This is influenced by a range of personal and contextual variables including teacher skills and ICT infrastructure. The aim of this chapter is to explore the perceptions of school principals and ICT co-ordinators regarding ICT integration in Irish second-level schools. The chapter draws on post-installation survey data of school principals as well as interviews with principals and ICT co-ordinators in case-study schools. The chapter starts by exploring the role of school culture in ICT integration. It then discusses school leadership and organisational culture; factors shaping principals' dispositions towards adopting and using ICT; the role of ICT co-ordinators; and the importance of schools having an ICT strategy.

5.2   ICT INTEGRATION AND SCHOOL CULTURE

There is now an extensive body of research on organisational culture in schools (Schein, 1992; Keup et al., 2001; Kruger, 2003). School culture has been found to impact on the work of both students and teachers and is cultivated by school management. The culture can either assist school improvement or act as barrier to change. Exploring organisational culture is important for understanding the integration of ICT in schools. In this study, second-level school principals were asked whether the school culture/ethos and objectives include the use of ICT by staff and students. The interviewees associated school culture, first and foremost, with creating a supportive and caring school environment: 'that would be the whole ethos, right, of caring for the student, helping them to develop' (Daisy Road, High ICT, Principal), and providing all students, including those with learning difficulties, with a high-quality education. The principal of Alder Lane, a large rural school with high ICT integration, linked school ethos explicitly with

access to ICT. He indicated that in their school every child has access to ICT, especially those availing of learning support.

Technology featured more strongly in the organisational culture of Elm Road and Juniper Avenue. In Elm Road (medium ICT integration) the principal in the school was a strong advocate of providing young people with specific skills that may help them to pursue further study in the field of technology:

> *We're one I suppose of a small number of schools in the country that would run Technology right through to Leaving Cert and I'd certainly feel that that particular subject would greatly enable students to go on to do degrees in engineering. (Elm Road, Medium ICT, Principal)*

In the same vein, Juniper Avenue (high ICT integration) can also be characterised as having a strong focus on ICT. Having invested in ICT integration in the school the deputy principal believed that introducing ICT into education has a potential to enhance academic achievement, as well as provide students with important skills for the future:

> *The ethos of [school name] is excellence through encouragement and effort. And what we have actually tried to do in recent past, working with the ICT co-ordinator is [to explore how] we can actually become excellent at the use of ICT of in our school. (Juniper Avenue, High ICT, Deputy Principal)*

The information gathered from the case-study schools indicates that most principals see school ethos or organisational climate in broader terms such as supporting students in helping them to achieve their potential. In this context some high and medium ICT-integration schools explicitly linked school culture with innovation and technology. Yet, all schools, irrespective of the levels of ICT integration, acknowledged the increasing importance of ICT for teaching and learning and performing administrative tasks – important aspects for school improvement.

5.3   SCHOOL LEADERSHIP AND SCHOOL CULTURE

School principals have an important role to play in the establishment of an organisational culture that supports the professional development of teachers and student learning (Singh and Lokotsch, 2005; Waters and Kingston, 2005; Kapp, 2000, McLeskey, 2011). In this context, effective ICT integration depends on the perceptions and vision of school principals (Pelgrum and Law, 2003). They

are seen to play an important role in introducing technology into teaching since they can promote the use of ICT at a strategic level (Polizzi, 2011).

5.3.1 The Role of the Principal in ICT Integration

In this study the importance of school leadership in initiating the integration of ICT into schools was somewhat more evident in medium and high ICT integration schools. The principal of Alder Lane felt that strong leadership was important in initiating change regarding ICT use:

> But occasionally, you have to push as a leader, you have to say, this is what we're going to do.... and the other half of the staff kind of have to be told they're [to] use it. (Alder Lane, High ICT, Principal)

In order to convince staff about the usefulness of new technology, the devices need to be up-to-date and fully functioning. The principal in Beech Street recognised this and started by investing in new computers for the school:

> When I became principal the first thing I did was, right, the computers,... I found money out of nowhere and now I said, okay we're at that stage where we have to upgrade again because otherwise they're too slow and teachers need to be able to access very quickly. (Beech Street, Medium ICT, Principal)

In the same vein, the importance of leadership in shaping the approach to ICT in schools was highlighted by a deputy principal in Juniper Avenue:

> Well I think if it doesn't come from the top, not a lot of people will follow. So if you're, if you're sceptical and you're trying to relay that to staff to try and engage with new methodologies. And you're a bit cagey yourself, it's not going to be, it's not going to come across. (Juniper Avenue, High ICT, Deputy Principal)

The deputy principal considered the use of technology in class to be of great benefit. He argued that providing a school with a vision, the management needs to be aware of the skill needs of staff, ensuring the availability of continuous professional development:

> I think you need to have continuous encouragement from, from senior management. To say, here are some more CPD classes, do you want to attend these.... here's an in-service on, here's your basic

introduction to ICT. This is going to get you up and running. (Juniper Avenue, High ICT, Deputy Principal)

Another ICT Co-ordinator considered it important that the principal kept herself informed of staff needs regarding technology:

[The principal has] always facilitated, she always wants to help teachers so she'd always come to me and go, what can we do, what do teachers need? (Beech Street, Medium ICT, ICT Co-ordinator)

While principals have an important role to play in shaping school culture and practices with regard to ICT use, they felt their work should be supported by national policies and guidance. One principal felt that a more sustainable approach needs to be taken at government level:

We had ICT 2000... where a lot of teachers took on courses and, you know, and it was a great start. But there hasn't been that momentum over the years and in particular with the changes and developments in technology because it's passing us [by] all the time. (Elm Road, Medium ICT, Principal)

In particular, the principal noted that more effort should go into providing teachers with sufficient ICT skills:

We do need support and... decisive and proactive and determined effort at providing that... specifically... we want to bring the nation's teachers up to a certain standard and we are going to provide this support to you and we're going to, you know, take you out of the school for a day or two in the year to build up your skills in this over the next number of years, you know, something targeted and specific. (Elm Road, Medium ICT, Principal)

In order to shape organisational climate in the school and encourage staff to use ICT, principals themselves need to hold a positive disposition towards technology. Principals' disposition towards ICT integration is shaped by both contextual-level and individual-level variables as discussed in Chapter 2.

5.3.2   Contextual Level Variables

Technology infrastructure in schools

Previous research has highlighted the importance of adequate technology infrastructure in schools (Darmody et al., 2010). Drawing on the post-installation survey data of school principals, this section describes which ICT devices are most frequently used in Irish second-level schools (see Figure 5.1). Shared devices, laptops, PCs, netbooks, tablets or mini-notebooks with internet were the devices most frequently mentioned by the principals (61 per cent). Twenty-five per cent of principals reported students using such devices on their own. Staff shared a number of devices, including digital cameras (78 per cent), data projectors (73 per cent), interactive whiteboards (55 per cent), laptops, PCs, netbooks, tablets or mini-notebooks with internet (43 per cent). Seven per cent of principals reported not having laptops, PCs, netbooks, tablets or mini-notebooks with internet available in their school. In addition to the other specific categories of technology, over 70 per cent of principals mention that there is some other form of technology which is not available in the school for educational purposes.

FIGURE 5.1   Use of ICT Devices in Schools
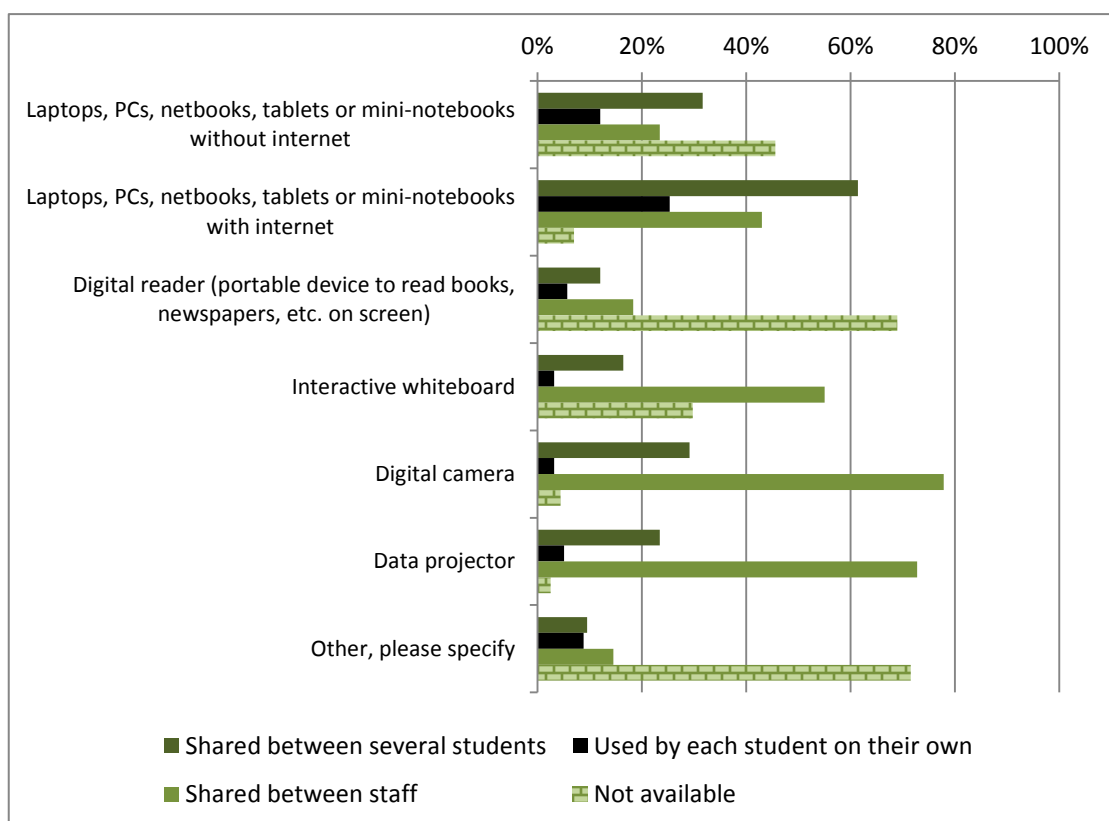
Source: Post-installation survey of second-level school principals (N=158); Categories are not mutually exclusive, for example, a resource can be 'shared between students' and 'shared between staff.'

Figure 5.2 shows that 62 per cent of principals felt that there was adequate provision of internet access for teachers in their school, but a far lower percentage consider the provision of internet access for students in their school to be adequate (35 per cent). Forty per cent of principals strongly agreed or agreed with the statement that there were adequate computing facilities in the school.

FIGURE 5.2   Principals' Satisfaction with ICT Provision in His / Her School
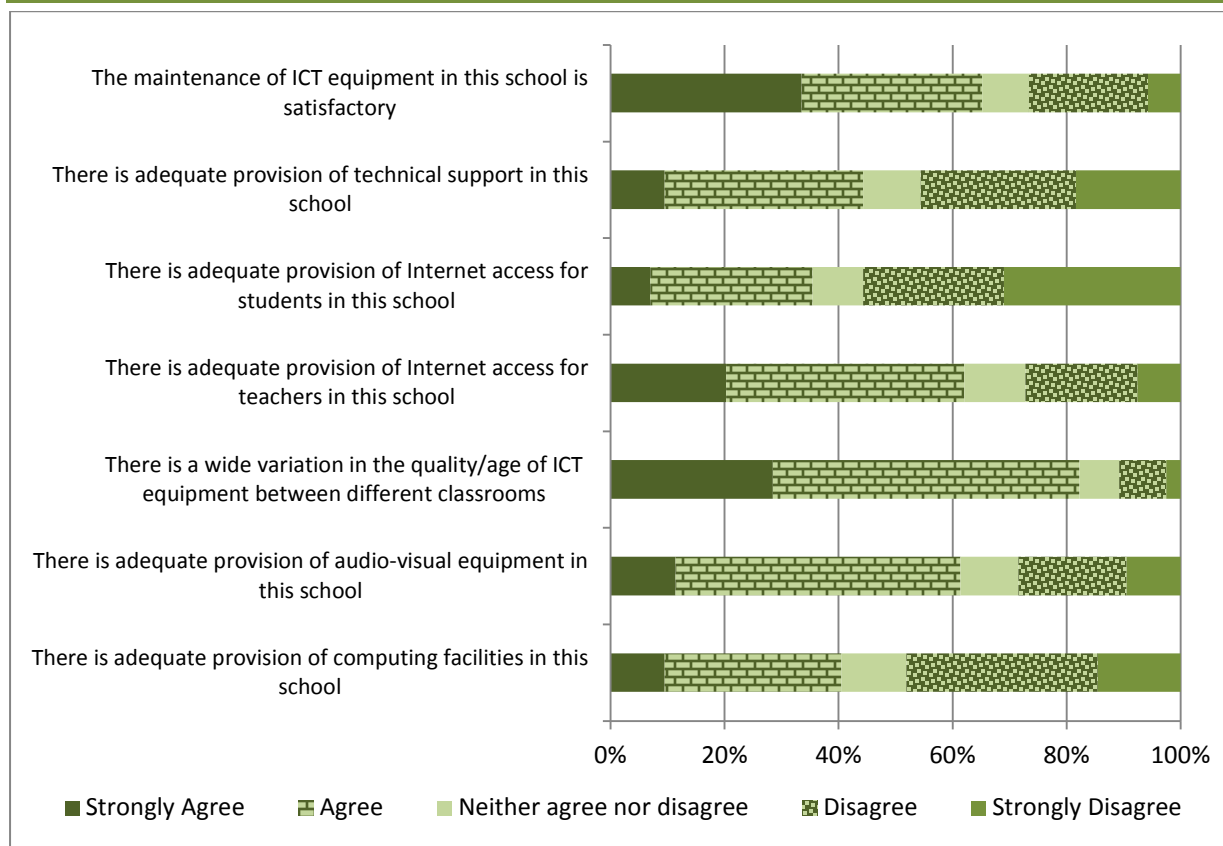
Source: Post-installation survey of second-level school principals (N=158).

Two important issues emerged from this survey: principals' dissatisfaction with technical support and the maintenance of ICT equipment. Over half of principals (strongly) disagreed with the statement 'There is adequate provision of technical support in this school', with 55 per cent feeling dissatisfied with the maintenance of ICT equipment. Nearly half of principals felt that the provision of computing facilities in their school was inadequate. The findings suggest that there is notable room for improvement in schools in these areas.

The principals' questionnaire also included a range of questions about school practices related to ICT use. Most schools use online tools and a range of internally- and externally-hosted content. A majority allow students' own devices

to be used at least some of the time, and as shown in Table 5.1, there was a small but statistically significant rise in this practice between the pre- and post-installation surveys.

TABLE 5.1   Change in Reported Uses of ICT in Schools by Principals

ICT practice	Average change in usage score
Students may use their own devices (e.g. tablets, smartphones, cameras) to support their learning within the school	0.12**
A 'live' video two-way link is used to share one or more subjects with students in another school	-0.011
ICT tools (e.g. email, video links) are used to communicate with other schools in Ireland	0.038
ICT tools (e.g. email, video links) are used to communicate with other schools internationally	-0.028
The school uses content and resources on the local school server to support teaching and learning	0.052
The school uses content and resources accessed through an external virtual learning environment (VLE) to support teaching and learning	0.084
Online tools and/or other applications are used to support teaching and learning	0.073
Student-owned computing devices (i.e. where each student has their own device) are being used in some year groups	0.15**
E-books are being used by some year groups as an alternative to paper based textbooks	0.14**

Source: Analysis of survey data. (N=272 principals pre-installation, 158 principals post-installation).
Note: Principal scores calculated by adding up category usage scores before and after installation of high-speed broadband, with No=1, In some cases=2, and Regularly=3.

The only other statistically significant change during the period around the installation of high-speed broadband was an increase (from a low base) in positive responses to 'E-books are being used by some year groups as an alternative to paper based textbooks'. The lack of statistically significant change in certain reported uses of ICT in schools (for example, 'A 'live' two-way link being used to share subjects with students in other schools') may be due to the fact that principals were surveyed relatively soon after the broadband connection was upgraded. This reasoning is consistent with the theory of educational change (Fullan, 1991), which notes that change processes in schools tends to be slow and incremental.

The survey data are complemented here with the analysis of information gathered from the case-study schools. While the principals in these schools were supportive of including various forms of technology in teaching, learning and administrative tasks, many highlighted elements/areas that need developing. The principal of Holly Road – a low ICT integrated school – recalled issues with inadequate technology when joining the staff three years ago:

When I came in here first the major issue was the internet was always going off or it didn't work or it was gone on the blink all the time... that was the biggest headache for teachers because they'd come in with their class planned and they couldn't run their class as planned... Then also the computers were very old, really old. (Holly Road, Low ICT, Principal)

Over the course of three years the principal managed to refurbish four computer rooms and provide mobile computing devices in the school. However, the principal was not satisfied with the development:

Day-to-day I'd say we have a long way to go. There's a lot that we could do that we're not doing at the moment.... I would say the hard work and the infrastructure is still not where I'd like it to be at all. (Holly Road, Low ICT, Principal)

Despite the principal's enthusiasm regarding ICT use in the school, the interview indicates that ICT integration may be a slow process, due to a number of factors, including the resources available for ICT development. Each school's ICT infrastructure depended also on the school's previous arrangements and investment in ICT. The principal in Ivy Lane noted that having provided PLC courses in the past, the school had developed a broader ICT network:

We have... six computer rooms, with twenty four PCs... And we would have a PC with internet access, in nearly all classrooms now. So every room in the school... has a PC that can connect onto your projector.... we took a huge jump in infrastructure. (Ivy Lane, Medium ICT, Principal)

This provided a base to build upon and develop a strong infrastructure that has also impacted on teaching approaches:

Well, once the infrastructure is there, teachers are using them way more.... Teachers that would've claimed to be IT illiterate are now doing stuff. (Ivy Lane, Medium ICT, Principal)

Leading ICT policy and assisting with ICT integration in schools has been seen to increase principals' workload (McGarr and Kearney, 2009). This study also indicated that in most schools principals are actively involved in identifying funding opportunities for updating and expanding technology in their school;

organising the maintenance of devices and dealing with a variety of issues that may emerge with regard to the use of various electronic devices in schools.

In the same vein, a challenge identified by most case-study principals was a lack of funding to cover costs associated with ICT development and maintenance:

> *We didn't have a budget for IT because the budget that they got in the grant had been spent for projectors, whiteboard projectors and, you know, interactive whiteboards and things like that.... So what I needed was money for updating computers, memory, the internet to be sorted out, you know. (Holly Road, Low ICT, Principal)*

Funding for ICT infrastructure was considered a challenge also by the deputy principal of one high-ICT-integration school:

> *Well funding is one [challenge]; I know every school is going to put out the, the begging bowl. But funding is one, to, to actually fund, to pay for the broadband that we have. Or to pay for our, our computers, it is an expense. And every year we've to review our budgets, to see if we can actually pay to improve.... So it's just, I suppose the escalating costs of running a school of this size, with all of the ICT that we actually have. It can be a bit of a barrier. (Juniper Avenue, High ICT, Deputy Principal)*

The most important factor in the implementation of computers in teaching and learning is whether a teacher can or cannot arrange appropriate teaching opportunities for using ICT in a classroom or laboratory (Pelgrum, 2001; Bingimlas 2009). Principals' views on teachers' skills and competences and how teachers themselves assess their confidence and skills will be discussed in Chapter 7.

5.4   THE IMPORTANCE OF ICT STRATEGY AND WHOLE-SCHOOL APPROACH

It is important to note that while the role of school principal is important in improving the culture of the school, a whole-school approach in implementing any change is essential (Deal and Peterson, 2009). Tearle (2004) argues for the need for a whole-school vision and a strategy for ICT. The implementation of ICT is best undertaken in the context of a vision for how it will be used to enhance and extend teaching and learning with an associated commitment and flexible strategy to achieve this. In this study, second-level principals were asked about their views on ICT planning.

The survey results show that most schools (95 per cent) promote the sharing of good practice in ICT integration among teachers. Fewer than half of principals surveyed (41 per cent) mention the existence of a school ICT plan, either as part of the School Development Plan (24 per cent) or as part of another document (17 per cent). In 66 per cent of the schools ICT planning was an integral (rather than separate) part of the overall school planning process (See Table 5.2). In 65 per cent of the schools a staff member had a special responsibility for ICT co-ordination. In 39 per cent of the schools ICT co-ordination was the responsibility of a designated eLearning team which included school management. The results indicate that while ICT is generally included in school planning, there is more scope for including teachers in the planning and decision-making process.

TABLE 5.2   Principals' Views on ICT Planning

	% Yes
ICT planning is an integral (rather than separate) part of the overall school planning process	66
The school has a written ICT (eLearning)planning section which forms part of the overall school plan	49
The ICT (eLearning)planning section is updated regularly to reflect overall school priorities	41
The school has a designated ICT co-ordinating teacher	65
The school has a designated eLearning (ICT co-ordinating) team which includes school management	39
The 'NCTE eLearning Handbook' and 'Roadmap' are used for ICT planning purposes, in the context of overall school planning	46
The school promotes the sharing of good practice in ICT integration among teachers	95
The school management and the ICT co-ordinating teacher jointly develop the ICT (eLearning)planning section	53
The school eLearning team, including school management, ICT co-ordinating teacher, and all teachers are involved in co-developing the plan	39
ICT/e-Learning is a regular agenda item at staff meetings	44

Source: Post-installation survey principal data (N=158).

The interviews conducted in the case-study schools showed that while the approach taken by school management, including the Principal, seemed to be driving developments regarding ICT use in schools, it was important to involve staff in the decision-making process, in line with the survey results:

> *I think it's important that the teachers have an input as well... it's important that the teachers buy in to it and by having a group like that [ICT team] teachers have an input and they'll take more ownership then of what, what direction the school goes in. (Elm Road, Medium ICT, ICT Co-ordinator)*

In order to facilitate teacher input, Elm Road had set up an e-learning team consisting of six teachers who had an interest in technology. The group was responsible for implementing the e-learning plan, which at the time of writing focussed on policies regarding acceptable use of technology in school by the students. The co-ordinator hoped that the group will become a permanent feature of the school to ensure sustainable development in the area of ICT:

> *Going forward... this year it was a group that had a finite five hours meeting time, but I would be encouraging them to stay together. It's going to have to be a permanent group, this is the first year we had any e-learning group here and it's a group that has to be permanent. (Elm Road, Medium ICT, ICT Co-ordinator)*

The ICT Co-ordinator in a high-ICT-integration Juniper Avenue noted that teachers who tend to get involved in developing approaches to ICT and technology integration in the school tend to have prior knowledge and skill sets regarding the use of technology:

> *The people on the ICT Committee also teach the subject of ICT or are involved in ICT in a part-time way, in their own interest as a hobby or they're working with subjects like TCG or technology as a subject or engineering or the construction teachers. They're the ones you actually find, in most schools that I have been to, are usually the ones involved in the areas of ICT are generally the tech savvy teachers. (Juniper Avenue, High ICT, ICT Co-ordinator)*

The co-ordinator highlighted the importance of student involvement:

> *I'll tell you who are very, very important, is having an ICT Student Committee and they're really, really beneficial, especially in Transition Year where they have the time and I usually have a few First Years as well. We have an iPad Committee too and they meet once a week on a Thursday and if there's any issues they would bring me the minutes of the meeting and I would meet with them once a month then as well. (Juniper Avenue, High ICT, ICT Co-ordinator)*

According to the survey of principals, an ICT plan was included in the school development plan in 24 per cent of the cases. Seventeen per cent of schools included it in another policy document and the remaining 59 per cent of principals report no formal e-Learning plan. Table 5.3 indicates the individuals involved in drawing up an ICT plan. The main staff members involved included the school principal or deputy principal (99 per cent), ICT Co-ordinator (85 per cent)

and teachers (74 per cent). The Boards of Management seem to have modest involvement (43 per cent). Some schools also included parents (38 per cent) and students (40 per cent).

TABLE 5.3   Parties Involved in Designing the School ICT Plan

	%
Principal/Deputy Principal	97
Board of Management	43
ICT Co-ordinator	85
Guidance Counsellor	11
Year Heads	22
Teachers	74
Parents	38
Students	40
other	9

Source: Post-installation survey principal data (N=158).
Note: Table refers to percentages where this has been mentioned.

The issue was further elaborated on in interviews with case-study school principals and ICT co-ordinators who were asked about ICT policies in their schools. Their responses indicated that schools vary in the extent to which they have formal ICT policies in place. The importance of ICT in guiding developments regarding ICT use was highlighted by the principal in Elm Road:

> *I think it does [guide developments] because I think it gives us a kind of a clear vision of the key priorities, you know, and gives us a little roadmap of where we want to go in terms of ICT development in the school. (Elm Road, Medium ICT, Principal)*

The way policies are developed varied between the case-study schools. While in some cases schools used ETB broad guidelines regarding ICT policy,[21] in other cases a team of volunteers worked on the project. In Elm Road the ICT plan was developed by a team of teachers:

> *We have an e-learning team, we set up an e-learning team this year. There's six teachers on it. So we looked at the e-learning plan and we picked our different target areas in that to work on this year... An example, like this year we are looking at our acceptable use policy*

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[21]   'It's an ETB document, it comes down and we all, each school individually adapts it to suit their own needs' (Daisy Road, High ICT, Principal).

and that's, because the role is changing and students are using mobile technology more and more we find our existing acceptable use policy is a little bit outdated, so it's, I suppose that's one policy area. (Elm Road, Medium ICT, ICT Co-ordinator)

In some cases individuals within the same schools gave different accounts of the existence of the formal ICT plan. For example, according to the principal in Beech Street, the ICT policy was part of the whole-school plan, and was integrated into general subject planning. The school also had an internet usage policy. At the same time, the ICT co-ordinator was not aware of the details of the ICT policy:

I'm not sure, I know me and [the principal] were working on something last year. (Beech Street, Medium ICT, ICT Co-ordinator)

This suggests that closer collaboration is needed between school management and ICT co-ordinators in some schools. In a high-ICT-integration school an ICT co-ordinator noted that rather than have an overarching plan or policy, each subject area had developed their own approach to ICT use:

I suppose we'd be trying a plan as such, in terms of, we'd all have our individual programmes in place. Everybody would be different in terms of, how much they would use it. Or where they would feel the need to use it. But whether, I don't think we have a specific long-term plan, of where we want to be in X amount of years. Everybody is well, everybody kind of dips into it, in terms of their own subject. (Juniper Avenue, High ICT, ICT Co-ordinator)

In Cedar Avenue, a low-ICT-integration school, developing an ICT/E-learning plan was not finalised as it 'wasn't seen as a priority'. The importance of having a progressive plan in place was highlighted by the ICT co-ordinator in Daisy Road, who noted that forward-planning is crucial in ICT integration:

Let's not kind of stand where we are. You know, if we're going, if we envisage we're going to be at such and such a height, in five years time. That's what we should be putting in place now. You know, as opposed to five years from now going, Jesus, if only we'd done it. (Daisy Road, High ICT, ICT Co-ordinator)

5.5 THE ROLE OF ICT CO-ORDINATOR

Irish schools vary in their approaches towards ICT policy development and equipment maintenance: some schools have appointed ICT co-ordinators, others use external contractors, and yet others have identified teachers who provide 'first port of call' assistance to other teachers in the school. Of the 158 principals who participated in the post-installation phase of the survey, 39 per cent reported that the ICT co-ordinator was a post of responsibility while the other 61 per cent of principals reported that their ICT co-ordinator did not have a post of responsibility. In Table 5.4, principals report the duties which their own ICT Co-ordinators fulfil. According to the principals, the ICT co-ordinator is responsible for arranging external technical support (63 per cent), helping the long-term ICT development of the school (59 per cent) and ensuring the day-to-day maintenance of equipment (53 per cent), among others.

TABLE 5.4   Role of ICT Co-ordinator (Percentages Mentioned)

	%
Maintenance of equipment (day to day)	53
Technical support for teachers	49
Arranging external technical support	63
Helping teachers develop their ICT skills	49
Helping the long-term ICT development of the school	59
Choosing the software and equipment used in school	50
Informing students and parents about online safety	35
Other, please specify	28

Source: Post-installation survey principal data (N=158).
Note: Table refers to percentages where this has been mentioned.

In line with previous studies in the Irish context (McDonagh and McGarr, 2013), and the survey results, information gathered from the case-study schools showed that ICT co-ordinators were highly critical of their roles which mainly involved maintenance and support rather than involving any leadership components.

> *My role is essentially to ensure that the equipment in the school is running as efficiently as it can. Like, I would deal on a daily basis, from teachers not getting, being able to access their computer, with wrong passwords, things like that. All the way then to co-ordinating... that would be my role like, making sure that that's all kept up to date. And then it goes from there then to printer cartridges, people running out of print. (Alder Lane, High ICT, ICT Co-ordinator)*

It's kind of more Little Miss Fix-It, (laughs), more than actually co-ordinating computers as such, so it would be trying to keep everything working, checking the printers, making sure the computers are working and dealing with any issues teachers might have. And then I would liaise with our ICT technician who would come in then to fix anything I can't fix. (Beech Street, Medium ICT, ICT Co-ordinator)

The co-ordinator in Beech Street felt that the role should be different. Ideally, they see the role of the ICT co-ordinator as:

Promoting the use of computers and, you know, liaising with staff on the use of computers and on how they can be using it more in their classroom.... I don't think we've gotten to the point where, you know, we're looking at, you know, ways to increase the use of ICT in the classroom and to get the kids more involved and things like that. I don't think we're there yet. (Beech Street, Medium ICT, ICT Co-ordinator)

The co-ordinator felt that more than one person should be allocated to ICT integration in the school:

I think one person alone [is not sufficient], I think we would need a team to be working on that. (Beech Street, Medium ICT, ICT Co-ordinator)

The ICT co-ordinator of another medium-ICT-integration school also felt that the day-to-day work as a co-ordinator is very different to what he had anticipated:

What I see my role should be is to upskill staff, whereas I'm tied up mostly in the, we'll say the technical... side of things, whereas where I should be spending my time is encouraging teachers to use ICT in the classroom, organising training, but I haven't time for it. I myself teach design and communication graphics that's one area I see as my job, was to make teachers more comfortable, less afraid. (Elm Road, Medium ICT, ICT Co-ordinator)

The focus on maintenance and troubleshooting was associated with the need for technical assistance in the school, although the principal in the school fully understood where the priorities should lie:

I would put that his responsibility is the whole vision of enabling us to move forward in terms of greater integration of ICT in the school, a greater number of teachers up-skilled, the provision of opportunities for teachers to be up-skilled. That's the role I would see for the co-ordinator, rather than the technical repairs. (Elm Road, Medium ICT, Principal)

The responses indicate that co-ordinators in schools across different types of schools, irrespective of the ICT integration, feel that their role is mainly to provide technical support for other staff.

Schools also varied in the extent to which they used external contractors to work on ICT-related issues such as maintenance (e.g. Beech Street, Elm Road). Other schools did not have a co-ordinator and the ICT-related work was carried out on an ad hoc basis (e.g. Cedar Avenue). Overall the main challenges identified by ICT co-ordinators included time, workload and support from management. Almost all co-ordinators interviewed for the project indicated that the time available did not enable them to address all the issues staff and students experienced in the classrooms. Co-ordinators, who also had teaching duties, felt that it was difficult to juggle ICT tasks and teaching:

I could spend, as you know, probably an hour inside in the computer room. Dealing with a, a problem, I could lose an hour very quickly. I have classes upstairs that are wondering where, well what's he doing? And obviously then you've a like from a, a health and safety point of view, you can't be leaving classes unattended. (Alder Lane, High ICT, ICT Co-ordinator)

The principal in Daisy Road noted that having a teacher as an ICT co-ordinator was not ideal due to the time constraints of being a full-time teacher and a school technician. The survey data indicates that just over 40 per cent of schools have an ICT co-ordinator as a post of responsibility. The case-study interviewees felt that having a post of responsibility with a reduction of teaching hours could alleviate the difficulties involved in balancing ICT responsibilities with teaching:

There should be, there should be room there for a post in the school, a dedicated post with a reduction of hours so that they can do it effectively. Similar to, to a year head, or a programme co-ordinator.... the big thing you get is staff coming to you with an iPad or a laptop.... I need you to fix it now. And you're in a classroom, or

you're sitting down doing something in the staff room, or you're talking to somebody. (Daisy Road, High ICT, ICT Co-ordinator)

In this high-ICT-integration school, the development of ICT infrastructure put an additional strain on a teacher with an added responsibility for ICT co-ordination:

[name] is our ICT co-ordinator but he's a full-time teacher, he's doing it in a voluntary capacity, you know, there isn't a post. Now I give some time allocation to try and deal with it, right, but as I mentioned previously, right, for the amount of users, right, and the amount of, the amount of ICT in the building like, you know, right, it's just not feasible. (Daisy Road, High ICT, DEIS, Medium, Rural, Principal)

Time-related pressure was mentioned by another ICT co-ordinator, who suggested that a visiting technician could help alleviate this:

I've to fit it in between, between classes and it's, I suppose it's frustrating for, for teachers and myself, is when something goes wrong it could be the next day, it could be a week sometimes by the time I get to, to look at something.... Whereas if we had someone here even once a week it would clear up a lot of, a lot of things. (Elm Road, Medium ICT, ICT Co-ordinator)

In fact, some co-ordinators considered their workload unsustainable, considering the increasing use of ICT in schools:

Because there's a huge stress on ICT co-ordinators and IT people in schools to do all of this work on top of their twenty-two hours of contact time of teaching and in this school to be expected to take care of 250 PCs, next year we'll have 600 iPads, we'll have 80 teacher iPads, we have wireless infrastructure, we have servers, we have I don't know how many hundreds of email accounts, Edmodo log-ins, computer network log-ins, the list goes on. So to ask someone to take care of that in their spare time I think is a huge expectation and I think the Department really need to look at that if they're gonna call Irish schools progressive in the area of technology. (Juniper Avenue, High ICT, ICT Co-ordinator)

The co-ordinator was also critical of the lack of guidance from the Department of Education:

I haven't been given any criteria or any vision from the department, you know. The reason I have this knowledge and skills as well is that I took it upon myself to go back and do a Master's in technology and learning and finished that only two years ago.... Yes, Board of Managements might have a say and Parents' Councils and so on, but there's absolutely no criteria out there, there's no checklist, there's nothing that a school has to go through in order to transform this teaching and learning and I've been in so many schools where some of them are an absolute mess and they're not being utilised correctly. (Juniper Avenue, High ICT, ICT Co-ordinator)

The co-ordinator was also critical of the ICT background and knowledge of people who are making decisions regarding ICT integration and use in the school:

Another barrier would be, I would say, management.... the thing that pops up most of the time is you're dealing with people that don't know much about technology.... these people are making decisions on transforming teaching and learning in institutions like this, they're not engaging staff, they're not engaging students, they're not engaging parents. (Juniper Avenue, High ICT, ICT Co-ordinator)

5.6   SUMMARY

There is now a growing body of literature on the role of leadership in school improvement. Principals have an important role to play in setting a vision for policy developments in their school. This chapter has looked at school culture and ICT integration in Irish second-level schools. International literature indicates that the success and failure in integrating ICT in schools depends on a number of factors including national policies, the efforts and competence of school principals and collaboration with teachers (Papaioannou and Charalambous, 2011; Eickelmann, 2011).

This study showed that ICT integration in Irish second-level schools was influenced by a variety of factors: school leadership, vision regarding the importance of ICT, staff skills, and the availability of technical support. Not all schools had set ICT policy development as a priority, but a high proportion had included it in their general school plan. Many principals felt that guidance on the integration and use of ICT from the Department has not kept pace with the development of the technology.

In line with international literature, ICT infrastructure and resources for maintaining ICT devices emerged as major factors impacting on ICT use in schools. In many cases schools needed to source funding themselves to pay for the updating and upkeep of equipment. Consequently, principals' satisfaction with the ICT infrastructure in their school varied. Another issue arising from this study is associated with the role of ICT co-ordinators. Rather than being responsible for the development of the direction schools should take regarding ICT development and integration, most deal with the day-to-day maintenance of equipment.

Overall, principals felt positive about the school's use of ICT in teaching and learning, irrespective of the level of ICT integration in their schools. The recent introduction of high-speed broadband has increased opportunities for using technology in schools and classrooms. However, in some cases schools found it difficult to keep pace with developments in this area due to lack of resources for updating and maintaining technology in their schools.

Chapter 6

The Role of ICT in Teaching and Learning

6.1   INTRODUCTION

Previous research on school improvement has linked ICT use to the potential to offer a wider range of learning strategies enabling a more equal provision of education to different types of pupils (Sammons, 2008). ICT was also seen to provide more flexible approaches to learning, allowing pupils to work more independently and extend learning beyond the classroom (Rudd, 2007). This chapter examines how principals and teachers reflect on the use of ICT in classrooms across a diverse range of school contexts, in the period shortly after schools received connectivity to high-speed broadband. For many schools the broadband programme entailed a move from slow and unreliable broadband service to a guaranteed high-speed connection with technical support. As discussed in Chapter 1, a core question of this study is to examine how ICT is used in the classroom with these new resources, and the extent to which this varies across school contexts and teachers. Among the issues addressed are how teachers use ICT currently and the perceived impact of ICT and enhanced broadband in teaching and learning. Reflecting the value of the mixed method approach taken for the study, the chapter draws on the survey data and the case-study research. Survey results from principals and particularly teachers, provide valuable evidence on the ways in which teachers have incorporated ICT into their teaching, the perceived benefits of ICT for teaching and learning and the extent to which teachers have engaged in ICT-related professional development.

6.2   USE OF ICT IN TEACHING AND LEARNING

6.2.1   Overall Use of ICT in Teaching

The survey provides interesting quantitative data on the extent to which teachers see ICT as having changed the way they approach their teaching and the extent to which ICT has become an important tool for teachers. Figure 6.1 examines principals' responses to questions on whether they feel ICT takes too much of teachers' time, whether ICT is an important tool for teachers and whether ICT has changed the way teachers teach in their school. Across almost all schools in the post-broadband installation survey, principals agreed that ICT was an important tool for teachers in their school (57 per cent strongly agreed and 42 per cent agreed). Similarly the vast majority either agreed (54 per cent) or strongly agreed (35 per cent) that ICT has changed the way teachers teach in their school. Just 6 per cent agreed that ICT takes too much of teachers' time, with the bulk

disagreeing (58 per cent) or strongly disagreeing (21 per cent) with this statement. Overall, the findings show a clear endorsement among school leaders for the value of, and growing place for, ICT within classrooms across a wide range of school contexts.

FIGURE 6.1   Principals' Views of the Role of ICT in the Classroom
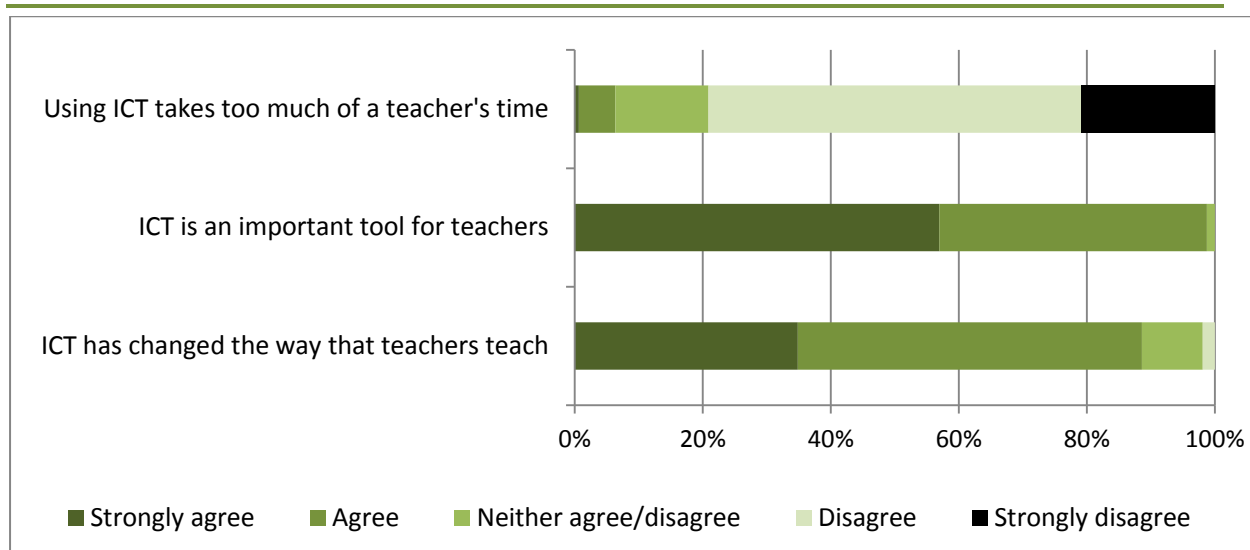
Source: Post-installation survey of second-level school principals (N=158).

Across all ten case-study schools, principals and teachers alike noted the ongoing shift towards the use of ICT in school administration and communication. As noted in Chapter 5, the delivery of high-speed broadband had further supported these developments and made software like VSware[22] an integral part of school organisation. Teachers commented on the benefits of using ICT in administration, reducing the burden on teachers and management:

> *It makes it easier and it saves a lot of time, it saves a lot of printing out, it saves a lot of filling out, you can just do it online... it does save an awful lot of time. (Holly Road, Low ICT, Teacher)*

Beyond the school organisational level, teachers spoke about the role ICT is increasingly playing across a number of key aspects of their role. For many of the teachers, ICT and online resources play a central role in class preparation. They

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[22]   VSware is a design-led, cloud and mobile based school administration platform which securely handles all core school data from attendance, assessments, and behaviour to the mandatory September and P-POD returns. As of September 2013, 400 second-level schools had signed up to VSware. See http://vsware.ie/about-vs.

reported widespread use of ICT/online resources in preparing for class, drawing together resources and content and providing up-to-date and topical content.

> *I find that if you're preparing lessons as well, like you can just go onto YouTube [and find useful content]. (Green Lane, Low ICT, Teacher)*

The following section draws on survey and case-study interview data to examine both the extent to which teachers use ICT in their teaching and the ways in which ICT is being used (over time).

6.2.2   Nature of ICT Usage Across Teachers

From the sample of 380 teachers who participated in the post-installation survey, the vast majority (83 per cent) of teachers report that they use ICT 'to a great extent (daily)', when asked 'to what extent do you use ICT in teaching?', 15 per cent of surveyed teachers report using ICT 'To some extent (Weekly)' and 2 per cent of teachers report that they do not use ICT to a great extent (less than weekly). This suggests at least three channels through which improvements to a school's broadband access might affect teaching and learning. First, since most teachers already use ICT extensively, existing applications might be used more, or more effectively. Second, teachers who do not use ICT might adopt it as the speed and reliability of the internet connection available to them improves. Finally, new applications might come into use, perhaps enabled by the order of magnitude increase in connection speeds for most schools.

It seems likely that effects operating through these three channels might manifest over different time periods, with incremental improvements for existing users coming faster than adoption by new users, and step-changes in application use coming later still. There is some evidence for this view: the reported frequency of ICT use in teaching did not change significantly between the pre- and post-upgrade surveys.[23,24]

In this section we explore how ICT is used for teaching and learning in Ireland, how this may be changing over time and how usage may be influenced by the introduction of high-speed broadband. Because the period between installation and our second survey is short, and changing teaching and learning practices is a

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[23]   We scored reported usage from 1 for 'Not to any great extent' to 3 for 'To a great extent' and calculated the average change in teachers' scores between surveys. This is not significantly different from zero [p-value=0.31].

[24]   It is important to reiterate that the sample of teachers who participated in the pre- and post-installation surveys differs; not all teachers in the first survey participated in the second survey.

gradual process (Orlando, 2013), we expect any effects to be subtle. The first channel – incremental improvements for existing users – may predominate so far. Also, because our survey lacks a control group that did not receive broadband, any findings will be descriptive rather than necessarily implying that the high-speed broadband programme *caused* the observed changes. Nevertheless, we hope to make some observations about the direction and pattern of change.

Two types of analysis are used here. One is to compare the answers given over time to structured survey questions about teaching and learning practices. The second is to apply text analysis methods to unstructured survey questions asked of teachers and principals after their schools received broadband upgrades.

Applications Used for Teaching and Learning

Figure 6.2 illustrates teachers' responses to the question 'How often do you use ICT to support teaching and learning in your main subject in the current year?' Teachers are offered a list of possible applications and asked to indicate whether they are used never, sometimes, frequently or usually/always. Full descriptions of the ICT applications are given in Table 6.1 below.

FIGURE 6.2   Frequency of Use of Different ICT Applications to Support Teaching and Learning (Pre- and Post-Broadband Upgrade)
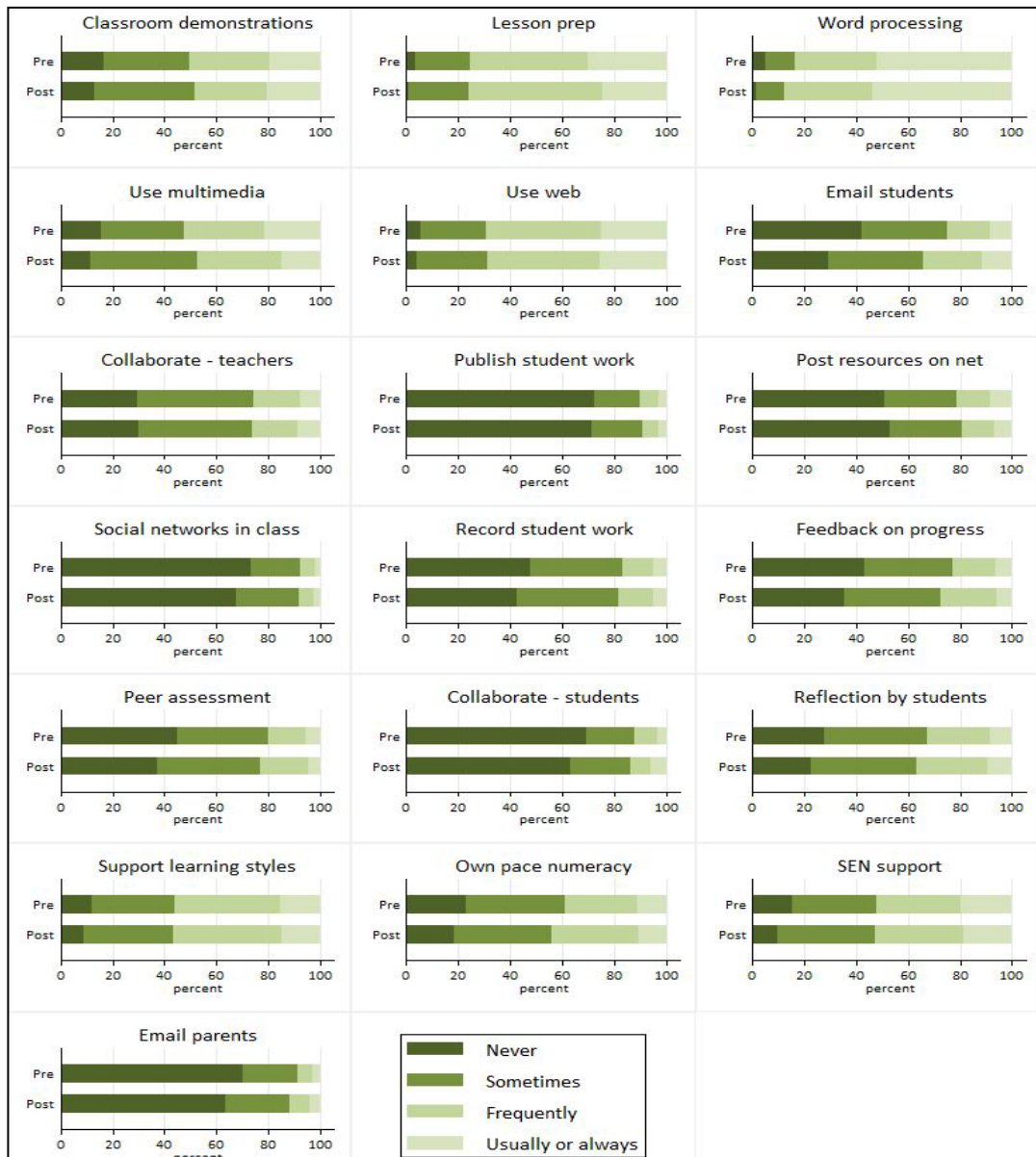
Source: Analysis of teacher survey data (N=880 pre-installation, 380 post-installation).

The absolute levels of change in reported usage behaviour before and after installation of high-speed broadband is small, which is unsurprising given the relatively short time elapsed between the surveys. To check whether the changes were statistically significant or not, we scored reported usage from 0 for 'Never' to 3 for 'Usually/always' and calculated the average change in teachers' scores for each question between the pre- and post-installation surveys (see Table 6.1).

TABLE 6.1 Change in Reported Educational Applications of ICT Use (Teacher)

ICT-based application	Average change in usage score
Conduct classroom demonstrations (e.g. computer-based simulations, virtual labs)	0.042
Use curriculum-relevant online resources for lesson preparation (e.g. websites, blogs and wikis)	0.034
Use applications such as word processing and presentation software to prepare resources for class	0.11**
Create multimedia resources, incorporating sound, video, images or other digital media for use in class	-0.026
Use curriculum relevant online resources to support their teaching (e.g. websites, blogs and wikis)	-0.053
Communicate with students via email	0.30***
Collaborate with experts and teachers in other locations to enrich student learning	0.011
Publish students' work online	-0.0056
Post teaching or learning resources on the internet (e.g. on a blog or wiki) for other teachers and students	-0.054
Use social networks in teaching in the classroom	0.068
Record student work for assessment purposes (e.g. digital camera, digital video)	0.066
To provide instant feedback to students on their progress	0.13**
Support student-to-student peer assessment	0.097*
Support collaboration between students for learning (e.g. live chat, online forums, school VLE)	0.096*
Support students to reflect on their own learning	0.10*
Support a range of student learning styles	0.033
Provide differentiated learning or own-pace learning to support the development of numeracy	0.087
Support the learning of students with special educational needs	0.057
Communicate with parents via email	0.11**

Source: Analysis of survey data (N=880 teachers pre-installation, 380 teachers post-installation).
Note: *, ** and *** denote significant at the 10 per cent, 5 per cent and 1 per cent level respectively. Scores calculated by summing category usage scores given by teachers before and after 100Mbps broadband upgrade, with Never=0, Sometimes=1, Frequently=2 and Usually/always=3.

No use of ICT showed a statistically significant decrease in reported use, whereas several applications showed (at least marginally) statistically significant increases in use: 'Use of applications such as word processing and presentation software to prepare resources for class', 'To provide instant feedback to students on their progress', 'Communicate with students via email', 'To provide instant feedback to students on their progress', 'Support student-to-student peer assessment', 'Support collaboration between students for learning (e.g. live chat, online forums, school VLE)', 'Support students to reflect on their own learning' and 'Communicate with parents via email'. Most of the remaining applications indicated increasing average usage without the change being statistically

significant. This may have happened because there was no actual change or because our sample was too small for change to be detected reliably.

While most of the changes in reported usage are small, the results may hint at a pattern. Reported communication with students and parents using email and use of word processing and presentation facilities rose significantly and substantially. These might be regarded as fairly well established uses of ICT in education. The remaining applications with indications of increased frequency of use tend to be associated with active teaching methods: e.g. provision of instant feedback to students and supporting students to reflect on their own learning. Future research could investigate any persistence in the patterns of ICT use.

Teachers' Use of ICT in Main Subject Area

Turning to teachers' use of ICT in their own main subject areas, we focused on a specific set of areas where teachers might use technology to support their work. The question posed to teachers was 'Thinking of your main subject area as stated in Q6, please indicate how frequently you use these approaches?' The results of Figure 6.3 indicate considerable variation across applications, but no statistically significant variation in average usage over time in our sample (although the trend appeared to be positive for most applications listed).

FIGURE 6.3   Different Applications of ICT Use by Teachers
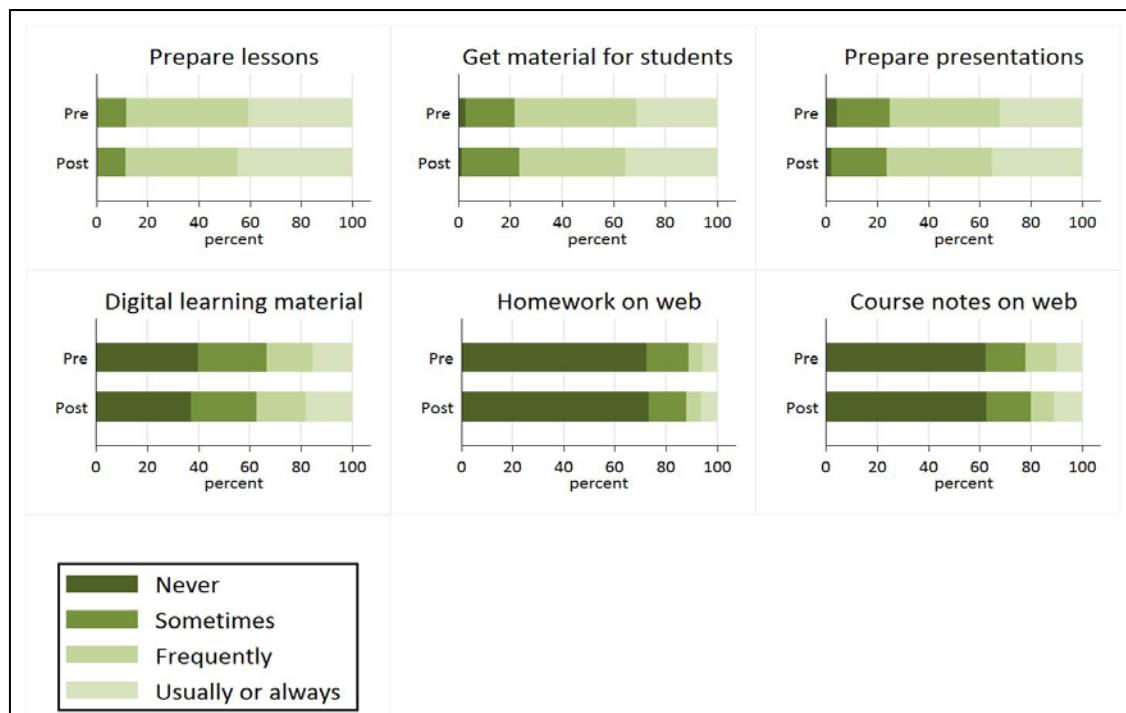
Source: Analysis of teacher survey data (N=880 pre-installation, 380 post-installation).

In line with the case-study evidence almost all teachers reported that they 'Browse/search the internet to collect information to prepare lessons', 'Browse or search internet to collect learning material or resources to be used by students during lessons', and 'Use internet applications [Google, YouTube etc.] to prepare presentations for lessons'. Many report using ICT for these purposes frequently or always. Less frequent use is reported for 'Create their own digital learning materials for students [create website with subject content]', and most do not 'Post homework for students on the school website' or 'Post course notes/materials for students on the school website'.

Students' Use of ICT Across Schools

We have noted previously that students' use of ICT in class is less common than teachers', and this pattern was reflected when we asked teachers 'How often do your students use ICT in the classroom in the following ways, again thinking of the main subject?' (Figure 6.4). Nevertheless, for several applications a majority of teachers indicated some degree of use, in particular 'Reinforce and practice routine skills and procedures', 'Find information on the internet (teacher directed)', 'Carry out research on the internet (student led)', 'Work with spreadsheets and databases', 'Analyse data or information', 'Create presentations using a range of media (e.g. podcast, video)', and 'Use simulations or animations to explore a system or abstract concept'.

The pattern of responses indicates a rising trend in usage of ICT applications over time, but changes between surveys are modest in absolute terms (Table 6.2). Of the applications listed, 'Submit homework', 'Use e-books' and 'Give feedback to peers or assess other students work' showed statistically significant increases in prevalence. No applications showed a significant decline.

**FIGURE 6.4** Frequency of Different Approaches to Technology Usage by Students
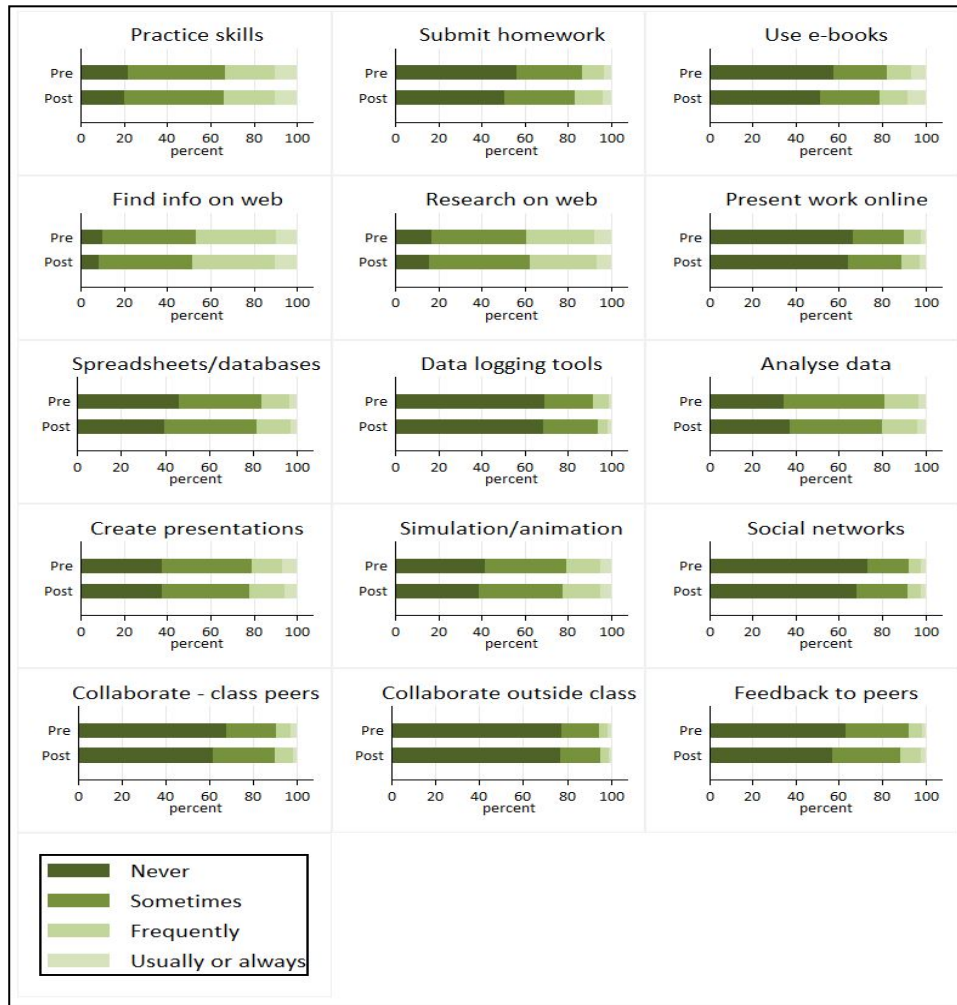
TABLE 6.2   Change in Reported Educational Applications of ICT Use (Teacher)

ICT application	Average change in usage score
Reinforce and practice routine skills and procedures	0.023
Submit homework	0.089*
Use e-books	0.12**
Find information on the internet (teacher directed)	0.037
Carry out research on the internet (student led)	0.028
Publish and present work online	0.041
Work with spreadsheets and databases	0.073
Use data-logging tools (e.g. for weather/environment)	-0.017
Analyse data or information	-0.0065
Create presentations using a range of media (e.g. podcast, video)	0.0015
Use simulations or animations to explore a system or abstract concept	0.040
Use social networks for school related learning activities	0.060
Collaborate with peers from class through email, videoconferencing, or online forums	0.058
Work with students or adults from outside class (e.g. students from other schools or adult mentors)	-0.013
Give feedback to peers or assess other students' work	0.11**

Source: Analysis of survey data (N=880 teachers pre-installation, 380 teachers post-installation).
Note: *, ** and *** denote significant at the 10 per cent, 5 per cent and 1 per cent level respectively. Scores calculated by summing category usage scores given by teachers before and after 100Mbps broadband upgrade, with Never=0, Sometimes=1, Frequently=2 and Usually/always=3.

The use of individual electronic devices in class by students increased significantly between surveys. When asked how often do their students use an individual device (phone, tablet, reader etc.) in the lesson for learning purposes, a smaller share of teachers reported that they never used ICT in this way, falling from 31 to 25 per cent (Figure 6.5). This reduction drove a significant increase in the average reported usage. This may have more to do with an increased availability of individual devices in schools than with the direct impact of improved internet connectivity, but we do not have the data to distinguish the chain of causation reliably.

FIGURE 6.5   Teacher View of How Often Students Use an Electronic Device for Learning Purposes
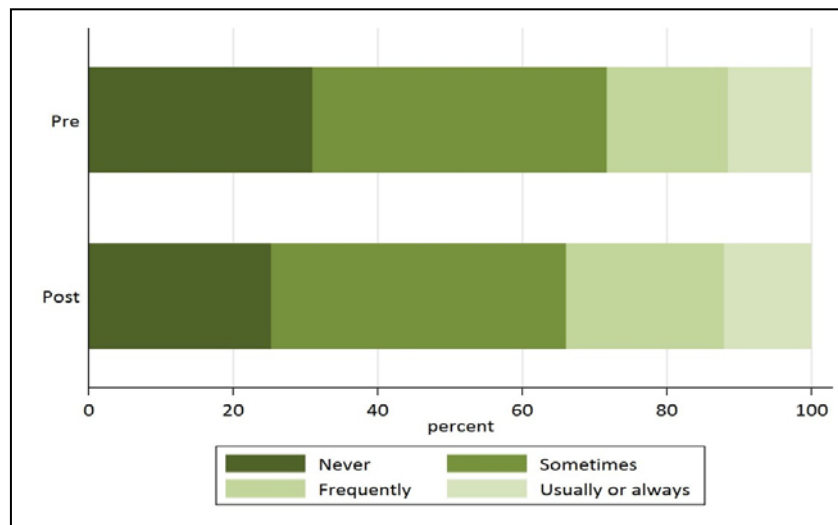
Source: Analysis of teacher survey data (N=880 teachers pre-installation, 380 teachers post-installation).
Note: Teachers asked about students in the main student group they teach.

6.2.3   ICT Use in the Classroom across Case-Study Schools

Across the case-study schools there was wide variation across teachers and schools in the level and type of ICT usage within the classroom. This ranged from fully interactive presentations drawing on online resources and requiring student feedback and engagement (sometimes via personal devices) to the static use of PowerPoint presentations (among some teachers), with no online content. This reflects a distinction apparent in a number of studies internationally between using ICT as a presentation aid and using ICT interactively and innovatively in teaching and learning (McDonagh and McGarr, 2013). Among the high ICT case-study schools in particular, there was evidence of widespread use of interactive, live ICT content within class – an approach that was fully supported and expected by management – it was very much a whole-school approach. A number of these schools had developed learning hubs/learning platforms for teachers and students, which further reinforced the centrality of ICT within the school and classroom and in the learning process. In these schools there was generally widespread use of ICT in teaching and learning, in assessment and in feedback to students. There was also evidence within these schools of a shift away from teacher-directed learning and a greater focus on students as active learners. As will be discussed over the course of this chapter, variation across schools and teachers reflected a range of underlying factors, including infrastructural resources, variation in subject area resources, teacher confidence and professional development issues, and school organisation/leadership issues.

Teachers also spoke of variation in opportunity and space to incorporate ICT-based teaching and learning across year groups. Curricular programmes like the

Leaving Certificate Applied (LCA) and, most notably, the Transition Year Programme allowed teachers greater opportunities to both draw on ICT and online resources and to develop broader ICT-skills among the students. Two teachers highlight the 'space' they found for ICT-based approaches in Transition Year:

> *In junior and senior cycle you are targeted... in TY you've a bit more time to play around with [to incorporate ICT]. (Alder Lane, High ICT, ICT Co-ordinator)*

> *Because Transition Year is compulsory we can bring a lot of ICT into it. They have a large number of classes in the week which are ICT driven and I have TYs once a week for enterprise for a double class, we're always in the computer room. (Beech Street, Medium ICT, Teacher)*

In Ireland, Smyth et al. (2011) finds widespread evidence of a shift in focus as students approached the high stakes environment of the Junior, and particularly, Leaving Certificate exams. In case-study schools, opportunities for more interactive teaching approaches, more creativity and a wider diversity of learning resources were squeezed as focus switched to the exam and led to a return to more traditional talk-and-chalk and rote learning approaches, with much less ICT integration.

> *... We're preparing for the Junior Cert style [now] and they were really disappointed [having spent much time using more interactive approaches]... 'you're not going to enjoy this, this isn't going to be fun' [they were told by the teacher]. (Beech Street, Medium ICT, Teacher)*

> *I wouldn't take the senior cycle [classes] to the computer room at all because you're so focused on the exam and delivering the syllabus, because it's so heavy, like there's so much... particularly for higher level. I have used it [ICT] in the past to get students to make PowerPoints... [but] which is more important teaching them PowerPoint or covering the course? (Alder Lane, High ICT, Teacher)*

In particular, teachers feel there is less room for exploration and creativity in senior cycle:

> *... They [students] want to glean the information from you, they don't want anything that's outside of the syllabus... there's no outside the box. (Daisy Road, High ICT, Teacher)*

The revised junior cycle emerged in many discussions of this issue, with teachers understanding that changes planned will enhance the role of ICT across the curriculum (DES, 2015c). These changes are designed to create a more interactive, student-centred approach, where ICT is central. Key to this is having opportunity for discussion, learning in small groups and variation in lesson delivery, which policy-makers, school leaders and teachers recognise can all be facilitated through the use of ICT and online learning resources. However, a number of teachers in the case-study schools also noted that changes within junior cycle education are unlikely to achieve their potential impact in the absence of corresponding reform of senior cycle education:

> *We're not changing anything to the leaving cycle... so are we just going back teaching the old way? (Cedar Avenue, Low ICT, Teacher)*

6.3 PERCEIVED IMPACT OF ICT ON STUDENT OUTCOMES

6.3.1 Perceived Impact from Quantitative Data

Internationally, research on the impact of ICT on student outcomes has shown somewhat mixed findings, reflecting differences in research methodology, research focus and institutional level variation in the place of ICT in education (Hyland et al., 2015). However, a growing body of work is demonstrating that ICT can assist the move towards transformative models of education, triggering a pedagogical shift from the teacher as the locus of knowledge, to the learner and learning. Transformative education can teach student 'how to learn' and develop vital skills – such as critical thinking, collaboration and problem solving – for today's knowledge economy (Kalantzis and Cope, 2008; Chandra and Mills, 2015).

Principals and teachers were asked the extent to which they agreed with a series of statements about the potential benefits of ICT in student learning (Figure 6.6 and Figure 6.7 respectively). These included: using ICT can enhance student participation in the lesson; computers and the internet can be used to enable students to work in a collaborative way; ICT assists in developing independent learning skills among students; ICT use in teaching and learning positively impacts on student achievement; ICT use in teaching and learning positively impacts on students' higher order thinking skills (critical thinking, analysis); and ICT use in teaching and learning positively impacts on students' competence in transversal skills (learning to learn, social competences).

FIGURE 6.6   Principals' Views of Benefits of ICT in the Classroom
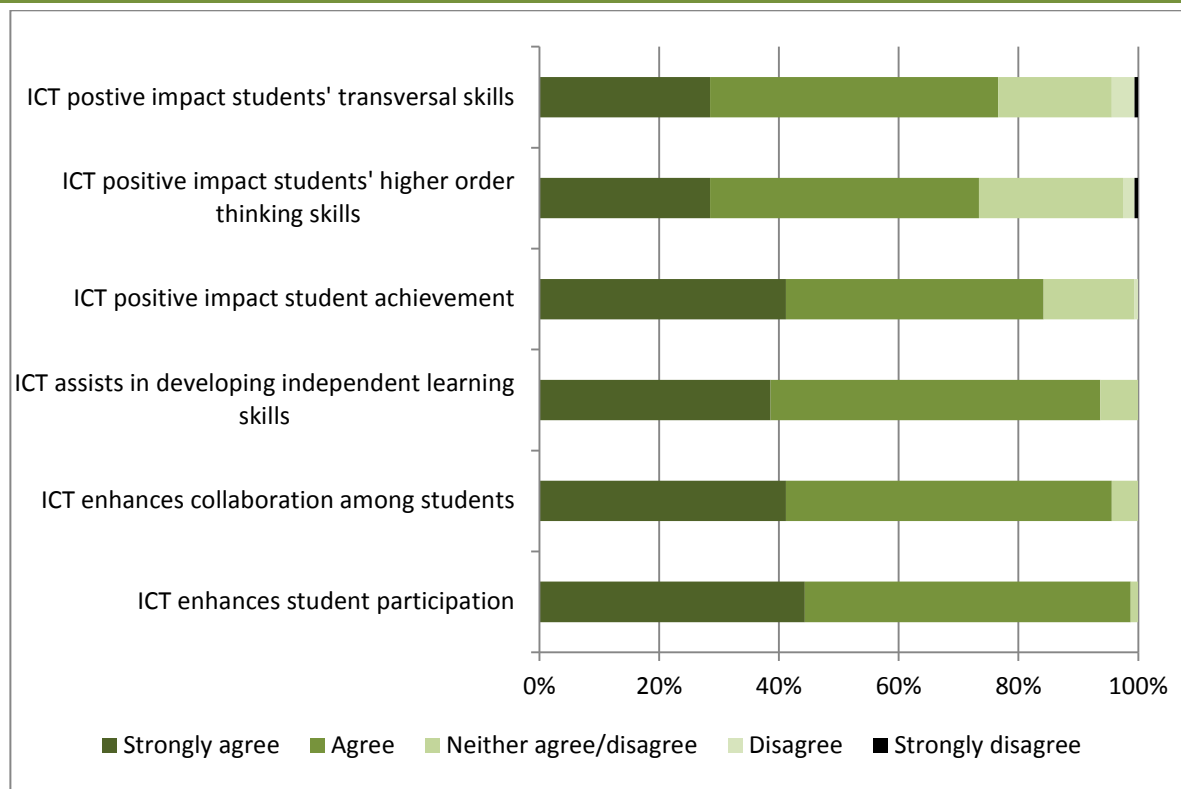
Source: Post-installation principal survey data (N=158).

FIGURE 6.7   Teachers' Views of Benefits of ICT in the Classroom
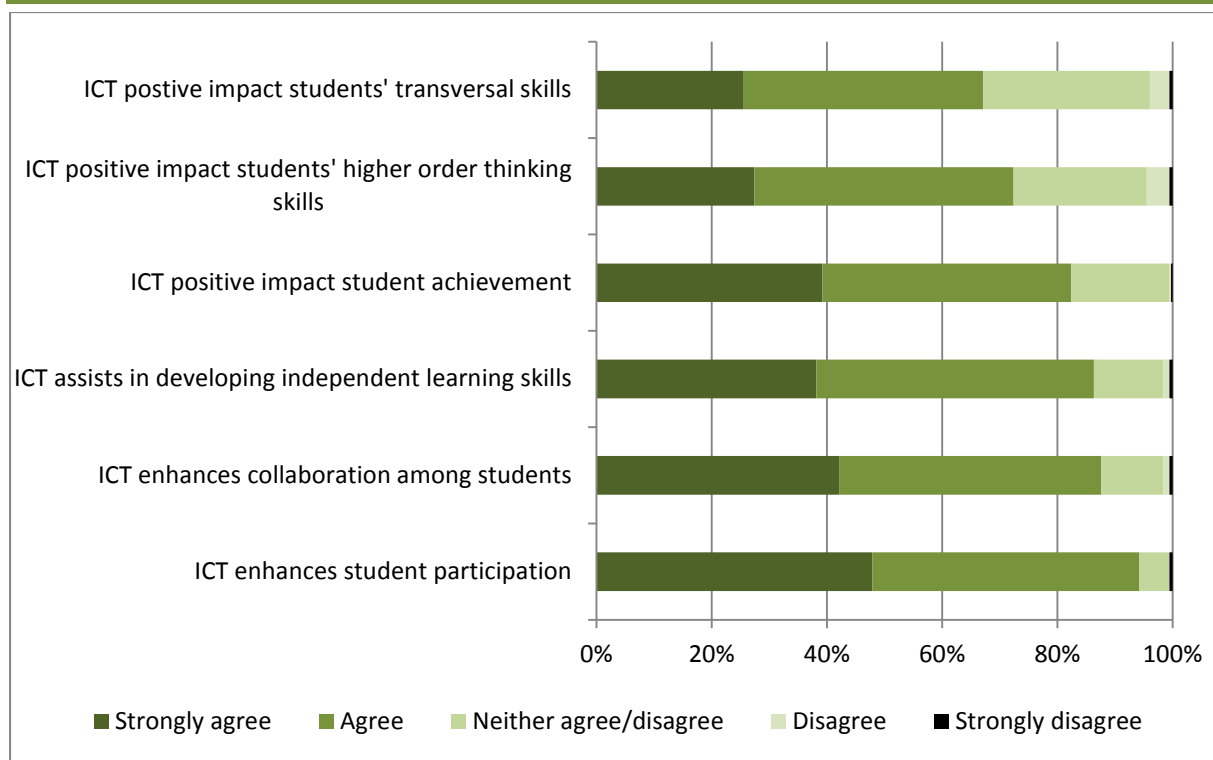
Source: Post-installation teacher survey data (N=380).

The findings show both principals and teachers perceive ICT to enhance student participation and achievement and the development of a diversity of key skills. While principals are marginally more likely than teachers to agree or strongly agree with each of these statements, across both sets of stakeholders responses are highly positive. In total 48 and 46 per cent of teachers strongly agree and agree that ICT enhances student participation. Eighty-eight per cent of teachers and 95 per cent of principals (strongly) agree that ICT enhances collaboration among students. Similarly the vast majority of teachers and principals recognise a perceived value in the development of students' independent learning skills, higher order thinking skills and transversal skills. In relation to higher order thinking skills, for example, 28 per cent of principals strongly agree and 48 per agree that ICT has a positive impact. Finally, ICT is held to play a positive role in student achievement. Among school principals in the post-installation survey, 41 per cent strongly agreed and 43 per cent agreed that ICT impacts positively on student achievement. Similarly, 39 per cent and 43 per cent of teachers strongly agree and agree with this statement.

6.3.2 Perceived Impact in Case-Study Schools

Overall, across the case-study schools teachers spoke of the benefits of ICT in their teaching practice:

> *You can do without it [ICT], but [your teaching] is so much better if you do use it. (Cedar Avenue, Medium ICT, Teacher)*

Many commented on the 'immediacy' and 'flexibility' ICT offers. Effective ICT integration was also seen to have an impact on student learning and engagement. In particular, the benefits were seen in reinforcing learning and meeting student needs and diverse learning styles, particularly through short, varied and more visual activities.

> *Nowadays kids need to see it on screen... it [ICT] just reinforced the point I was trying to make... it's there to support me... obviously I'm the teacher; the IT is not going to do the work for me.... Everyone sees the benefits... it makes the teacher's job easier. (Alder Lane, High ICT, Teacher)*

> *If it's up on the white board, they become active, they genuinely become active... they're looking... their searching skills... they're learning all the time. (Daisy Road, High ICT, Teacher)*

These comments mirror the work of Apkon (2013) who argues that the ubiquity of screens in today's world necessitates that educators re-imagine and redefine literacy. The impact of ICT within education is argued to depend on the way in which ICT is used, with Thomas and Brown (2011) distinguishing between teaching and learning. They argue that schools can either blend or fail to blend with contemporary technological potential and that such success or failure can be seen through a school's pursuit of teaching-based approaches (traditional learning) or learning-based approaches (innovative experimental learning) respectively. This section examines the ways in which ICT usage is perceived by teachers to enhance student learning, particularly through differentiation, more student-centred approaches and social learning, all of which have been found to play a key role in student engagement and educational outcomes (Chandra and Mills, 2015; Shinners, 2013; Brown and Adler, 2008).

Across a number of schools, teachers contended that the use of ICT enhanced their capacity to engage with, and meet the needs of different student groups. This was particularly the case for students who were seen as less academic, those from socio-economically disadvantaged backgrounds and students with different types of special educational needs (SEN):

> *I find that IT is very informative for the kids, it's also very visual, which a lot of our children would be visual learners... they'll learn much faster using IT, they do a lot of projects on their iPads. (Daisy Road, High ICT, Teacher)*

> *There is an advantage [of ICT] I think for learning support, particularly. Especially when you've got different styles of learners, when you have more visual [learners]. Or they may struggle with handwriting... if they've dyspraxia or something. (Alder Lane, High ICT, Teacher)*

> *With the type of students we have, they're great visual learners, they need to see things in front of them... because we're in a DEIS school the academic standards wouldn't be as high... so you have to try and make it as practical as possible for them. (Beech Street, Medium ICT, Teacher)*

The shift towards the pedagogical use of ICT among some of the teachers manifested in the greater use of group-work, project work and other more student-centred approaches. Some highlighted the potential of the reformed junior cycle to enhance and further promote such approaches, underpinned by the effective use of ICT:

> *When we are doing project based learning they are... going out, finding information themselves, collating it, sifting through it together [group-work] and then presenting it... and that's done through the internet [All stored centrally on Google Drive] (Juniper Avenue, High ICT, Teacher)*

> *If they can work in the project work properly into the new proposals for the Junior Cert, it'll work out great... It'll definitely change the dynamic. (Beech Street, Medium ICT, Teacher)*

Research internationally is increasingly highlighting the value of social learning in the educational process. Brown and Adler (2008) argue that 'the most profound impact of the internet, an impact that has yet to be fully realized, is its ability to support and expand the various aspects of social learning'. Social media shifts the emphasis from the content of the subject to the learning activities and human interactions around which that content is situated. They cite diverse evidence for the importance of social interaction to learning. In the Irish context Shinners (2013) finds evidence that the use of Edmodo, an online platform for classroom communication, increased student attainment as compared to a control group using traditional teaching methods.

One teacher spoke of the use of social learning approaches, which they felt students welcomed and valued:

> *I have a class blog, teaching twitter, I use a range of ICT focused technologies in the classroom for active learning purposes... so it's real effective for social learning so they're answering each other's questions and looking to see what feedback the teacher gives.. [it's moderated] so when they post I have to accept it in order for it to go up on the blog... They've used a lot of Sways as well, which is another form of PowerPoint, but it's all online... and we use interactive games and Socrates and Cahoot... through CPD you've learned all about [these]. (Green Lane, Low ICT, Teacher)*

The same teacher considered it important for students to learn independently:

> *It's all about giving the independence back to the students, the independent learning, where they're responsible, if they don't make a certain amount of contributions to the blog over the year well then you're looking at the assessment... it's blended learning, its teacher plus tool equals learning. (Green Lane, Low ICT, Teacher)*

A number of schools have developed online learning platforms, providing material for teachers and students alike. Particularly good examples of this were observed in Alder Lane and Juniper Avenue (below):

We use Edmodo... we say to the children it's like an online Facebook... it stores all of our notes [teachers],... everything is up there, which cuts down hugely on the amount of paper we generate for them... but more importantly it's permanently there [no material/notes get lost]. (Juniper Avenue, High ICT, Teacher)

In Green Lane – Microsoft OneDrive is a software platform which is used in a variety of ways:

[For] uploading materials, editing them between staff and students, we work on the one document... so they all [students] have access to all their subject hubs... and all notes are available. And then each teacher can share their notes with other teachers... [and] you can track when students are doing their homework. (Green Lane, Low ICT, and Teacher)

Such online communities were seen as useful in terms of continuous assessment of student learning:

The weekly spelling test is done through Edmodo on the children's iPads... it helps the literacy really hugely simply because they have a permanent record of their spelling tests and they have a cumulative score... their parents can see that at all times and if they're at 89 per cent... they want to get ten out of ten in the next test so that they can get up to 90 per cent. (Green Lane, Low ICT, Teacher)

Online platforms were also considered to enhance engagement with parents and aid in the communication of information. For example, in Alder Lane teachers upload content for students to access (particularly for students who have been absent) and this resource also keeps parents informed about class content.[25]

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[25] 'There's more discussion at home about what's happening in school, which we wouldn't have had before.' (Alder Lane, High ICT, Non-DEIS, Large, Rural, Teacher).

More generally, learning platforms and email distribution of class content/PowerPoints, enabled students to keep pace with class content, particularly for those who were absent from school:

> *... with emails... you can send out different PowerPoints, you might not get the whole thing covered in class and you might not want them to be taking down notes the whole time, you want to get discussion, but then they can reference back to a PowerPoint that you've sent them. (Green Lane, Low ICT, Teacher)*

Online platforms also helped to enhance student's broader ICT skills:

> *It's not just the actual homework that they're doing, they are up-skilling as well, digitally, and I think it goes back to the whole idea of the information is coming from everywhere and they're used to that now. (Green Lane, Low ICT, Teacher)*

In line with studies across other national contexts (Kafyulilo and Keengwe, 2014; Hauge, 2014), schools and teachers were at various points along the spectrum from the use of ICT as an administrative resource to an aid in teaching and the use of ICT for pedagogical purposes and to facilitate student-centred approaches. This issue is captured by one teacher:

> *ICT is not projectors and interactive boards... My opinion of ICT is teaching through ICT and having pedagogical approaches that benefit the students and the teachers. That's how you're gonna see benefits of ICT. (Juniper Avenue, High ICT, ICT Co-ordinator)*

While the survey data hints at a shift towards more student-centred ICT usage between the pre- and post-installation surveys, the case-study schools highlight wide variation across schools and teachers. While this variation reflects school-level factors such as leadership and climate (see Chapter 5), teachers identify a range of constraints impacting on their capacity to use ICT effectively in teaching and learning. These constraints are discussed in Chapter 7, along with issues around teachers' level of confidence and professional development.

6.4   SUMMARY

This chapter has examined how principals and teachers reflect on the use of ICT in classrooms across a diverse range of school contexts, in the period shortly after schools received connectivity to high-speed broadband. The findings show a high

level of positivity among principals and teachers alike for the value of, and growing place for, ICT usage in classrooms. Principals and teachers endorsed the benefits of ICT in student learning, such benefits ranging from enhanced student participation and achievement, greater collaboration among students and in the development of higher order thinking skills and transversal skills. Teachers spoke about particular advantages in terms of meeting diverse student needs, allowing greater differentiation and tailoring of approach. The potential for ICT and online resources to support and expand social learning was also noted.

However, it is clear that the change process is slow, with incremental improvements for existing users coming faster than adoption by new users. There is some evidence of teachers increasingly using ICT for more student-centred teaching methodologies, and greater levels of student usage, over time. Overall, differences in the level and nature of usage were apparent across the high, medium and low ICT schools. Further, the case-study evidence also clearly highlights the centrality of the high stakes examinations, with opportunities for more interactive teaching approaches drawing on ICT and online resources being squeezed in the pre-examination period. This contrasted with the TY programme, which was seen to allow opportunities for schools to both draw on more innovative ICT-based resources and to develop students' ICT skills.

Chapter 7

ICT Integration: Barriers, Teaching Resources and Professional Development

7.1   INTRODUCTION

As discussed in Chapter 1, a core question of this study is to examine the factors shaping variation in ICT integration across teachers and schools. This chapter examines three sets of factors shaping the use of ICT and the internet in teaching and learning. The first section examines a range of barriers identified by teachers in the case-study schools as impacting on the integration of ICT in their teaching. The second examines the types of online and ICT resources teachers draw on in their teaching. The final section considers teachers' and principals' views of levels of ICT knowledge among teachers and examines the extent of participation in professional development. Survey results from principals and particularly teachers, from the pre-installation and post-installation surveys, also provide valuable evidence on the challenges teachers face in utilising ICT and online resources in their teaching and the extent to which they are confident about their ICT-related skills and competences.

7.2   CONSTRAINTS TO (GREATER) ICT USAGE

As discussed in Chapter 2, earlier research has highlighted a broad range of socio-technical factors shaping ICT integration across schools and classrooms. In earlier analyses of the pre-installation survey data (Coyne et al., 2016) we showed variations in the perceived barriers to ICT integration across school contexts. In particular, this research found that measures of teacher professional development (such as levels of ICT knowledge, confidence and participation in professional development) play a key role in understanding variation in the use of ICT to support teaching and learning processes. This section examines a range of structural concerns expressed by teachers as they sought to enhance the place and impact of ICT in the classroom. The in-depth qualitative approach was particularly valuable in allowing teachers to identify the specific constraints they faced in their daily teaching activities, issues which surveys are not well placed to capture. These related to school organisational issues, infrastructural constraints and technical supports.

One issue that emerged across four of the case-study schools was the requirement for teachers to move between classrooms. Not having their own base class was seen as limiting their opportunity to incorporate ICT in lessons:

The biggest deterrent to myself using IT would be the fact that I don't have my own room.... By the time I get from that side of the school down to this side... setting up, I've to take roll... I will not use IT.... If I had my own room, I could use IT for every class. (Alder Lane, High ICT, Teacher)

This and other teachers felt that ideally it should be students moving between classes:

Basically the students [should] come in and I'm ready as opposed to me coming in to their lair and flustered because I've walked the whole length of the school. (Juniper Avenue, High ICT, Teacher)

Now first of all I don't have my own classroom, that is a pain... it's a biggy [in terms of using ICT]. (Fern Avenue, Medium ICT, Teacher)

ICT resources, typically Wi-Fi reliability and equipment quality, were of variable quality across school buildings and classrooms in a number of schools, impacting on teachers' capacity to use ICT across different classes:

I'd have issues where I'd go into classrooms where there are old data projectors and you can't freeze them... where you have data projectors that you can freeze, you can take the roll while they're working on something [an activity on screen]. (Alder Lane, High ICT, Teacher)

There's one classroom... I can do all my PowerPoints and everything because they're on my computer... but access to the internet is very poor. (Elm Road, Medium ICT, Teacher)

You have glitches in various rooms. (Green Lane, Low ICT, Teacher)

This meant that teachers needed to have back-up class content, particularly to compensate for unreliable online access 'because it's [online content] more to aid the lesson, it's not the lesson itself' (Green Lane, Low ICT, Teacher)

In a number of schools, the absence of Wi-Fi proved a significant barrier for teachers in incorporating ICT in teaching and learning: There is no Wi-Fi here in the school, which can be a pain (Beech Street, Medium ICT, Teacher).

ICT infrastructure and, particularly, the quality and quantity of computers available to teachers and students, was found to limit the extent to which teachers could incorporate ICT widely across classes and year groups. This section provides evidence of teacher awareness of the upcoming demands with the new junior cycle. In particular, they felt that the new programme is likely to further exacerbate capacity and quality constraints, in the absence of significant ICT investment over the coming years. The requirements to store student's work electronically, cloud computing, access issues and privacy were also raised as constraints by teachers across a range of school contexts:

> With portfolios and things like that it's not going to work... I just can't see how the school could cope with it considering, there are, you know. If first to third year need to use the computer room for just English alone. And then you've LCVP, they need to use it for projects... I can't see how it will work, with just one suite of thirty computers. Given that a computer, on any day, could crash.
> (Alder Lane, High ICT, Teacher)

> I think every school is gonna have issues with it [the new junior cycle]... [it's] going to be the facilities... we're lucky we have two computer rooms... but I mean you have three years that have project work that's going to involve ICT... where are you gonna have to space to get everybody in. (Beech Street, Medium ICT, Teacher)

> If you are leaving computer rooms open for students to have access themselves, they'll have to be supervised... the logistics become an issue as well. (Beech Street, Medium ICT, Teacher)

Restrictions on online access and content filtering were raised among a number of teachers in Green Lane, Cedar Avenue, and Ivy Lane:

> We [teachers] wouldn't have access to the Wi-Fi code so say I brought in my laptop I wouldn't have access to it [the internet]... small things that are just restrictive. (Green Lane, Low ICT, Teacher)

Teachers in a number of other schools fear that restrictions will follow:

> I would use YouTube quite a bit... my big fear is that someday [it will

be blocked], because I know in some schools it's blocked. (Alder Lane,
High ICT, Teacher)

School design issues also emerged as constraining ICT adoption, in particular the absence of window blinds in a number of schools, the nature of classroom layout (largely a traditional design in many classrooms) and ICT equipment located solely at the top of the classroom, hindering efforts to promote student usage and more interactive teaching and learning styles.

Either the absence of, or serious limitations in the time available for technical support, was viewed as a significant impediment to ICT integration across many of the case-study schools (an issue discussed in Chapter 5):

We could really benefit from a full-time technician. I had that in the
UK. We had access to three in a school I was in and I found that
hugely beneficial. (Alder Lane, High ICT, Teacher)

... the school has a secretary, the school has a caretaker, the school
should have someone in this society for technical support. (Daisy
Road, High ICT, Teacher)

Finally, as discussed later, in Chapter 9, teachers indicated that they couldn't assume all students would have appropriate computer facilities or online access at home, impacting on the extent to which online learning platforms could be used or homework requiring online content could be assigned.

7.3   TEACHING RESOURCES

Overall, across high, medium and low ICT schools, teachers spoke of the benefits of ICT and online access in terms of accessing up-to-date (visual) content across the curriculum, which was seen to have benefits for student engagement and learning:

I definitely think there is some excellent resources that you can use,
through the internet. So I definitely think it [ICT] can improve your
subjects if you engage with this. (Cedar Avenue, Low ICT, Teacher)

Teachers reported high levels of reliance on online resources like YouTube, content sharing websites (Scoilnet, National Centre for Technology in Education – now PDST), Professional Associations (Artists Association) and a wide diversity of

apps/software (Autograph, GeoGebra, Mangahigh in Maths) and programmes (such as the Ulster Bank 'Money Sense Programme'). In using these resources, teachers generally reported positive feedback; the resources typically provided useful content on the topic and enhanced the relevance and accessibility of material for students. In general, it was felt that these online resources play an important role in the repertoire of resources teachers can avail of:

> *There's nothing the internet cannot answer... you take for example, Edmodo, the professional development communities, I can ask a question and I'll have answers from across the world in ten, fifteen minutes.... It's the same with Schoology, it's the same with any of the other learning management systems... As regards the content for each subject... I would be of the opinion that there's something out there for every single subject. (Juniper Avenue, High ICT, ICT Co-ordinator)*

The perceived value of online resources and ICT was particularly emphasised in some subject areas. For example, the simple visual display of content in a subject like Art was seen to greatly enhance student learning:

> *It is very difficult to explain a painting say for Leaving Certs, whereas when you bring it up on a screen... it's giving kids the opportunity to look at something and look at it really hard. In a book format it's very difficult to do that. (Ivy Lane, Medium ICT, Teacher)*

There also appears to be a difference in the amount of online resources provided to teachers across subject areas. The official Department of Education and Skills (DES) website, Scoilnet.ie, is a source for teachers to access ideas and resources for interactive uses of the internet in class. Of the 8,359 unique entries for second-level teaching, 88 are labelled specifically for the ICT subject and 44 are listed for SPHE class. Although most of the resources on the website are tips and tools for using ICT methods in class, 1,826 of these are for History. The variation in the number of web resources provided across the curriculum underlines the difficulty some teachers may face in accessing helpful teaching resources.

FIGURE 7.1 Number of Scoilnet.ie Web Resources (by Subject)
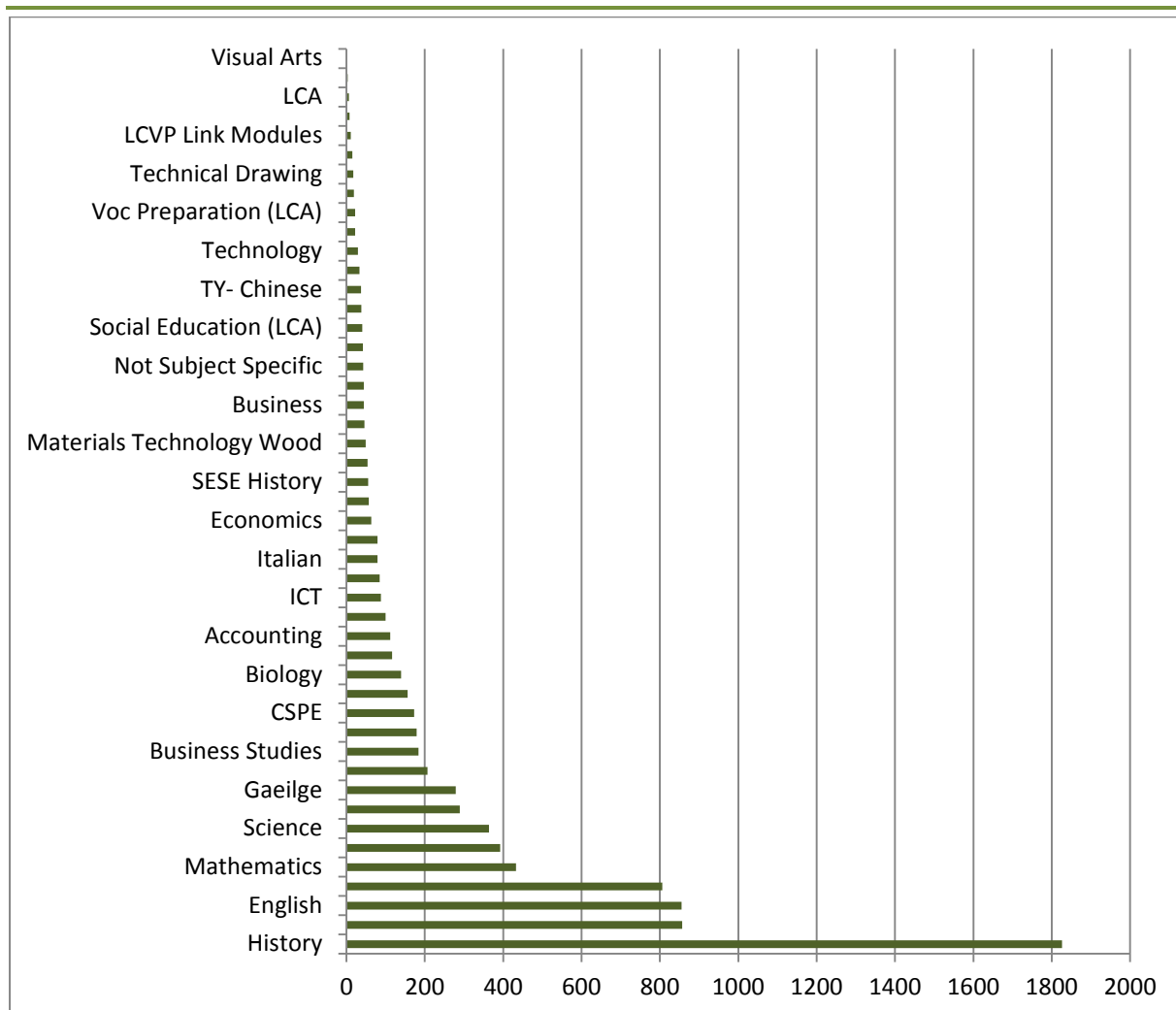
Source: Scoilnet.ie (2015).

Teachers frequently referred to the supports offered by PDST and specific subject support services. In one medium ICT school, teachers variously spoke about Science, Biology and Physics supports on offer:

> *There's a PDST unit that work in Science... and the resources for that are excellent. (Elm Road, Medium ICT, Teacher)*

> *There's a Biology Support Service and it's just amazing. We're literally given a CD with all our PowerPoints that we'd ever need on it. (Elm Road, Medium ICT, Teacher)*

> *The Physicsteacher.ie is just an amazing website as well. It's an Irish website and an Irish physics teacher does it for junior and for senior physics and it's just brilliant and... he has a link page on how they're rated, star rated, what videos suit the topic you're teaching? (Elm Road, Medium ICT, Teacher)*

Many teachers spoke of leaders in their particular subject area, undertaking groundbreaking work in developing and collating relevant online material, which was then made available to teachers more widely. This was particularly noted in the sciences.

> *[The resources are updated] every year for Biology, we're very lucky... there is an amazing teacher in Carlow that does a lot of work with that. (Elm Road, Medium ICT, Teacher)*

Teachers across a wide spectrum of subject areas noted the availability and value of online resources, from core academic subjects to physical education; one PE teacher talked of the value of using YouTube for demonstrations of sports/skills:

> *If you can show somebody it [a skill] on the internet and maybe analyse a skill and look at the different components... it's a very powerful tool from a PE point of view... when you do use it... you can get across a point very well. (Elm Road, Medium ICT, Teacher)*

ICT was also seen to be more centrally located in course specifications and resources in Project Maths[26] and in career guidance:

> *They've really revamped their website [Project Maths], they've re-jigged the whole thing and the way they've laid it out now is brilliant that you can literally be teaching your topic and go straight to that topic and see what works and doesn't work. (Elm Road, Medium ICT, Teacher)*

However, some concerns were expressed over supports in the languages area, particularly relating to online resources for teaching Irish:

> *It would be nice to have some kind of online classes... we don't really have them for something like Irish... there's not enough there for Irish teachers. [Has used TG4] but I would like to see more programmes where... they don't talk as fast... I'd like to see them bear learners of Irish in mind... TG4 have failed dramatically there. (Alder Lane, High ICT, Teacher)*

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[26] A teacher in Elm Road was concerned about curriculum overload within Project Maths, where material has been added to the course, but little has been removed, resulting in a greater workload on teachers and students that reduces time for investigative learning.

There was a reliance on international sites and pay per download services, raising questions over the extent of curriculum suitability for Irish classrooms:

> *Sites like TES look like they're going to move to pay per download... that's the route they're taking... There is no Irish based site, they're all UK, or American... twenty thousand teachers are accessing TES [an online teaching resource website] from Ireland. (Alder Lane, High ICT, Teacher)*

Overall, teachers contend that finding resources requires initiative and time (depending on their starting point):

> *Time is a major issue... it's very hard when you're at home preparing. It's very hard to prepare something with regards to IT for every class... you're just not going to be able to do it. So you pick and choose. (Alder Lane, High ICT, Teacher)*

> *Time is very limited for doing your own kind of research... if you've a full timetable, if you're starting from a low base to getting yourself up to using ICT in almost all lessons... there's a lot of work involved. (Elm Road, Medium ICT, Teacher)*

There were some suggestions as to how to lessen the burden on teachers. Some suggested that 'Croke Park Hours' could be used for ICT preparation and collaboration across subject areas – including the potential to bring in speakers on new methodologies – and allow greater collaboration among teachers in different subject areas/departments. Some schools also highlight the benefits of online platforms to share resources among staff:

> *We have our OneDrive online so we would share resources amongst the staff... a lot of the resources that we would share within the school [within subject areas] are more relevant than what you would find online. (Green Lane, Low ICT, Teacher)*

Overall, reflecting the findings in Chapter 5, teachers felt there was greater room for DES support and guidance. ICT comes up regularly in the context of Whole School Evaluations (WSE) and Subject Inspections, and it has been key driver of change (particularly in high ICT contexts). But teachers reflected on a gap between policy and resources to support that; particularly relating to a lack of advice/guidelines and information.

The Department has to be... more kind of proactive. They're telling us to use IT, they [have] got to give us the resources as well. (Alder Lane, High ICT, Teacher)

The Department of Education at times is... aspirational.... You [they] might put together... something that can be handed out to teachers across the board. Every subject... websites that would enhance their teaching. (Ivy Lane, Medium ICT, Teacher)

The software is always changing...which software do you invest in? Is it going to be obsolete in twelve months' time, what viruses are we going to get, who's going to monitor that?... I just think there's this big bubble at the moment that, 'ah sure they have the computers they're grand'... and the fact that the UK have moved to a coding-based curriculum, sends a huge message. (Alder Lane, High ICT, Teacher)

Similarly, there appears to be little in the way of guidance on what a formal computer studies class should entail. For junior cycle subjects, the National Council for Curriculum and Assessment (NCCA) provides a fact sheet outlining some 'basic and concise information' about each subject offered as part of the curriculum (NCCA, 2015b). Although Computer Studies is noted as a non-examination subject, there is no fact sheet outlining what students can expect to learn in this subject. This is the only subject (either examinable or non-examinable) to not have a basic outline of course content.

The NCCA provides information for primary and second-level teachers to access resources and an outline of the curriculum of each subject through their CurriculumOnline.ie web page. Although there is no outline of a Computer Studies junior cycle curriculum, there is an outline of a short junior cycle course in coding. The aim of this class is to:

... Develop the student's ability to formulate problems logically, to design, write and test code through the development of programs, apps, games, animations or websites, and through their chosen learning activities to learn about computer science. (NCCA, 2014)

The need to provide a robust Computer Studies curriculum has been identified by the Department of Education as a key target as a part of their 2015-2020 Digital Strategy. A senior cycle curriculum in Computer Studies will be designed to provide an 'in-depth study of ICT' (DES, 2015c). The forthcoming provision of this

course underlines the importance of ICT-related competencies when students progress to further and higher education, which students themselves highlight as an important part of the education system (Chapter 8).

7.4   PROFESSIONAL DEVELOPMENT EXPERIENCES AND REQUIREMENTS

As many schools attempt to prioritise investment in ICT, the emphasis is often on providing infrastructural resources and not the pedagogies that will ensure the effectiveness of technology-based teaching and learning. A key requirement is for teachers (and school management) to have not just the knowledge on how to operate and use technology and online resources, but also an understanding of the pedagogy required to use these resources to meet teaching and learning needs (Tearle, 2004). As Haydn (2014) argues, 'being good at ICT' as a teacher is not principally about levels of technological expertise but about the sophistication of teachers' judgements about the potential benefits and possible disadvantages of using various forms of new technology. Similarly, Venezky and Davis (2001) argue that the impact of ICT on learning and the benefits that can accrue from this approach depend on the way in which the technology is used: the same technology, in the hands of different teachers, produces different outcomes. The most important factor in the implementation of ICT in teaching and learning is whether a teacher can or cannot arrange appropriate teaching opportunities for using ICT in a classroom or laboratory (Pelgrum, 2001; Bingimlas, 2009). This section examines principals' views on teachers' skills and competences and how teachers assess their own confidence and skills.

7.4.1   Principals' Perspectives on ICT-Related Professional Development

Figure 7.2 explores principals' perceptions of the skills and competencies of teachers in using ICT, collected during the post-installation survey of schools. Overall, principals feel that teachers would benefit from professional development opportunities to enhance their ICT-related skills. In total 51 per cent of principals strongly agree that teachers in their school generally require more training, while an additional 41 per cent agree with this statement. This suggests that ongoing focus on professional development provision for teachers will be an important component in terms of realising the potential of the broadband roll-out. In particular, as Haydn (2014) highlights, there is a need to go beyond technological expertise for teachers, towards enhancing the sophistication of teachers' judgement about the potential benefits and disadvantages of using various forms of new technology. In line with the results of the pre-installation survey (Coyne et al., 2016), principals generally do not feel that teachers in their school are reluctant to adopt new technologies, with just 9 per cent agreeing or strongly agreeing with this statement.

FIGURE 7.2 Principals' View on Teachers' ICT Competencies
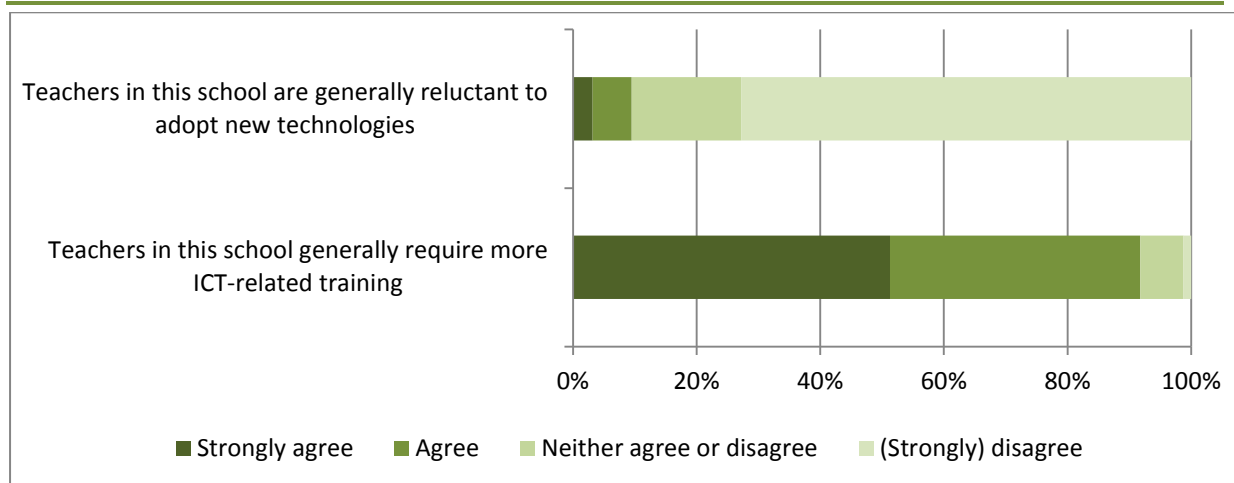
Source: Post-installation principal survey data (N=158).

Principals in the case-study schools commented on how levels of ICT competency vary between teachers, from very skilled to users to those with a basic skill set:

Well you have teachers here that don't know how to use a laptop even or Word or anything like that, you have teachers that kind of know how to use it, just a little bit [I'm] afraid. Then you have teachers that are okay with Word or with, you know, maybe looking something up on the internet...(Holly Road, Low ICT, Principal)

In Beech Street, the principal argued that a broader policy might be needed that would motivate teachers to engage with professional development opportunities:

... You have to have teachers who are competent, really competent and I think more and more work needs to go in there, you know.... And there needs to be some kind of policy about perhaps supporting teachers in and bringing teachers, that there are levels, grades, where teachers have come up to certain grades, you know, in IT proficiency, in their teaching of their subject.... but I think more investment in teacher training and that as part of a mandatory CPD.... teachers need to have mandatory CPD on IT and it's like other professions where, you know, you get points for doing courses, you know, so something like that. (Beech Street, Medium ICT, Principal)

Some school principals felt that if teachers gained stronger ICT skills this would encourage teachers to be more creative and use different teaching methodologies:

So I think if they became more skilled through CPD, or a few, I suppose a few workshops on the best apps to use. Or like the best methodologies to use, in using ICT it, it would actually enhance their learning. Like a lot of teachers now would still be, I'm used to these lessons, I have my PowerPoint. They don't know how to take it to the next step. (Juniper Avenue, High ICT, Deputy Principal)

Principals also observed that, in general, younger teachers tended to be more comfortable with using ICT in their classrooms:

What I would see is the younger teachers coming in who have grown up a lot more with the IT are very comfortable with a lot more things and taking on more. (Fern Avenue, Medium ICT, Principal)

In order to make all teachers comfortable with using ICT it is important to have the necessary facilities and professional development opportunities in place, as observed by one principal:

... A lot of teachers wouldn't have grown up with IT. And the only way you can expect them to get IT friendly, or involved, is you have to put the facilities in place. And we have had bits of training and we've had bits of different things being done over the time. And if the PC is in your room, you tend to use it. (Ivy Lane, Medium ICT, Principal)

Principals in the case-study schools also commented on teacher attitudes towards ICT in their schools. In line with international literature, adverse attitudes were sometimes associated with the age of the teacher with older teachers generally feeling less confident. However, with adequate encouragement initial concerns about the use of new technology were often overcome:

I think its baby steps.... I mean, I've one staff member who just is not into IT at all. You know, he's in his sixties and this is, you know, I'm not. He is, he's been the first person on to VSware, he was on it on Thursday. He went on it on Friday and he was the first person to take his roll this morning.... he's focused on this and this is what he wants to do.... unless they see the relevance to them, for them, for the subject. Then they're not going to, to embrace it, you know. (Cedar Avenue, Low ICT, Principal)

The use of ICT also depends on whether teachers are interested in trying out something new in their work:

Some teachers are very interested in the area, are interested in improving all the time. And other teachers are actually, will only on a need to know basis. (Fern Avenue, Medium ICT, Principal)

In addition, support from other colleagues in using ICT is regarded as essential. One principal noted that having a core team with the same vision would make it considerably easier to integrate ICT into schools:

I think with ICT with it being introduced to the school unless you have, you have your core team. Your ICT co-ordinator and you might have one or two teachers that are IT savvy. My background is Computer Science and Geography, so I'm, I'm au-fait with ICT. (Juniper Avenue, High ICT, Deputy Principal)

7.4.2 Teachers' Perspectives on Professional Development

This section examines the extent to which teachers feel confident and knowledgeable in using ICT in their teaching. It then considers the extent to which teachers have participated in ICT-related professional development and the types of training accessed.

Figure 7.3 examines the extent to which teachers agree with statements about whether: they feel confident that they can use the internet in lessons to meet teaching goals; that the use of computers/internet will help students to understand concepts better; that they can use relevant software in their teaching; and that they can teach their students to select appropriate software to use in their projects. Over 90 per cent of teachers (strongly) agree that they can use the internet in lessons to meet their teaching goals. Just fewer than 90 per cent believe that use of ICT assists students in understanding concepts.

The majority of teachers are confident they can use relevant software in their teaching. Slightly fewer teachers feel confident they can teach students to select appropriate software to use in their projects; 37 per cent strongly agree, 38 per cent agree and 9 per cent disagree. This suggests there might be room for the identification and dissemination of appropriate software for students across curricular areas.

Teachers were asked to rate their knowledge about the use of computers and the internet in teaching their main subject, with response categories very good, good, adequate, not very good. As shown in Figure 7.4, teachers report high levels of

knowledge with 54 per cent rating their knowledge in using computers in their teaching as very good and 31 per cent as good. Similarly, 52 and 33 per cent rate their knowledge in using the internet in their teaching as very good and good.

FIGURE 7.3   Teachers' Views of their ICT Confidence
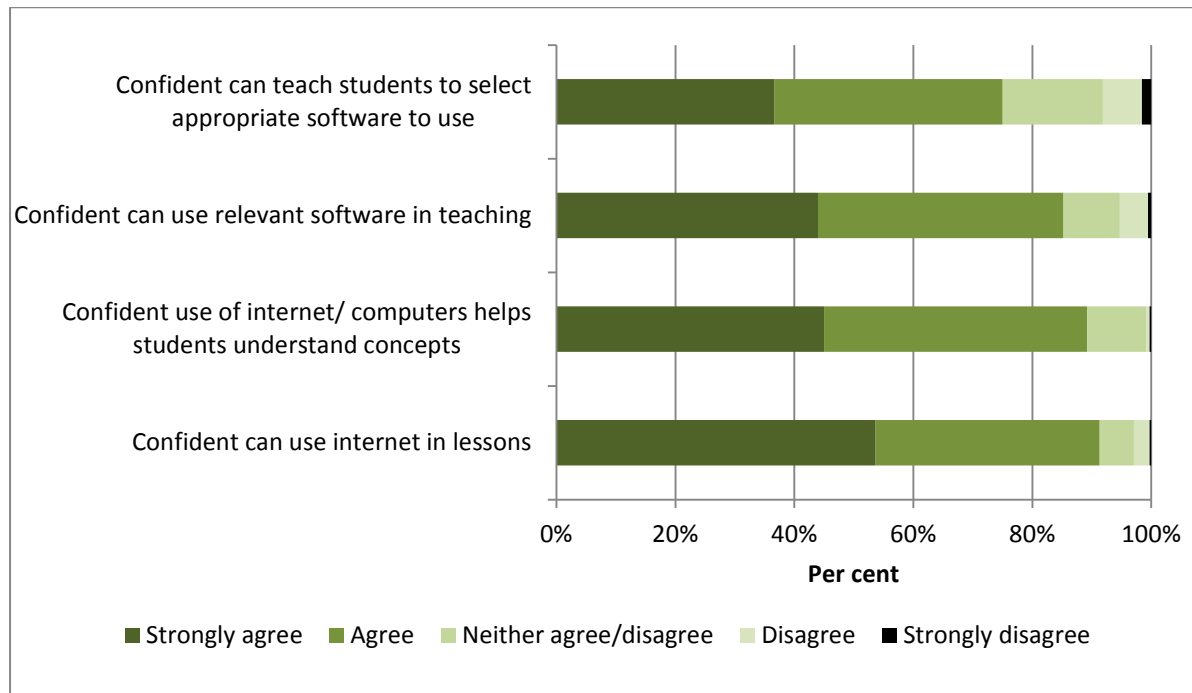
Source: Post-installation teacher survey data (N=380).

**FIGURE 7.4**   Teachers' Views of their Level of ICT Knowledge
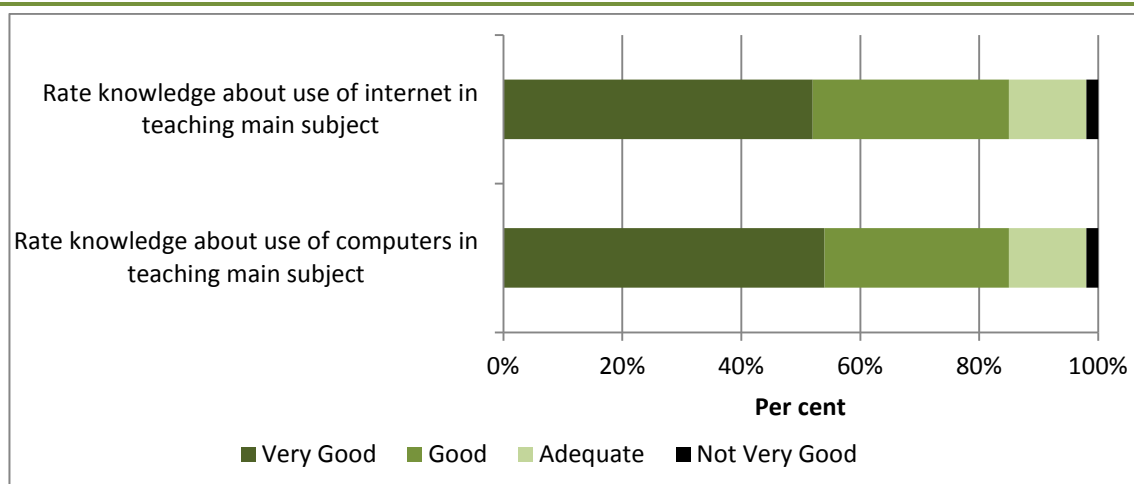
Source: Post-installation teacher survey data (N=380).

Participation in ICT-related professional development was somewhat more varied across the survey respondents. In terms of the amount of time spent on professional development over the past two years, just under one-third had

spent 1-3 days training, while 27 per cent spent at least six days training. Sizeable proportions had undertaken little training; 12 per cent spent no time and 16 per cent less than one day (Figure 7.5). In terms of the types of training undertaken, Figure 7.6 shows that the largest proportion indicate personal training which was undertaken during their own time. Just over half participated in training provided by a school colleague. Approximately one-third engaged in training related to the pedagogical use of ICT in teaching and learning, subject specific training in learning applications or equipment-specific training. These results suggest that teachers are benefitting from more pedagogically-oriented professional development, which as Gleeson et al. (2001) argues may, in time, allow them to fully exploit the potential of ICT for innovative teaching practices that could provide for a wide range of learning outcomes.

FIGURE 7.5   Time Spent on ICT-Related Professional Development in Past Two Years
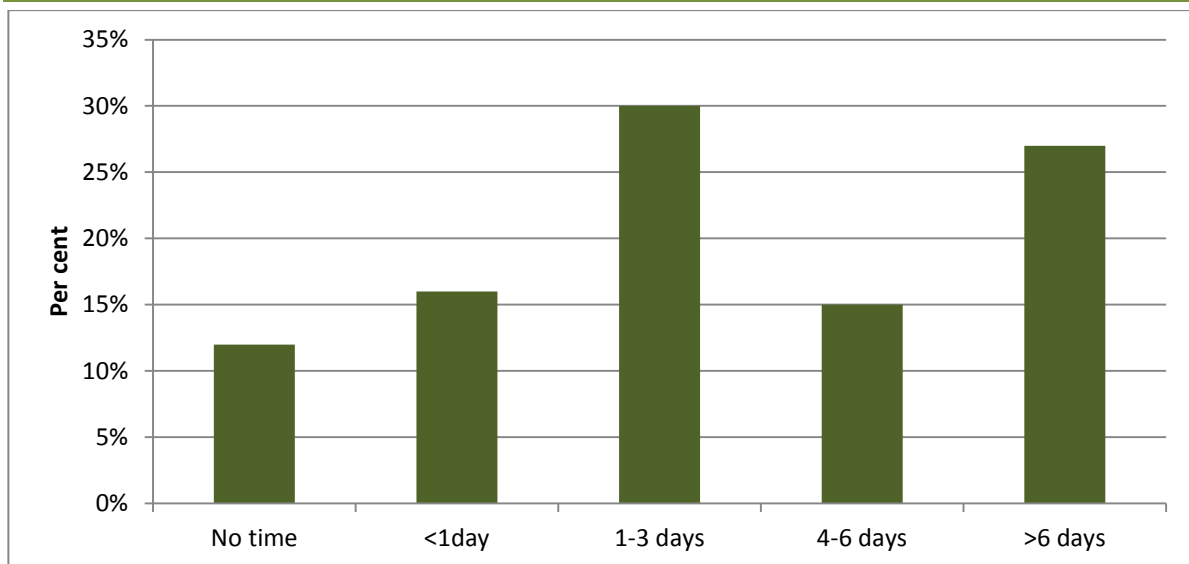
Source: Post-installation teacher survey data (N=380)

FIGURE 7.6   ICT-Related Professional Development Completed Over Last Two Years
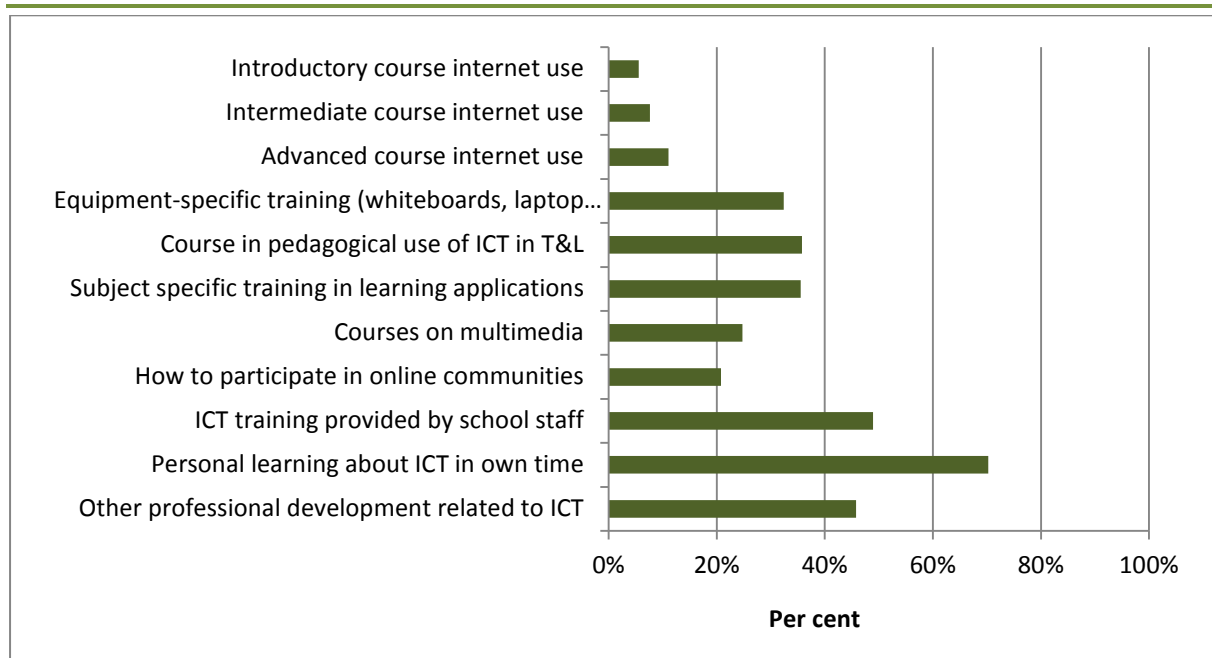
Source: Post-installation teacher survey data (N=380).

Given the rapid pace of technological change and growth in online teaching and learning content and resources, as well as the recent introduction of high-speed broadband, it is perhaps not surprising that ongoing professional development opportunities will be a key requirement. The high levels of ICT-related knowledge and confidence perceived by teachers, however, is somewhat at odds with the nearly universal call for ICT-related professional development opportunities.

7.4.3   Professional Development Issues in the Case-Study Schools

There was significant variation across schools in the share of teachers using ICT in teaching and learning; in many high and medium schools visited it appeared that many if not all teachers were using ICT, whereas in other schools a sub-group of teachers are regularly using ICT. Teachers recognise the centrality of ICT knowledge and confidence in using ICT:

> *If you're not proficient or comfortable using ICT yourself you're not going to use it in front of students... you're not gonna put yourself in that situation.   (Elm Road, Medium ICT, Teacher)*

Several studies highlight that incorporating ICT, in particular to facilitate a shift in teaching and learning approaches, is a slow process. Orlando (2013) highlights the slow and iterative stages in ICT integration, in terms of using technology more frequently, broadening the range of ICT resources used, using resources with a

wider range of content and purposes, and making more purposeful and critical use of them. For teachers not using ICT, professional development is required at a low starting point, comprising very basic IT competencies; how to use email, how to send documents, how to share resources; training needs to be tailored to the individual needs of teachers:

> There's definitely room for plenty more training and the training would need to be appropriate... huge variation in levels of knowledge within the staff. (Cedar Avenue, Low ICT, Teacher)

> The courses are very good but they need to be... delivered to smaller groups at a time... categorise teachers... weak, strong, middle ability. (Elm Road, Medium ICT, Teacher)

Some engaged in online CPD (with PDST) and were generally positive, but they would have liked to be able to ask somebody questions. A number of teachers commented that some subject specific CPD doesn't address ICT:

> The CPD courses that I've covered [attended] in my own subject area [woodwork and technology], haven't really gone into ICT... it's definitely down to my own initiative, to try and test out apps... to see whether they're fit for purpose. (Juniper Avenue, High ICT, Teacher)

Conversely, professional development in other subject domains was positively received in terms of addressing ICT issues and components:

> I attended all the T4 in-services for the DCG, now they were excellent... a lot of ICT in them.... And the Project Maths ones also... there was ICT elements in that too. And they were very good. (Cedar Avenue, Low ICT, Teacher)

> Every year the PDST will put on little in-services and the ones for business teachers, they'll always have developments in ICT. (Beech Street, Medium ICT, Teacher)

A number also commented on the role of professional associations and subjects associations in providing valuable professional development:

> The Business Teachers Association of Ireland... have their annual conference every year so there's workshops in that so if there's new ICT methodologies [they are covered]. (Beech Street, Medium ICT, Teacher)

The majority of those attending CPD within school hours were supported and facilitated by school management. However, many attended training outside school hours, on weekends or during holiday periods.

In line with the views of principals, some teachers felt that there should it be compulsory professional development for teachers in ICT and online resources:

> *Technology is so big now and is in every school... it should be nearly compulsory that all schools do one day or all teachers do something... it's such a big thing now. (Beech Street, Medium ICT, Teacher)*

A whole-school approach to professional development is one potential way of achieving this. One ICT co-ordinator arranged for half of the staff to enrol in a Bridge 21 course (TCD), done on a voluntary basis over the course of an academic year (22 hours in total, largely out of school hours). This was seen as crucial in the effective usage of ICT in teaching and learning in this school; many of the students are now being taught almost exclusively through project-based learning (particularly at junior cycle, as mentioned by Juniper Avenue). The project has also had a significant impact on teaching staff who did not participate in this training. Similarly, several schools had a range of ICT-related whole-staff in-service days. Elm Road, for example, organised a day on Cloud Technology.

There was generally a desire for more in-school training, either experts coming in for a training day or more expert staff members training other staff:

> *You'll get training and everything but really you actually need somebody to sit down with you... some of the older teachers who haven't used it before... they need people sitting down with them to go through it. (Beech Street, Medium ICT, Teacher)*

> *I'd like to see more use of Croke Park hours... a lot of them are used for... numeracy or literacy... I would [like to see] maths teachers getting together and meeting... we need to meet more as a group over the course of the year rather than meeting once, maybe twice in the year. (Elm Road, Medium ICT, Teacher)*

Overall, teachers spoke of the lack of focus on ICT in Irish initial teacher education programmes until relatively recently:

> *There's a huge misconception out there that if you have young staff*

that they're going to be tech savvy and this is not true... because they're not being trained on this in their teaching practice and in college. (Juniper Avenue, High ICT, ICT Co-ordinator)

7.5   SUMMARY

This chapter examined three sets of factors shaping the use of ICT and the internet in teaching and learning; the role of structural barriers, the nature of online resources available and professional development issues. The in-depth qualitative approach was particularly valuable in allowing teachers to identify the key constraints they faced in deciding on different teaching approaches and using different teaching resources. A number of structural barriers were viewed as limiting teachers' capacity to adopt ICT in their teaching across different school settings; these included school organisational issues, particularly teachers moving between classrooms, classroom design issues, variable Wi-Fi network and equipment quality and restrictions imposed though content filtering.

Teachers across a broad diversity of subject domains reported a high level of reliance on, and appreciation for, a wide range of online teaching resources, national and international. While teachers frequently spoke positively of the supports offered by PDST and subject-specific support services, online content was also sought from websites like Scoilnet.ie and other national content sharing websites, as well as a diversity of international websites like YouTube and TES. ICT was seen to be more integral to the resources and supports offered in the area of Project Maths for example. In a number of Science areas, innovative teachers have played a valuable role in developing and collating relevant online material suitable for the Irish curriculum. The absence of Departmental guidelines, particularly the absence of any subject specifications in the area of computer studies, was also observed, and this has been acknowledged as a key target of the 2015-2020 Digital Strategy.

Finally, this chapter has highlighted a number of key issues relating to professional development in the use of ICT for teachers. The findings show variation in the extent and nature of participation in ICT-related CPD and in the way in which such professional development is embedded as a whole-school process in some of the case-study schools. Professional development will likely play a key role in embedding broadband and ICT within teachers' pedagogical practices, increasing teachers' competence, skill and confidence in using ICT and achieving the desired teaching and learning outcomes.

Chapter 8

Student Opinions on ICT Use in School

8.1   INTRODUCTION

School improvement planning and integration of new technologies in schools have the same overall goals: the enhancement of the student learning experience and educational outcomes (Rudd, 2001). One key aspect of this research was the opportunity to conduct interviews with agents at every level of the school system, to ask their opinion regarding the benefits and barriers associated with ICT in their school in light of a recent upgrade in the school broadband connection. Given the typical school structure where management make financial and planning decisions and teachers decide to what degree they avail of the technology at their disposal, the student learning experience is the end result of the entire school process.

The attitude of students towards ICT has been a topic of great interest internationally. The current generation of students is defined as 'Digital Natives'; adept at learning through ICT-based methods. Although the exact definition of this label has been questioned by some (Gallardo-Enchenique et al., 2015; Li and Ranieri, 2010; Selwyn, 2009), it is used as the general term for the current generation who have grown up with computers and the internet (Prensky, 2001). The gap in ICT competence between 'Digital Natives' and 'Digital Immigrants' (typically older people who have been exposed to technology at an older age) manifests itself in the classroom teacher-student relationship (Underwood, 2007), a disparity which Prensky (2001) considered to be the biggest problem facing education at the time.

This chapter aims to lend context to the Irish second-level education landscape, with insights provided from interviews with focus groups of second and fifth year students (the number of participants in focus groups varied from 3-10 students). Over the course of the interviews, students from both year groups in every school showcased a high level of confidence, providing thoughtful answers and insights. Some of their opinions mentioned aspects of school ICT integration which the research team had not previously considered. The quality and strength of the student voice is a key component of this study and this chapter in particular.

The rest of the chapter is outlined as follows: First, students provide insight into the use of ICT in the typical classroom. This will investigate the views of students

regarding the use of ICT in classes, the way teachers leverage technology into their teaching and the typical ICT setup in their classrooms. After this, we investigate student opinions of their computer class, covering what they do in this class and how beneficial the class is to students. After this, students provide their opinion of in-school personal electronic devices and the importance of being safe and responsible online and what role their school plays in supporting this. Finally, students discuss the value and importance of having connectivity outside of the classroom to aid their studies. In every section, students provide insights into what their experience is and also provide suggestions on what changes or improvements they think would enhance their teaching and learning experience.

8.2   ICT USE IN TYPICAL CLASSROOM SETTING

In addition to providing insight about computer classes in their school, students described how other classes incorporated ICT. According to the student focus group interviews, there was a wide variation across and within schools in the extent to which ICT-based teaching methods are adopted in non-ICT subjects. Some teachers adopted a mix of computer-based teaching methods while others just used 'traditional' teaching methods; both approaches achieved the goal of educating students:

> *Our Maths teacher has a YouTube channel where he does, well he did a few times, he put like, he put problems up and he explained them on the thing and he put it on Edmodo [a school online learning hub] so that we could see it. (Juniper Avenue, High ICT, 2nd Year)*

> *I don't think you need to have PowerPoint to make it interesting, like some teachers still don't use computers at all really or very little and it can still, like they're still good teachers. (Fern Avenue, Medium ICT, 5th Year)*

The following section will highlight the opinions of student focus groups from the sample of ten schools interviewed regarding the typical classroom ICT setup, the extent of ICT usage and their views on the comfort level of teachers using ICT equipment.

8.2.1   Standard Classroom ICT Equipment Setup

A typical classroom features a computer (desktop or laptop) for the teacher, paired with a display projector or an interactive whiteboard. Students remarked that some rooms are not fit for purpose due to old equipment, poor connectivity or even poor lighting conditions for viewing an overhead projector. These issues lead to a less-than-optimal learning environment:

Up in our economics room though like the teacher who uses it [the internet] the most probably, the broadband is cat [not good] like, she has to go out to the hall and all to get it like, it's slow. (Elm Road, Medium ICT, 5th Year)

Besides that we can't even see it. 'Cos it's so close to the window.
And he makes us all move up.
Then he makes us all move up and then you're all squashed up at the top.
Interviewer: *So you can see it?*
And we've nowhere to write.
Blinds.
Interviewer: *Blinds? Just so you can stay in your same seat?*
Yeah. (Ivy Lane, Medium ICT, 2nd Year)

If there's glare from the windows, from the sun and stuff you can't really see your books, the way it reflects off the iPads. (Juniper Avenue, High ICT, 2nd Year)

It is difficult to identify an all-in-one solution for each classroom for fixing the issues which disturb the learning environment. However, it seems that students feel there is a need for support to address some of the issues which present a barrier for their learning experience.

8.3   STUDENT VIEW OF TEACHER ICT SKILLS

When looking at the variation in the extent of ICT-based teaching methods used, students were asked whether the difference was teacher-specific, subject specific or due to another factor. Students had mixed opinions, with the general view that teachers who wish to incorporate ICT-based methods have been able to do so successfully, especially since the introduction of a reliable, fast broadband connection in the school:

Yeah, we never really watched like, do you know, videos on YouTube, or anything last year in Irish and stuff. But now he puts it on like once or twice a week at least. (Alder Lane, High ICT, 2nd Year)

Students recognise that teachers do not need to adopt ICT-based methods in order to do their job. They think that teachers should be allowed to teach as they see fit, as it is not always optimal to use ICT-based teaching methods:

I have teachers who don't use it at all, I've a teacher who doesn't use it at all and he's brilliant as well like.... It depends on the teacher, you know. I think it's forced a bit much on teachers... older teachers and

all, like you know, they're kind of expected to learn and to use it like. (Elm Road, Medium ICT, 5th Year)

Yeah like, it depends on the teacher as well. If a teacher has a way of teaching something it's not going change just because a new computer comes along. (Green Lane, Low ICT, DEIS, 5th Year)

Alder Lane uses an online learning platform where teachers can upload content for their class groups on a secure web platform. Although this tool is mainly used outside the classroom, the benefits to students are clear. However, the effectiveness of this platform relies on teachers using the platform frequently. Students really appreciate this type of interaction, as it helps them to catch up on homework they may have missed when they were absent:

We were doing media studies and then she'd like show us ads. And then we'd write in our copies about the ad we saw.
And she'd, like, everything we're doing; she'd made them into like a massive PowerPoint.
And then she'd put those PowerPoints on to the learning hub. So if we got stuck with our homework, we could just check.
Yeah, or if we missed a day. (Alder Lane, High ICT, 2nd Year)

Students in the same school note that teachers have adapted to new technologies over time. It is worth noting that in this school there is a cloud-based attendance platform (VSware) which requires teachers to log attendance at the start of each class on an internet-connected computer. It could be the case that this basic computer use helps to encourage teachers to use more ICT in their classroom by eliminating some of the 'barriers', such as booting up a computer, logging in or opening content:

It took them a bit of getting used to... at the start you could notice that they weren't really comfortable with it. But now they're just kind of do it like, do you know. It's like, it's like talking, you just kind of do it without thinking. (Alder Lane, High ICT, 2nd Year)

Overall, students seem to be aware that computer-based teaching methods have an appropriate time and place. One effective way in encouraging teachers to try and use more ICT-based teaching tools appears to be through giving the teacher simple tasks which would familiarise themselves with the computer interface.

This way, those who wish to incorporate computer-based lessons in the future do not have to overcome the obstacle of navigating the computer.

8.3.1   Teacher Use of ICT in Class

The interview phase of this project allowed the researchers to study the different teaching techniques that are used in the sample schools. Another piece of the learning puzzle involves asking students if they consider ICT-based teaching methods to be an improvement over more traditional methods. Generally, students felt that the effectiveness of ICT-based teaching methods depended on the teachers' ICT skills and confidence using ICT-based teaching methods. It was also very clear that students did not view ICT as a requirement for effective teaching. In most cases however, students found the use of multimedia and other innovative activities to be beneficial:

> *It's nice to have a bit of a break from taking down notes and watch a video on it, I think you learn a bit more... The documentaries and stuff, there's some great stuff, I mean during TY in English we watched a series called Inside Death Row, much more interesting than just reading somebody's account of life on death row... It complements the teacher rather than independent of it. (Fern Avenue, Medium ICT, 5th Year)*

> *Yeah I did well in French anyway; we've watching kind of French videos as such, Peppa Pig in French, which is really handy because it's kind of slow and it's easy French. And it's good for, for our aural study. (Ivy Lane, Medium ICT, 5th Year)*

> *Interviewer: Do you think students have more interaction with teachers or do you think, do you think it changes the dynamics in the classroom?*
> *Yeah, because if you're reading a book you're not really talking with the teachers, you're just reading it out, then if you're like with the PowerPoint the teacher is asking you questions. (Beech Street, Medium ICT Urban, 5th Year)*

However, students had quite a mixed opinion in regard to PowerPoint presentations. Some considered the condensed notes format to be a great way of learning, being easier to write down their own notes with key points and clearer handwriting than a teacher writing on a board provides.

> *You get through the material faster, so rather than spending five classes taking down notes while waiting for the teacher to write up*

now we're waiting for them... you can actually read them, not trying to decipher handwriting. (Fern Avenue, Medium ICT, 5th Year)

In a book they have a lot of writing about it but on a PowerPoint they have the main point that you know about it, so that sticks with it and then you can just put it in to your own words. (Beech Street, Medium ICT, 2nd Year)

Other students felt that PowerPoint allowed the teacher to be lazy, leading to less active engagement with the class:

I know in one of my classes it's just taking notes from the board, next slide, next slide and I don't learn like that at all.... [The teacher] just puts it up and I know myself like, I'm taking it word for word, I don't understand what I'm taking down and I go home and I learn it. So she's not really teaching in my opinion... she's just giving the notes. (Fern Avenue, Medium ICT, 5th Year)

Most teachers just rely on the internet stuff and PowerPoint. Something that they found on the internet or something. They don't just like engage with us like they used to. (Green Lane, Low ICT, 5th Year)

Although students seem to be mostly receptive to ICT-based teaching methods, there is room to support teachers with advice on how to use PowerPoint as an effective teaching tool in order to engage students.

8.3.2   Student View on Teacher Professional Development

Although students do not think teachers should be forced to adopt ICT-based methods, they think that training should be provided for teachers to improve their computer competencies. This would help show teachers the potential uses of technology in a classroom setting which they might not have previously considered:

If they had like quick courses so they can just like quickly learn how to do these things instead of having to like go and ask for help or like trying to find out if there's like another way of doing things, like they'll know how to do this, how to go there, how to pick this up on the internet. (Beech Street, Medium ICT, 2nd Year)

Some teachers have a really good grasp on like how to like do the basics so they can like use videos and PowerPoints but some teachers

are like so clueless, like they're just, it's so bad. (Beech Street, Medium ICT, 5th Year)

They all have their own little system and they use them all the time, what they're used to... They're not used to using the technology that much.... they're managing the way they are. (Cedar Avenue, Low ICT, 2nd Year)

In addition to initiatives encouraging professional development in the area of ICT competencies, another practical solution could perhaps involve students helping teachers to develop their ICT skills. This discussion with students in Daisy Road shows how an experienced teacher who was not aware of the potential uses of computers responded positively to being shown the functionality it provides:

Last year we had a, an older teacher but she retired there last year. And like she didn't have any, like it was kind of, I think it's kind of the younger teachers that know more about it.
And like the older teachers would be like, have no clue. And the other day there I set up an Edmodo [a school online learning hub] for my Science teacher. And she was like delighted and she was like looking up all these things for Science and she was like fascinated with it.
***Interviewer:** So she didn't know how to do it, until you showed her?*
Yeah.
***Interviewer:** Is it just; is it purely just sort of an old teacher, young teacher kind of split?*
It's because like sure, whatever era you were growing up in like.... all the older ones, they never, like they wouldn't really have gotten into computers. And then sure they can, they have taught without it for years. (Daisy Road, High ICT, 2nd Year)

It is clear that this requires a few conditions to be successful; teachers need to be receptive to students helping them and students need to be able to help the teacher suitably. In another case, although students noted that helping teachers with ICT support contributed to a more collaborative working relationship, this wore thin if the teacher continually needed assistance with the same problem:

as you said like although you might get a better like relationship with the teacher and whatever in that class if they are asking you for help... but there's kind of a fine line as well like, once is grand, twice yeah, but three times you're like just [frustrated]. (Fern Avenue, Medium ICT, 5th Year)

In general, student interviews show that teachers who wish to adopt ICT-based teaching methods tend to be able to do so (mostly) successfully. There are only a few examples of teachers using technology which students consider to be less effective than traditional teaching methods. Students note the possibility of training for teachers to increase their ICT skills, which would serve the dual purpose of helping them to use classroom ICT and (perhaps more importantly) show them some creative uses of ICT which could be used to engage students.

Although students generally appreciate the use of ICT-based lessons, it is also clear that they do not have a problem with a teacher who does not adopt these methods. This might be because certain class material might not lend itself well to being taught through ICT-based methods, but also that it might be detrimental to the learning experience if it was shoehorned into the curriculum.

8.4   COMPUTER CLASS IN CASE-STUDY SCHOOLS

In the ten case-study schools it appears that schools decide which year groups receive computer classes and what the class content is. Every case-study school provided computer classes of some form to first year students. After first year, there is variation in the amount of formal computer classes provided. Table 8.1 outlines which class groups receive a formal computer class.

TABLE 8.1   Computer Class Provision in Case-Study Schools

School	1st Year	2nd Year	3rd Year	4th Year/TY	5th Year	6th Year
Alder Lane	✓			✓		
Beech Street	✓			✓		
Cedar Avenue	✓	✓	✓		✓	
Daisy Road	✓	✓		✓		
Elm Road	✓			✓		
Fern Avenue	✓			✓		
Green Lane	✓	✓		✓		
Holly Road[27]	✓	✓		N/A	N/A	N/A
Ivy Lane	✓	✓	✓	✓	✓	
Juniper Avenue	✓	✓	✓	✓		

Source: Mentioned by students in focus group interviews.

There appears to be a lack of guidance on a computer class curriculum (except for a short course in coding for junior cycle).[28] Until recently, the NCCA considered

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27   There are no senior cycle year groups in Holly Road.

effective ICT integration to play an 'invisible' role, seamlessly embedded across all subject areas:

[ICT as] a teaching and learning tool (e.g. dynamic geometry packages in Mathematics); as an integral part of the curriculum (GIS in Geography), or as an integral part of curriculum and assessment (e.g. CAD in Design and Communications Graphics, Music Technology in Music). (NCCA, 2015a)

However, the most recent DES Digital Strategy has requested that NCCA investigates the possibility of developing a formal computer studies curriculum (DES, 2015c). The student voice on the type and quality of course material they cover as a part of the computer studies class is especially important given these recent developments in policy. This section will provide insight into what students do in computer class and what they think could be done differently.

8.4.1 Computer Class Content

There was a wide range of content being offered in computer classes across the schools. The most common tasks typically featured tasks in Microsoft Office. Some schools assign informal tasks to complete while others provide the opportunity to obtain a qualification such as a FETAC Level 5 or ECDL certificate. In Ivy Lane, students note that having computer classes in every year improved their computer competencies, improving their performance in other subjects:

Learning from like first to third really helped – and TY. 'Cos we had to do a lot of write ups and stuff on the computer and, and PowerPoint and stuff. So we knew how to use Office, we know how to use Word. (Ivy Lane, Medium ICT, 5th Year)

Some students in the same school expressed a desire to cover more IT-specific areas such as programming and networking:

The ECDL course was just, it was good but it was dirt boring... I thought they'd be like teaching us how to like things about networking and all, all of this. Like different programmes and stuff. (Ivy Lane, Medium ICT, 5th Year)

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28   www.curriculumonline.ie/Junior-cycle/Short-Courses/Coding.

There was a wide range of other topics covered in computer class such as basic coding and creating applications, creating and editing multimedia projects, competitive cross-school online maths games (e.g. Mangahigh.com in Holly Road). One common aspect of computer class was that it served as time for students to complete computer-based project work for other classes.

8.4.2   Potential for Future Computer Class Curriculum

Some students would have liked more experience with Microsoft Office, citing the importance of these skills for the workplace:

> *I think they should be teaching us like things like Excel. Because like clearly a lot of Excel is really heavily used everywhere and no knows how to use Excel. (Alder Lane, High ICT, 5th Year)*

> *A lot of people now, they're trying to get in to bigger jobs, big office jobs, like architecture even, you need the computer like and most office jobs, you need the computer. And a lot of people like aren't really sure about – because even around here a lot of the students like... they wouldn't really have much technology in their household, they've farming backgrounds and stuff. (Cedar Avenue, Low ICT, 2nd Year)*

Students in Alder Lane noted a difference between their comfort level with everyday technologies and the devices they would be expected to use in the workplace:

> *I think there's a difference between using a phone and using an actual desktop like. And when you're going in to a job in work like, you're not going to be doing all your work on your phone. (Alder Lane, High ICT, 5th Year)*

In Green Lane, computer classes in Transition Year focused on students learning to type cover letters and CVs. Although students found these activities useful, they suggested that the class could be improved by helping students prepare for tasks that would be required as part of the Leaving Certificate Vocational Programme (LCVP) portfolio. In terms of formal assessment, students did not feel like there should be a State Examination for computer class, but many felt there was a need for an incentive (such as a certificate) to motivate students to participate in class and engage with material:

> ***Interviewer**: And you get a certificate at the end and it's something to put on your CV?*

> *Yeah that would make it worthwhile, like I think it would make the teachers want to do it as well. They'd want to. (Alder Lane, High ICT, 5th Year)*

However, students did not feel that any computer course should disturb preparation for State Examinations, citing the already high workload required during these years. They think there is a need to be proficient in ICT skills *before* they have to begin project work which requires ICT skills:

> *I wish there was like another class of computers. And it's not even the fact that like you know, oh yeah another fifty minutes are for games, like you know. But I, to be honest, I want to get the ECDL course over and done with like. I don't want to be dragging it out for two years, like you know.   (Juniper Avenue, High ICT, 5th Year)*

> *Cos I know like for History you have to do a project, you've to type it up and stuff. And it'd be handy to have that class for that, 'cos that's throughout sixth year.... so it'd be nice to have the ECDL sort of finished by sixth year and then focus on that. (Ivy Lane, Medium ICT, 5th Year)*

The student perspective on the potential future of computer class highlights the great understanding that students exhibit about the shape that they feel this curriculum should take, while also demonstrating awareness of the constraints that need to be considered, such as scheduling and curriculum constraints. The student voice has the potential to play a key role in shaping the future format of computer class in second-level education.

Related to this, the term 'Digital Native' is often attributed to the current generation of youth who have grown up in an age of ubiquitous electronic devices with online functionality. Although there is variation in what exactly this label encompasses (Gallardo-Enchenique et al., 2015), there is a general assumption that young people today possess better computing skills than previous generations, seeing the world differently as a result of growing up with technology all around them. Wang et al. (2014) investigate the differences in ICT usage of middle school students in the US and find that although school-age students may be fluent in using entertainment or communication technologies, there has not been much change in the way that students use technology in the confines of school. Their analysis also finds that teachers primarily ask students to use technology in researching and writing papers, with few providing opportunities to allow students to use ICT in more creative ways (ibid).

International evidence seems to show that there is a clearly defined role for schools to play in helping pupils to develop their ICT competencies.

In Juniper Avenue, a High ICT case-study school, recent junior cycle students (first and second year) have personal devices (Apple iPad), yet students still see value in having computer class on traditional desktop computers:

> *It gets you away from the usual technology you're kind of into because we use these like every class, every day. Like, for most of the class anyway, so it's different to get on a, like a PC. Even, like some people don't have it at home, so it's like, just handy to have, to get to know the PC. (Juniper Avenue, High ICT, 2nd Year)*

Students in the focus group interviews highlight how important computer classes are in developing their ICT skills. They note how these skills lead to improvements in their ability in computer class but also in subjects where there is a need for computer-based project work. Students appear to be keenly aware of the importance of ICT skills for their future, citing the importance of computer skills for working across a wide variety of industries. The *Leaving School in Ireland* study underlines the need for ICT skill development opportunities for students, as only half of 22/23 year-olds reflected that they had acquired strong ICT skills[29] during their previous educational participation (McCoy et al., 2014). The student focus groups support other evidence on the Irish education system, that there is a role for schools to play in helping equip students with the ICT skills necessary to succeed in school and later in life.

8.5 ONLINE AWARENESS

One topic that is frequently in the public spotlight is online safety. The current state of online technology and social media use has unearthed issues such as cyber-bullying, online privacy and responsible online behaviour. We asked students what role their school currently plays in educating them about online safety and if they consider it to be helpful in increasing student awareness, as well as their opinions regarding online safety and how comfortable they are with their level of online competence. Internationally, the theme of youth safety online and the role that schools play has been covered from a broad range of perspectives. The general concept of digital competence has been explored on an EU-wide scale by Ferrari (2013). This research provides a conceptual framework

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[29] This is defined as the ability to use computers or the internet (McCoy et al., 2014).

for the skills needed to 'become competent in a digital society' (Ferrari, 2013), considering areas of safety, information, communication and problem solving to be areas of digital competence. Livingstone et al. (2011) provide a neat classification of the three main online risks to young people – *Content*, *Contact* and *Conduct*. *Content* considers spam, adverts and generally unsuitable content. *Contact* encompasses tracking and bullying online. *Conduct* is the term for inappropriate action by youth online covering hacking, illegal downloading, bullying and inappropriate content creation.

In Italy, Calvani et al. (2012) measured the digital competence of adolescents (14-16 years) and found that the perception that youths are digitally competent is optimistic. They consider the idea that youths are digitally competent to rely on the assumption that 'mere use of technology fosters new and inherently positive high-order cognitive and socio-ethical skills' (ibid). In Norway, Hatlevik and Tomte (2014) found that social background plays a role determining the internet safety awareness of second-level students. In a country where there is close to a 1:1 student to computer ratio, their research found that 'gaining access to technology does not necessarily give students the competence and ethical awareness needed in order to behave responsibly and correctly online' (ibid). They also assert that 'it is the responsibility of the school to help even out differences in skills and reduce the gap of the digital divide' (ibid).

It is important to note that the Hatlevik and Tomte (2014) definition of a 'digital divide' represents not only a disparity in the stock of ICT equipment but also in the degree to which people can correctly use these systems and software in their school learning. Pedró (2007) strengthens the argument for a redefined 'digital divide' by noting that the previous definition of simple access to technology is not as big an issue as before. This conception of the 'digital divide' relates to both access to technology and the actual uses of technology.

In looking at cyber-bullying across a selection of seven European countries, Livingstone et al. (2011) use survey data and found that 6 per cent of children aged 9-16 were victims of cyber-bullying in the past year. A comparable follow-on study found that 12 per cent of children aged 9-16 reported being bullied over the internet or via mobile devices in the past year (Mascheroni and Olafsson, 2014).

The following section will highlight the services and guidance that schools provide to students. Focus group participants also express their views on the importance

of online safety, describing creative projects which helped to increase awareness of the importance of online responsibility throughout the entire school.

8.5.1   Online Safety Guidance

From the sample of ten schools interviewed, every school seemed to offer some form of guidance to incoming first year students on online safety as part of the SPHE curriculum:

> *We had a class, earlier in the year, about internet safety.... it was all about like, you know, how not get caught out on the internet. Turn your safety settings on; don't turn location settings on and things like that.... there's things that you wouldn't even think of, like having your Bluetooth on or anything. (Alder Lane, High ICT, 2nd Year)*

Some schools also provided extra talks from local Garda or a forensic expert (Fern Avenue), who warn students of the dangers online. Generally, students found the external talks like this to be positive and helped to open their eyes as to the importance of online safety:

> *We had a Garda in, in first year and we had a big talk, it was about an hour long talk for each class about internet safety and different things like that and how public you can make things without meaning to. (Juniper Avenue, High ICT, 2nd Year)*

There are some examples in schools of older students actively engaging with younger students. Both Alder Lane and Ivy Lane sent older students to nearby internet security firms to learn about online safety. Then, these students returned and presented what they learned to younger year groups (in Ivy Lane, students also went to local primary schools):

> *I'm on the student council and we went to [an internet security firm] and got this whole like, day talk. And then we had to come back and say to the students and we all had to like go into different groups. And we'd to tell them about internet safety and show them videos and like what the difference is kinda like. We went and got the talk for like a day and we came then.... we split into groups and we told people about like internet safety and how safe they are online. And it was like, we're doing it now and putting up posters and stuff about, you know responsibility online.... it is like students like they're telling all the other students, this is what you need to do. So it's not like some adult like telling them this is what. (Alder Lane, High ICT, 5th Year)*

In another school, the deputy principal is active on the school social media profile, helping make students aware of how visible their comments online can be:

> *[Deputy principal] is mad into all that. She's very helpful.*
> *She was saying that, we have to take, like say, we are [School Name] so you know when you find the page were your school is. She was saying take that off 'cos there could be people going into your page and they know... everything else about your school.*
> *Where you live, all that, she was saying you're better off taking all that down.*
> ***Interviewer:*** *that's great that they're giving you that advice, you know?*
> *Yeah, she always helps you 'cos yea, she's real big into all that.*
> *Like her herself, she's into big into the Facebook, she puts everything.*
> *But she is safe about it, yeah. (Green Lane, Low ICT, 2ⁿᵈ Year)*

It is clear that more interactive and engaging attempts to increase student awareness of the online space are effective. Although students seem to be generally aware of the dangers online, interactive examples like presenting information to younger peers really seem to reinforce the importance of this issue. There is a clear space for schools to help increase student awareness surrounding the issue of online safety in interactive and informative ways.

8.5.2   Student Awareness of Online Safety

In most circumstances students appear generally aware of the risks that are associated with the internet, regardless of how highly ICT-integrated their school is. These risks include pop-up advertisements, viruses and disclosing personal details on websites – especially social media websites:

> *You kind of have to keep it private, like private, like only people you know.... You have to add only friends you know and all that because if some random person adds you then you don't know who they are, they could just hack your account or anything. (Beech Street, Medium ICT, 2ⁿᵈ Year)*

> *... Most of it anyway is common sense anyway like.... if there's an ad that comes up and it's a dodgy website sure like common sense would tell you to close it, there's no point in clicking on it and looking around. (Elm Road, Medium ICT, 2ⁿᵈ Year)*

> *Interviewer: So people still don't fully understand then the dangers (online)?*
> *Yeah, the safety of it.*
> *That completely random people like, complete strangers like could be sending you friend requests on Facebook like and there are people who would accept them. (Cedar Avenue, Low ICT, 2nd Year)*

Some student groups felt that they are well informed on online safety, as they have been told about the danger of it since they were younger in primary school or by their parents:

> *That would be directed more and like, like anyone, in my opinion anyway, with, with, like that's anyway smart should know it all by now like, it's, it's fed in to us from the age of about ten up like so. (Fern Avenue, Medium ICT, 5th Year)*

> *During primary school, in sixth class they [teachers] would do courses on how we'd be smart on, how to be smart on the internet, how to keep safe and how to not go to like dodgy websites. (Beech Street, Medium ICT, 2nd Year)*

For students, one aspects of online safety which is relevant for them is online bullying. A body of literature has found that cyber-bullying is an extension of offline bullying behaviour (Raskauskas and Stolz, 2007; Tokunaga, 2010; Katzer et al., 2009; Salmivalli and Poeyhoenen, 2012). Similarly, students in the focus group interviews considered 'online' safety to be analogous to 'offline' safety. Unprompted, they draw comparisons between examples of general safety and safe behaviour online. The merging of off- and online awareness may speak to how much technology has permeated the day-to-day lives of the current generation of youth:

> *Do you know if you saw someone, who's going to hand you like, like a brand new phone just out on the street.... the same if it pops up on the computer. (Ivy Lane, Medium ICT, 2nd Year)*

> *Clicking on one of those things is like getting into the car with somebody you don't know. (Ivy Lane, Medium ICT, 2nd Year)*

> *It's not really much of a difference, I mean you're not going to walk up to a random person the street and tell them where you live.*
> *(Fern Avenue, Medium ICT, 5th Year)*

In addition to being aware of the current importance of online responsibility, students from junior and senior cycle groups noted the importance on having ICT skills and a clean online profile for future career prospects:

> *Like I only, like I know what the implications when I go for an interview, they're probably going to be looking me up on site. (Alder Lane, High ICT, 5th Year)*

In Fern Avenue, the external forensic speaker helped to warn students about the dangers associated with commenting online:

> *They kind of, like they told us they were going to put up a message that they found from someone in the class, or someone in the group, and like they were only kind of kidding like, when they put, but it made everyone kind of realise like the stuff they were typing.... They just talked about how it can come back to bite you and stuff like that. (Fern Avenue, Medium ICT, 2nd Year)*

Students from the case-study schools demonstrate an awareness of the risks that are present online. In light of the recent technological development of schools nationwide, there is potentially a role for schools as the main educator on the importance of online safety, even if students seem to exhibit a high level of understanding with it. Up-to-date instructions and guidance for educators would be important given the fast pace of developments in risks on the internet, where new applications and threats continually pose new risks for the youth nationwide.

8.5.3   Senior Cycle Student Perspective on Online Safety

Although most student focus groups expressed confidence in their own online safety competencies, some senior cycle students felt that younger students might be overconfident, not fully understanding the danger that is present on the internet:

> *I think it should be maybe even brought like to the attention of first and second years a lot more. 'Cos they're new to this'*
> ***Interviewer:*** *Yeah, they're little fishes in the big pond?*
> *And like that's where the biggest like, the biggest kind of thing about it is like the cyber-bullying. And I don't think like people like, it's not actually their intention of bullying. It's like, they're just like they're kind of maybe, they'd be like saying, like making, like names and stuff, in public and everyone can see it. And they're like, oh he's like but the person could be clueless because they're just new to all this. (Alder Lane, High ICT, 5th Year)*

Although some students noted receiving tips on being safe online in earlier years or in primary schools, older students might not have received these classes in their experience. They think that it is important to inform students on how to be safe online from primary school:

> *... They should do it in primary school.... Not when they go in to secondary school because then it's too late, if you're already doing it it's not going to change, you're not going to change it too much.*
> *(Beech Street, Medium ICT, 5th Year)*

This exchange with second year students in Juniper Avenue helps to highlight the general opinion of students towards online safety, ranging from appropriate behaviour to the future implications of online posts. In this school, they have worked on the online Netiquette platform which covers 'courtesy online and the informal 'rules of the road' of cyberspace' (Albion, n.d.). A student explained the concept of Netiquette, and how it has helped them:

> *It's kind of like how you should use the internet... being nice on the internet and things you shouldn't do.*
> ***Interviewer:*** *And do you find that's helpful or is it kind of like 'Yeah, I know'?*
> *Yeah, like, because some of the stuff we've been doing like from primary school so it's just like repeating their selves now.*
> *Yeah it's like, we know. We know that.*
> *Yeah we know what we shouldn't post up on Facebook, we get that.*
> *You don't have to say it like, for like, four years.*
> ***Interviewer:*** *But like you all think you're pretty safe online?*
> *Yeah because we've been using it for so long now it's just like.*
> *You just know, it just it comes naturally.*
> *You just think, 'would this be okay in a couple of years. Will this be alright to be putting up in a couple of years? Then if not, don't post it.' (Juniper Avenue, High ICT, 2nd Year)*

A common theme across schools is that education on the importance of online safety has an impact on the awareness of students. Active engagement from an external speaker, a student-led project or from enthusiastic teachers seems to help make students aware of the importance of online safety. The fact that students consider online safety to be analogous to offline safety highlights the value students place on their online activity and also the importance of effective, current guidance in this area. The perspective of senior cycle students emphasises the importance of instructing pupils on the importance of online

safety from a young age, as children are gaining access to internet-equipped devices and social media platforms from a far earlier age than previously.

8.6   SUMMARY

The opportunity to speak to student focus groups about their views on the current state of ICT in Irish second-level schools is a valuable resource. Their broad, diverse and well informed opinions from the ten case-study schools provide a new perspective into the current state of teaching and learning in Irish second-level schools. The student voice is especially timely given the recent roll-out of high-speed broadband in schools across the country. This research is one of the first opportunities to study changes in teaching and learning in the wake of this technological development.

A key finding of this research is that the best student learning experience involves active engagement. The introduction of a fast, reliable broadband connection has given teachers another avenue through which to actively engage students. This is generally viewed as a positive development by students, who note the increased enjoyment and overall better experience of most teaching methods drawing on ICT and online resources. Although teaching through some ICT-based methods is one way of achieving student engagement, students are very clear that teachers can successfully engage students without using computers. Using ICT-based methods are one of many avenues through which to achieve the goal of educating and engaging students. Furthermore, some students remark that certain teachers can use ICT to the detriment of the overall learning experience, resulting in students becoming disengaged with the learning material.

Students appear to be receptive to most of the changes that have occurred in classrooms. From a planning standpoint, students are broadly supportive of class content being provided through presentation software (e.g. PowerPoint). Students also appreciate the use of multimedia content, where relevant, in the classroom setting. Another key development was in the use of e-learning platforms, which students found helpful. It is also clear that students receive school guidance regarding being safe and responsible online. What is especially interesting is that students perceive online risks to be analogous to offline risks, furthering the idea of the current youth as being 'Digital Natives'. However, there is still a role for schools in emphasising the importance of online safety.

High ICT-rated schools show how a reliable internet connection paired with good equipment and connectivity empowers teachers to use ICT in class creatively, if they so wish. The student focus groups reaffirm the role of the teacher as the

catalyst of the student learning experience. ICT-based teaching methods can be leveraged by teachers, provided they know how to use them effectively and the barriers to seamless use are minimised.

From the student perspective there were a number of areas where there is room for improvement. They feel that teachers should be supported in their role as educators by equipping them with the skills to utilise ICT-based teaching methods if they wish. As Enyedy (2014) notes, there must be effective professional development in addition to investment in equipment to ensure that a teacher can use technology as a part of their teaching. Similarly, students took issue with problems that disturbed their learning experience, such as a faulty classroom internet connection or an inadequate classroom display setup.

Chapter 9

New Technologies in Education: the Student Perspective

The previous chapter discussed the student view on the use of ICT in their typical school setting, discussing the typical ICT classroom setup, how teachers use the technology available to them, the value of a computer studies class and the importance of online safety. This chapter will delve into some of the more recent developments in the ICT space which students were very eager to discuss. Students had a lot to say about the use of personal devices (tablets) in school and their use of technology outside of the classroom (which aids their studies).

9.1   STUDENT PERSPECTIVE ON 'PERSONAL DEVICES'

One of the more recent developments to the school ICT space is the increased use of personal electronic devices for students in second-level schools. These personal devices (typically tablet computers) have become increasingly more common in second-level schools. Given the rapid development of this technology and the deliberate approach that schools take to introducing new technology, there has been a lot of public discourse surrounding the introduction, application and benefits that these devices provide. Internationally, attempts have been made to embed electronic personal devices into schools. Enyedy (2014) notes how it has become difficult to make claims about the effectiveness of in-school technology systems due to the broad variation in the type of system introduced in each case. The following section will discuss the views of students relating to the benefits of personal devices, the issues they experience in school and some other important issues to consider when evaluating the benefit of personal devices in schools.

9.1.1   Benefits of In-School Device Use

Students were enthusiastic about personal devices and their experience with them. In schools where personal devices were not used, students expressed their views on the potential of these devices. For the purposes of in-class use, students noted that researching and textbook functionality are the main uses:

> *It's good for like projects and stuff because like in some classes you need to do all these projects but like the book just doesn't have the information or it takes forever to find it and then you're like wasting time. (Beech Street, Medium ICT, 5th Year)*

> *I do think they're good so you can research the stuff, if you need to*

look up something it's grand, you can just look it up there and then.
(Juniper Avenue, High ICT, 2nd Year)

In Daisy Road, second year students had project-based assessments worth 25 per cent of their final subject grade (10 per cent in the first semester, 15 per cent in the second). Students were encouraged to research and complete these projects on their tablet devices:

We didn't use our iPads at all but we are doing our junior cert, the 15 per cent project and we're typing that up on our iPads.... in music like, we're using it more like to research composers and stuff like in class. (Daisy Road, High ICT, 2nd Year)

Students were enthusiastic about their subject-specific projects, noting the different ways they could use their device to create an interesting and engaging presentation which helped them learn:

For maths, we had, we'd to do mind maps on terminology and statistics and the sets. So it just makes it easier for us to remember things.
I did a key note, like PowerPoint. So like you could do whatever you want like really... you have all the information there.
Interviewer: *Okay, so with the projects, (the device) is flexible enough to really do what you want to?*
For History like, I did a, on Pages (word processor application) when you go to do a new one. Like there's a load of different options what you can type on it, like a newspaper article....
Like when we were doing the maths, I was a bit shaky on some of it, on some of them at points. But then after doing it, I had a better understanding of it. (Daisy Road, High ICT, 2nd Year)

One common aspect noted about personal devices in class is that it saves students from having to go to the computer room to research a topic. This is important because the computer room typically is not available on demand and must be booked in advance. Having devices in classrooms would allow students to conduct research without the issue of moving classrooms or rearranging the computer room timetable.

It's like you don't, you don't really have to go into the computer room. Or use computers, like if you have it right in your hands like.
(Daisy Road, High ICT, 2nd Year)

Another surprising application of personal devices was how some students discovered new ways to learn that they found effective. Students in Daisy Road used the audio capabilities of their tablet to read back highlighted text, or play a video of a poem in order to learn material:

> *They're good for revision like, Stephen did it, I tried it out as well. All you did was you just, if you had an essay, or something to learn off, you'd type it all up. And you just highlight it and then you can, it'll speak and just like listen to it. And it like gets into your head.*
> *Yea, that's what I did for a few of my essays on the thing. I recorded myself speaking it and I just went to bed every night and I listened to myself speaking it for around two or three times.*
> *There's a girl in my class and she, we were doing English and we were learning poems. And she found it very hard to learn the poem and she played it on YouTube while she was doing her homework in another subject. And she knew it perfectly the next day.*
> *It's not really all visual though, like you can be hearing too. (Daisy Road, High ICT, 2nd Year)*

What is so interesting about this example is that students discovered this learning technique themselves and found that it enhanced their learning experience. In addition to the new dimension that personal devices bring to the classroom environment, students highlighted some benefits that were not previously considered by the research team.

This section underscores the value that rich qualitative data provides to this research, especially when it comes from students – the main beneficiaries of investment in the school system. Students from schools who did not have personal devices were eager to highlight the practical benefits of tablets rather than the learning benefit that they would provide. Although students in most of these schools do not have in-school personal devices, the reduced bag weight and ease of having all of their textbooks on one device was repeatedly mentioned as a major potential benefit:

> *You've the weight off your back and you've your whole curriculum in one box like. (Cedar Avenue, Low ICT, 2nd Year)*

> *Like sometimes you might have six books in your bag at one stage. Then you might not even use them in some classes... you're hauling a book for no reason. (Elm Road, Medium ICT, 2nd Year)*

The reason I'd get the iPads because you have so much books in your bag and your back is so sore when you come home from school. Yeah, and it'd be so much handier carry it round. (Alder Lane, High ICT, 5th Year)

At the time of these interviews, only first and second year students in Daisy Road and Juniper Avenue have personal devices (tablet computer). Each year, incoming students would buy tablets when starting in school. Over time, students in every year would have a personal device. For now though, second year students in this school see the burden that carrying books place on the more senior students:

You see them (students in older years with no iPad) and they have like books up to here, carrying them around and we just have like this.
Interviewer: *So you think you're definitely a bit better off?*
And it's like really heavy because I've a friend who goes to school where they don't use iPads and then they measured, like, how much their bag weighed and it was like really heavy. (Juniper Avenue, High ICT, 2nd Year)

9.1.2   School-Related Issues Concerning Personal Devices

Although the addition of personal devices has led to inventive uses of technology in the classroom there are still a lot of challenges, especially on the increased burden on the ICT co-ordinator and overall school resources. Students highlighted issues ranging from the quality of tablet applications, the internet connectivity in school, the degree and method of content filtering and means of discipline with this new technology.

Of the two schools featuring personal devices on a 1:1 basis (Daisy Road, Juniper Avenue), students in Juniper Avenue reported issues with the textbook application they used. These issues ranged from requiring the application to be downloaded again, losing the access to older books and students losing highlighted text and annotated 'sticky notes' when they moved from first into second year:

It takes like ages to actually log on to the books because like, there's thirty people trying to get on (to the internet connection) at once.
Interviewer: *Right. So you think that's a problem with the app?*
The app is kind of glitchy because like, especially on my Science book… say I highlighted the whole page and then I turned the page and turned back, all the highlighters are just like gone…

And like, also, you could go a random page and it's just completely black so you're missing pages in your book…. you have to, like, delete the chapter and then re-download it again
So if you've got notes or highlights on the chapter they're just all gone now. (Juniper Avenue, High ICT, 2nd Year)

You can add like sticky notes to the books so then you can go in to them if you have a short note... we always like highlight in our History books and then last year, when we moved in to second year, they all went, all the highlighting we do. (Juniper Avenue, High ICT, 2nd Year)

The annoying thing about the app is like, on like our Spanish books it said it was expired even though we'd bought it last year... Once we'd got to this year because it was in first year it was expired, so if we wanted to look at any notes from the first year book we couldn't get on to them.
Oh yeah, that happened to a lot of books.
Interviewer: Okay, right. And what happens then? Do you just lose your notes?
Yeah, you lose like the whole first year book. So if I ever wanted to like, look back at stuff we done in first year that isn't in the second year book, I can't do it.... even though, like, we paid for the book. (Juniper Avenue, High ICT, 2nd Year)

Of the ten schools visited for the purposes of the interview phase, Juniper Avenue was classed by the research group as being highly ICT integrated, demonstrating a clear vision for embedding tablets into the learning experience. It comes as a surprise that students in this school reported problems with the quality of the textbook applications that were being used. If this programme was used in every school across the country, it is reasonable to assume that issues like this would be more frequently observed. In addition to reporting problems with the textbook applications they used in school, students in the same school felt that the tablet did not provide the same level of convenience that textbooks did:

You can't really flick through the book either, where like if you had a normal book you can kind of flick back through it, you can hold on a page... but it's only one page and you have to keep pressing the button to go on.
Interviewer: Do you think that they could do a bit more work on the app and make it a bit easier for you to use the books?
I don't think it'll ever be like a book. (Juniper Avenue, High ICT, 2nd Year)

However, it takes more than a personal device with specific software to unlock the full potential of these devices in school. A suitable school internet connection is an important piece of the puzzle. A tablet without an internet connection will eventually be limited in the benefit it provides. In Daisy Road, students used tablets for over a year without a suitable wireless internet connection. Researchers visited the school only a few weeks after students were able to access the upgraded wireless internet – with vastly improved results:

> *Last year we didn't, we'd use it a bit for a few projects and stuff. But like last year, in first year, we didn't really use the iPads a lot really. They were a bit of a waste 'cos the Wi-Fi was awful. But up until, after midterm there, we just came back there last week.*

> *The fact now that the Wi-Fi is better, we'll be using it a lot more. But last year, definitely, for ourselves, we didn't really use it all.*

> *'Cos now like we're in History class we're like bringing in headphones like listening to videos and stuff so.*

> *Like the internet is top class, so you're able, everyone's able to on to use it like.*

> *Interviewer: Were they (iPads) a little bit redundant when the internet wasn't (good)?*

> *The teacher couldn't even put it on the board with the computer like, it was buffering all day.*

> *For training like, when like, the teacher sometimes like they'll tell you to on this link before. But the link was so slow that it couldn't even load up and the teachers were getting frustrated. (Daisy Road, High ICT, 2nd Year)*

The argument could be made that one drawback of tablets is that they are so multifunctional. These devices can do almost anything, from highly productive uses to games and instant messaging. In Daisy Road, an older student notes how their younger sibling in second year is easily distracted by their personal device at home, where the home internet connection does not filter certain applications like the wireless connection in school:

> *I've a sister in second year too. And I know it's at home, is when she really like goes on what she's on. And like 'cos she has homework on her iPad but it's so easy to go into other stuff. And because she's at home, you can't block that off. (Daisy Road, High ICT, 5th Year)*

This problem is also present in Juniper Avenue, where the unfiltered home internet connection leads to increased distractions for students when studying. This also highlights the fact that although the student was comfortable with using the device, they did not know how to change the individual application settings to disable notifications:

> *Even though I logged off Instagram [photo sharing application] it kept giving me notifications which was so distracting and you'd just hear beep, beep, and just like... Popping up and it's so distracting. (Juniper Avenue, High ICT, 2ⁿᵈ Year)*

One other issue that students commented on was the school-level controls on the content that was allowed on personal devices that students used in school. In schools where personal devices were used by pupils, each school took a different approach to filtering applications that schools considered to be inappropriate. Daisy Road had a robust wireless internet filtering protocol which allowed pupils to have any application they wanted on their device, but it would not be accessible through the school internet connection. Juniper Avenue had a device-based filtering system, with a 'blacklist' of applications that students were not allowed to install on their device. If students installed any of these applications at any time, a notification was sent to the school:

> *(On being allowed to install non-educational applications)*
> *No you're not allowed [to] do that. No even if you installed it when you went home and deleted it before you came in in the morning …*
> *We had two weeks off school last year and I thought we were allowed to like download them back for that and … I didn't have a phone, like a proper phone in first year, I only had the iPad for social media …*
> *I asked my parents could they write a note for me… they (the school) just kept bringing it up … 'you have to get a new note saying this and that [that she installed certain applications on her device].*
> *It's kind of annoying when like, you come into first year … they say you can bring in your own iPad or you can buy a new one…. It's not as if we rent the iPad from the school, we buy it. It's not theirs like, it's ours. (Juniper Avenue, High ICT, 2ⁿᵈ Year)*

Students in Juniper Avenue expressed displeasure with the school web filtering system. They noted some of the disciplinary issues surrounding this, where the misbehaviour of individual students with certain applications resulted in the application in question being banned; this resulted in all students being punished as a result of the action of a minority of students. Students voiced concern at the

fact that families purchased these devices and students were not allowed to use the device for non-educational purposes – even during holiday periods. This caused distress for students who did not have any other computer or smart phone to communicate with friends:

> *Yeah I thought, when I was coming into the school and they said they had iPads I thought like they would have something to, like, if you went onto the Snapchat app, like, you wouldn't be actually able to do anything with it, it would just go blank or whatever, like I thought that was it and I thought that was a good idea. (Juniper Avenue, High ICT, 2nd Year)*

Although Juniper Avenue seems to have a restrictive application filtering system, it does seem that certain applications which would typically be considered inappropriate for in-school use (for example, Facebook) are allowed to be on iPads yet do not work through the school internet.

> *I think you're allowed Facebook on it, I have Facebook on mine... it just doesn't work in here. (Juniper Avenue, High ICT, 2nd Year)*

If it was possible for students to install any application but for schools to disable access to these applications on the school wireless network (as in Daisy Road) this might remedy the frustrations that students in Juniper Avenue have with paying for a device that they use all the time, yet has certain applications permanently blocked by the school.

9.1.3   Additional Issues Concerning Personal Devices

Although students see the benefit of personal devices, they also understand that these products cost a significant amount of money. Students suggested a variety of methods of tackling the potential socioeconomic issue that this cost presents, ranging from bulk ordering devices to get a discounted price, rental schemes from the school and even the possibility of purchasing cheaper tablets which might be more affordable and yet serve the same function as an iPad would:

> *My cousin goes to school in England; they all have their own iPads.*
> ***Interviewer:** And how does that work?*
> *Like just you borrow, you kind of like borrow the iPad from the school, they make you sign a contract and stuff, like if you break it or whatever you pay for it, but like they all use iPads. (Beech Street, Medium ICT, 5th Year)*

It's grand for the people that have one but then for the people that have to go off and buy one, it could be expensive.
Interviewer: Okay, okay. So you don't think it would be a good idea?
No, not unless you were getting them at a discount price. (Cedar Avenue, Low ICT, 2nd Year)

Generally though everybody nowadays has a tablet of some sort that you can get apps and...
Like when you're doing the book rental or whatever with the school they could make a certain price for the iPads to use.
You could rent one. (Elm Road, Medium ICT, 2nd Year)

In addition to the once-off cost of purchasing a personal device, there is no guarantee that this device will be functional for the entire time that a student is in school. Students are aware of the need to repair and upgrade their devices over time due to usage and obsolescence:

I got an iPad a few years ago and it won't let you update to the new iOS (software) any more. It's kind of forcing you in to a situation where you have to buy a new one. (Juniper Avenue, High ICT, 2nd Year)

Interviewer: So you're in second year? Have you had to have the iPads repaired much?

I had to have mine once.
Yeah, I had to have mine twice.
Mine just cracked on the screen. (Juniper Avenue, High ICT, 2nd Year)

I think last year as well when you'd charge your iPad it would last maybe two days if you didn't use it that much but now it would kind of only last a day and a half with the battery...
Interviewer: Okay, so the battery is kind of wearing down over time a little bit?
Yeah. (Juniper Avenue, High ICT, 2nd Year)

Another point that students raised was the effect that using an electronic device had on their health. Research shows that the current generation of students spend more time than ever before on computers and in front of screens during their leisure time (Nugent et al., 2015). It is important to consider potential health implications of increased device usage on students. International literature has found evidence that increased leisure time involving screens has a negative impact on sleep (Cain and Gradisar, 2010; Hysing et al., 2015), on the level of

physical activity students have (Melkevik et al., 2010) and on social wellbeing (Richards et al., 2010). Student from the case-study schools noted in some cases that they would prefer reading from a textbook, specifically because they felt that screens placed a strain on their eyesight:

> *To be honest I prefer books, I think it's easier.*
> ***Interviewer:*** *Do you prefer books?*
> *Well to read from, yeah, than a screen.*
> *It doesn't hurt your eyes, you know.*
> ***Interviewer:*** *Do you think it has an impact on your eyes then for those?*
> *Well maybe after about, after two hours, yeah, definitely. (Juniper Avenue, High ICT, 5th Year)*

> *I don't think the iPads would be too good because... I do and I'd say most people do as well, if you look at an iPad or a screen too long you get a headache. (Alder Lane, High ICT, 5th Year)*

One pupil in Elm Road reported that she needed glasses, and attributed this to the use of iPads as textbooks in the last two years of her primary school education. In addition to eyesight concerns, students raised other possible health-related issues stemming from overusing devices, such as obesity and diminished social skills:

> *Too much use of it (iPad) is bad but it's good if you use it properly, it's brilliant if you use it properly.*
> *I think the whole thing about obesity as well, like that's caused by it as well like, it's only getting worse like. In the last few years, even in first, second, third, fifth, sixth year, you can tell children are just getting more... they're getting bigger. (Elm Road, Medium ICT, 5th Year)*

> *See there'd be no communication at lunch time (if all students had iPads). Like everyone would be just staring at a screen.*
> *No, we'd all be on our phones.*
> *We'd probably be messaging each other across on the iPads.*
> *Like kind of with the second years they're like, there at lunch time, like just on the iPads. And they'd be like did you see this, did you see that.*
> *They'd be sitting beside you but they'd be like messaging. (Elm Road, Medium ICT, 5th Year)*

> ***Interviewer:*** *And how do you feel about that, what are your thoughts on iPads?*
> *It's kind of like, I don't like children on them all day and night.*

Yeah, children should be out playing like.
It's kind of like an easy way to, to distract them like, you know for the parent.
For them to, you know, or even the teachers, just to kind of distract them for a while, just give them an iPad or something, you know.
Interviewer: *Really? So you don't think it (devices) is necessarily a good thing then?*
Definitely not, no. (Elm Road, Medium ICT, 5th Year)

It is clear that students view the reduced weight of school bags as the main benefit of personal devices outside of the classroom. When school leadership consider introducing tablets into the curriculum – often asking families to pay for devices – it is important to be aware of the scope for extra costs such as repairing devices and the likelihood of purchasing a newer device when the first device becomes obsolete. Another consideration is to seek assurances from vendors that device and educational software will be kept up to date for the life that students are expected to use it for.

9.2   STUDENT VIEWS ON HOME INTERNET CONNECTIVITY

Previous sections provide an idea of the ICT in-school experience of students from a subset of schools throughout the country. One concept that the researchers wished to study was the state of ICT at home for the purposes of schoolwork. The idea for this came primarily from the way schools have introduced new online learning hubs for students to communicate and complete work.

If the belief is that a connected learning environment leads to better educational outcomes for students, the quality of home connectivity becomes an important link in the chain. The introduction of a high-speed internet connection into second-level schools has allowed school leadership to take a more creative and ambitious online direction than before. Although the barrier of the school internet connection has been mostly resolved, it is crucial to investigate what other barriers remain; it is clear that home connectivity has become an increasingly important piece of the puzzle for the school learning experience.

Student focus groups considered internet connectivity at home to be important for school success. This section highlights the sentiment of students regarding the importance of home connectivity for their education.

9.2.1 Benefits of Home Connectivity: E-Learning Platform

Although there are many benefits to the presence of a broadband connection in households, from an education standpoint one key innovation in many Irish second-level schools is the introduction of e-learning platforms. Although there are different versions with slightly different features, the core feature is to facilitate online communication between a teacher and their class via a secure online platform. Students note that the most commonly used feature of these services is the listing and submission of homework activities for a class group. Recent investments in the school internet connection have made it relatively seamless for teachers to 'post' homework material online. For students, this online facility is viewed as a helpful tool to catch up on homework they might have missed due to absence:

> If you're out you can go back on to the subject, say you've missed. And the teacher will have posted what you did in school, so then if you miss notes, or anything you could write them down. And you can catch up to what you've missed. (Alder Lane, High ICT, 2nd Year)

> All of our notes get sent on (Microsoft) Office, so like teachers will send us, so if we're not in, or anything. And now, if we say to her like, oh miss I didn't get that, they're like, oh well I sent it to you. (Green Lane, Low ICT, 5th Year)

Students who had suitable home connectivity also noted that online learning platforms helped to facilitate co-ordination with classmates for project work:

> It's also good for group-work because then you can just open a Google document and everybody can put their notes. (Juniper Avenue, High ICT, 2nd Year)

However, the effectiveness of e-learning platforms relies on the assumption that all students have access to a suitable internet connection outside of class time in order to receive and submit homework.

9.2.2 Benefits of Home Connectivity: Homework

In addition to schools which use e-learning platforms, students highlight the general importance of a suitable internet connection for helping with their homework. Students find the internet to be a great resource for research and note that web resources often provide richer information than what is provided in textbooks:

> *Interviewer: Do you think using computers and the internet at home improves your school work at all or improves your learning?*
> *Yes because we can, instead of reading from a book and it's just simple, like a straight answer, we can learn more and get more in to what the actual thing is about. (Beech Street, Medium ICT, 2nd Year)*

Students seem to view the internet as being an essential part of their homework experience on a regular basis. In an age where most students possess smart phones with internet capability, the internet is far more readily accessible from a smart device than it might have been previously on a traditional desktop computer which needed time to boot up:

> *I wouldn't go up to do my homework without the iPad or my phone or something there just in case...*
> *Rather than looking up a dictionary, you've your phone. (Fern Avenue, Medium ICT, 5th Year)*

Although students clearly feel that the internet is a legitimate resource to aid their studies, they note how parents are often sceptical when students use the internet during homework time. Some students feel that parents see a screen and assume that it is being used for unproductive purposes like social media, gaming or media consumption:

> *I just think they don't really like understand it that much to see like the benefits of it. They just think everyone like are on social media all the time.*
> *Interviewer: Do they? Would your parents think that?*
> *Yeah, like my mam doesn't know how to work anything. But my dad's good at computers and like he's on Facebook and stuff.*
> *... If you said that you needed like your computer to do your homework, they mightn't trust you. They might think you're going to like, just go on Facebook or something. Instead of doing your homework. (Alder Lane, High ICT, 2nd Year)*

9.2.3 Issues Surrounding Home Connectivity: Access

During focus group interviews, students spoke positively about the benefits of home internet access. Generally, students think there is only a small minority of students without internet access at home. Where students felt that internet at home was not readily available, they suggested solutions such as the local library or using the school computer room:

Interviewer: Do you think many people don't (have broadband)?
Well like, normally it's like one person in a class, if, only one person.
Interviewer: Okay and do you think there are ways of getting around that then?
You could go to the library. (Alder Lane, High ICT, 2nd Year)

So people that, that, some people that don't have internet at home, they might come in here and use these computers. (Beech Street, Medium ICT, 2nd Year)

Another group of students suggested that they could rely more on textbooks – but admitted that this would be inferior to having internet at home:

Interviewer: So what about students who don't have any broadband and don't have any computers or phones at home?
I don't know how they survive.
Interviewer: In what way?... in terms of say school work?
Probably more book work for them.
Interviewer: And do you think that's much more difficult, does that put them at a disadvantage do you think?
Yeah.
Yeah, it is.
They'd be at a loss.
Interviewer: Would they?
Yeah, there'd be more information on the net.
For going in to college they might be at a loss for all the work that they have to do. (Cedar Avenue, Low ICT, 5th Year)

Students in Daisy Road use personal devices and an e-learning platform. They noted that students who had a lack of connectivity at home could complete their homework assignment on their tablet and upload it when they arrive into the school the following morning. Although students noted that a lack of home connectivity was an issue, most offered ideas and possible solutions for students facing this issue. However, the optimism expressed by students was not indicative of the reality that some students who had no connectivity at home:

(On whether a lack of home connectivity was an issue)
Definitely, because in a lot of classes they specifically say to look up things on the internet.
... I don't have it at home, but I have it in my Da's, I have to go to my Da's home.

> *Interviewer: Okay. So do you think that's fair that they assume you have the internet?*
> *Sometimes, no, because sometimes you don't have it and then they just think you do because so many people do have it.*
> *... There is one person in my class who got a detention for not being able to do it because he had not internet at home. (Beech Street, Medium ICT, 2nd Year)*

Although the genuine lack of home access is an issue for a minority of students, some focus groups mentioned examples where classmates cited a temporary lack of home access as an excuse for not completing homework:

> *Sure you can make any excuse; it's a virus or something like that.*
> *....or your sister has the laptop in college or something like.*
> *...and then they can't really prove that you didn't do it then either, if you're like, if you were going to back up on to Office 365 (e-learning platform) like you could just say I put it back up, I don't know where it's gone though.*
> *... It's kind of more unreliable or something, it's not like hardback copy, you know, where you can see it.*
> *Now like, it probably will get more reliable in years to come. (Elm Road, Medium ICT, 5th Year)*

Although this could be a concern, it is certainly possible that the same group of students would also try to avoid completing homework if it was assigned through traditional methods. A more significant issue arises if students genuinely do not have a means of connecting to the internet at home.

It is clear that students feel that connectivity at home is important to help succeed in school. Although the exact number of students with no home internet access could not be assessed, students who were interviewed note that other students without access resort to visiting local libraries or submitting homework online when they arrive to school each morning. In addition to making efforts to bridge the lack of home internet access in certain areas, it would be useful to identify ways that schools could facilitate students who have no home access.

9.2.4   Issues Surrounding Home Connectivity: Affordability of Access

A further issue related to home internet access relates to affordability of access. From 2010 to 2014 the average residential broadband plan in Ireland offered a speed of 11.3 Mbit/s for €51.60 per month (Coyne and Lyons, 2015). This report

has provided evidence supporting the importance of a home internet connection in supporting students. From a social inclusion perspective, there is a high likelihood that students from disadvantaged backgrounds are those who cannot afford broadband. Without supports in place to bridge the economic affordability gap, many students could miss out on the benefits that the internet provides. In Ireland, improving the affordability of internet access for certain groups could be targeted through the DEIS scheme. DEIS schools are provided extra financial support for services such as home school liaison, a school meals programme, support under the School Completion Programme and initiatives for improving literacy and numeracy. These supports are provided to schools deemed to be based in a disadvantaged socioeconomic community (DES, 2015b). It is clear that there is a need to further investigate how students without home internet connectivity can be supported, especially as the internet is becoming an increasingly important learning tool.

In looking at the impact of broadband roll-out across the United States, Whitacre et al. (2014) find a difference between the effect of broadband availability and broadband adoption on economic growth. They find that high levels of broadband adoption positively impact income growth in rural areas and have a negative impact on unemployment growth rates. Based on their findings, they find that future broadband policy should be 'demand-orientated', focusing more on adoption (ibid). Another aspect related to affordability is the consumer willingness to pay. Carare et al. (2015) studied a large scale survey of households who had not adopted broadband. Of these households, roughly two-thirds reported that they would not be willing purchase broadband at any price. Other research (LaRose et al., 2007; McConnaughey et al., 2013) also support the need for policies stimulating broadband adoption in addition to efforts for total availability coverage. Although much of this literature is based on US data, the key message is relevant for the Irish case: once the 'digital divide' of broadband access is bridged, the next objective should be to create policy measures which stimulate adoption.

Investment in technologies such as online learning platforms will never reach their maximum potential if there are students who cannot access the internet outside of the classroom. If a school invests in an e-learning platform but a teacher has a handful of students with no internet access outside of the classroom, the teacher will have two options: Either be burdened with more work from having to cater to both 'online' and 'offline' students or resort to the common denominator of offline instruction, ignoring the functionality the e-learning hub provides. The latter scenario would result in a wasted investment on unused technology.

9.3 SUMMARY

This chapter has provided some important views from students on some of the most recent technological developments in their school. The opportunity to get a snapshot of changes in this area during a time of rapid change is very valuable. When considering investments such as introducing personal devices (or an e-learning platform), part of the challenge is to ensure that the device (or software) will ultimately be productive and that the benefit outweighs any drawbacks associated with it. The large degree of heterogeneity across school environments highlights the need for tailored guidance on the optimal way to introduce new technologies into classrooms. Students who have already adopted tablets have noted some of the benefits they provide, such as an easy tool for online research and convenience for everyday use. Students also cite concerns surrounding in-school connectivity, the filtering of content and the software used on devices. All of these factors must be evaluated when measuring the potential impact of personal devices on student learning.

In their latest Digital Strategy, the Department of Education and Skills has outlined a number of forthcoming developments which aim to address some of the key aspects of improving school connectivity and facilitating the integration of personal devices into schools. The need to improve in-school connectivity is viewed as a key government priority, with schools across the country requiring 'scalable, robust Wi-Fi solutions' (DES, 2015c). In addition to this, the report acknowledges the need for schools to receive expert technical advice in choosing 'fit-for-purpose and future-proof systems' (DES, 2015c).

Chapter 10

Summary of Key Findings and Policy Implications

10.1 INTRODUCTION

As part of Ireland's National Digital Strategy, the Irish government has invested substantially in a national roll-out of high-speed broadband to all second-level schools in the country. This investment signals a move from a slow and often unreliable broadband connection that inhibits the use of ICT within education to a high-speed reliable broadband connection with connectivity support. With this higher quality broadband connection comes a new set of challenges; how can ICT support, enhance or transform teaching and learning in schools?

In order to explore the links between ICT and teaching and learning, this report has drawn on school improvement theory. School improvement research is concerned with the process by which schools can change, in order to improve the educational chances for every child. This research has highlighted the need for strong leadership, a focus on teaching and learning and the importance of creating a positive school culture, particularly for schools in disadvantaged areas (Sammons, 2008). This research explores the role that technology might play in school improvement. The recent DES strategy draws attention to the potential for technology to contribute to improving learning experiences of students, a theme which this research explores. We also report on what principals, teachers and learners perceive to be the value of technology use in their schools in the period shortly before and after schools received connectivity.

The study is guided by five central research questions:

1. How is ICT used in teaching and learning across schools following high-speed broadband installation?

2. What role do school processes like culture, leadership, staff collaboration and technical support play in the extent and nature of ICT integration across school contexts?

3. What are the key challenges facing teachers in using ICT? How do teachers view the types of ICT and online resources available to them and what role does ICT-related professional development play?

4. How do students view different teaching methodologies and to what extent do they see ICT-based approaches as enhancing their engagement?

5. How do students reflect on the ICT skills and competencies they are gaining while at school and to what extent does current curricular provision, particularly relating to computer studies, facilitate the development of these skills?

The study places a central focus on the student voice, particularly when answering the latter two research questions. The student voice is often absent from research on the role of ICT in education. The study draws on a rich evidence base to address these questions, including:

- Large-scale surveys of principals and teachers at two time points (before and after the roll-out of high-speed broadband)
- In-depth case-study research in ten schools, including interviews with school principals, ICT co-ordinators, teachers and focus groups with students.

The key finding of this research is that the introduction of a high-speed broadband connection has made a noticeable improvement in the quality and use of the internet across second-level schools. This noticeable change is observed over a small timeframe and can be expected to provide greater benefit in the coming months and years as teaching and learning approaches adjust to the reliable connection that has been provided to schools.

Principals' and teachers' reactions to the high-speed broadband programme were highly positive, with the vast majority reporting 'high' or 'significant' impact on teaching and learning. Principals who received broadband earlier were significantly more likely to report that it had an impact on teaching and learning. It is clear that principals display a vision around the potential for innovation and the roll-out of high-speed broadband has furthered that vision. Teachers' views of the programme's effect did not differ significantly by time since installation. The investment in broadband infrastructure has eliminated one of the biggest barriers constraining ICT integration in teaching and learning, but other infrastructural deficits remain. These include limitations on Wi-Fi and hardware quality and reliability, and insufficient technical support. Such barriers may weigh more heavily upon teachers' attitudes and behaviour than on principals'.

One other factor to be considered is that educational reform takes time to occur. Most educational reforms and policies take a long time to have a clear and measurable impact. This needs to be kept in mind when assessing the impact of interventions. Fullan (1991) found that one of the most fundamental problems in education reform is that people do not have a clear and coherent sense of the

reasons for educational change, what it is and how to proceed. This can lead to confusion, failure of a programme that is being introduced as well as misdirected resistance by those involved. With regard to teachers, the most meaningful and persistent impact will likely be in the slow, steady improvement in teachers' use of ICT. Discussing ICT use in Greek schools, Pavlou and Vryonides (2009) note that bringing about a meaningful change involves the cultivation of a whole-school approach that includes the integration of ICTs. In order to ensure continuity, the authors suggest the introduction of short- to medium-term initiatives with regard to creating an environment in schools that supports ICT integration. Such initiatives, including sufficient investment in technical support and continuous professional development, may lead to changed attitudes towards the use of ICT in schools by teachers and other school staff.

As discussed over the following sections, the findings provide tentative evidence of a growing place of ICT in schools and in teaching and learning. Positive attitudes were apparent across all of the key stakeholders – school management, teachers and students. There is clearly widespread use (and benefits) of ICT and online resources in school administration and communication. However, the level and nature of usage in the classroom is highly variable across teachers. Principals and students distinguish between early adopters, 'reluctant' teachers and those who are risk-averse. Overall, the findings provide *some* evidence of a shift towards more student-centred usage; and there is widespread recognition of potential value in this space. Further, students use ICT less than other stakeholders and don't see it as being essential in learning, but do see it as important for gaining the relevant skills and competencies for the longer term.

10.1.1   School Climate, Leadership and Technical Support

International literature indicates that success and failure in integrating ICT in schools depends on a number of factors including national policies, the role and competence of school principals and collaboration with teachers (Papaioannou and Charalambous, 2011; Eickelmann, 2011). In order to promote the effective use of technology, principals as well as teachers need to know how ICT usage meets the pedagogical aims of the school. Schools need to develop a clear and shared understanding of how to use ICT for teaching and learning. This study showed that leadership was important in directing policy development in schools.

Qualitative research within selected case-study schools, categorised on the basis of different levels of ICT integration, demonstrated that the principals and ICT co-ordinators often tended to have a personal interest in, and commitment to, ICT. However, schools differed in the extent to which they had developed technology-

specific policies. While having a formal ICT policy was important in some schools, others adopted a more ad hoc approach whereby each subject department decided its own procedures. However, many principals felt that guidance on the integration and use of ICT from the Department has not kept pace with developments in technology.

In line with international research, school infrastructure and teacher competencies emerged as major factors impacting on ICT use for principals. School principals and ICT co-ordinators also highlighted that the maintenance and upkeep of technology was a challenge. In many cases, schools needed to source funding to pay for the updating and upkeep of hardware. Consequently levels of satisfaction with the ICT infrastructure varied across schools. Finally, the research examined the role and experiences of ICT co-ordinators in the case-study schools.

A number of schools that did not have adequate ICT technical support in place found their teaching staff were overburdened with tasks in relation to technical issues and troubleshooting, which served as a hindrance. There were clear constraints in funding and time allocated to the role of ICT co-ordination. Where such positions (or posts of responsibility) were available, their role was largely confined to the day-to-day maintenance of computing facilities. There was limited evidence of ICT co-ordinators having the resources and time to maximise their role in ensuring the effective and smooth integration of ICT across classrooms.

10.1.2   Teaching and Learning

From the range of evidence gathered, both quantitative and qualitative, it is clear that school principals and teachers are highly positive about the place, and potential place, for ICT in Irish classrooms. The benefits of ICT in teaching and learning were noted in a range of diverse ways. Both principals and teachers indicated that students benefited in their learning, with such benefits being achieved through enhanced student participation and achievement, greater collaboration among students and in the development of higher order thinking skills and transversal skills. The qualitative evidence, in particular, allowed teachers to highlight particular benefits in terms of meeting diverse student needs, allowing greater differentiation and tailoring of approach. They also highlighted the role of ICT and online resources to support and expand social learning.

However, in line with research elsewhere (Kerr, 1991) it is clear that the change process is slow, with incremental improvements for existing users coming faster

than adoption by new users. There is *some* evidence of pedagogical change with teachers increasingly using ICT for more student-centred teaching methodologies, and greater levels of student usage, over time. However, the findings support those of Gleeson et al. (2001); teachers are using ICT to enhance their existing pedagogies, but are not yet fully exploiting the potential of ICT for innovative teaching practices that could provide for a wide range of learning outcomes.

Overall, differences in the level and nature of usage were apparent across the high-, medium- and low-ICT schools. Further, the case-study evidence also clearly highlights the centrality of the high stakes Junior and Leaving Certificate examinations. In the pre-examination period in particular, opportunities for more creative and interactive teaching approaches, drawing on ICT and online resources, were constrained. This contrasted with the TY programme, which was seen to allow opportunities for schools to both draw on more innovative ICT-based resources and to develop students' ICT skills.

10.1.3   Factors Shaping ICT Usage

The in-depth qualitative approach was particularly valuable in allowing teachers to identify the key constraints they faced in deciding on different teaching approaches and using different teaching resources. While teachers were positive about the potential for greater ICT use in their classrooms, they also identified a number of constraints impacting on this. Three sets of factors were prominent in their feedback: the role of structural barriers, the nature of online resources available and issues relating to continuous professional development. A diversity of structural issues was seen as limiting teachers' capacity to adopt ICT in their teaching across different school settings; these included variable Wi-Fi and equipment quality, school organisational issues, particularly teachers moving between classrooms, classroom design issues and restrictions imposed though content filtering.

Across a broad range of subject domains, teachers reported sourcing valuable teaching resources and content online, both on national and international websites. Much of the feedback was positive, particularly in relation to the supports offered by the PDST and subject-specific support services, and Irish-specific websites like Scoilnet.ie. ICT was seen to be centrally placed in professional supports in newly revised curricular areas, particularly in relation to Project Maths and the revised junior cycle. In a number of Science areas, innovative teachers have played a valuable role in developing and collating relevant online material suitable for the Irish curriculum. Students and teachers alike spoke about weaknesses in relation to guidance and subject specifications in

the area of computer studies; this has been acknowledged as a key target of the 2015-2020 Digital Strategy.

The extent and nature of teachers' engagement with continuous professional development (CPD) in the use of ICT also featured strongly in the findings. While participation in ICT-related CPD varied widely, we also saw examples where such professional development is embedded as a whole-school process underpinning all ICT-related developments. Professional development will likely play a key role in embedding broadband and ICT within teachers' pedagogical practices, increasing teachers' competence, skill and confidence in using ICT and achieving the desired teaching and learning outcomes. The findings have important implications for both initial teacher education and CPD, highlighting the need to go beyond technical capability:

> ..'being good at ICT' as a teacher was not principally about levels of technological expertise but about the sophistication of teachers' judgements about the potential benefits and possible disadvantages of using various forms of new technology.... being able to use new technology to motivate and engage learners and to make teaching and learning more effective (Haydn, 2014).

10.1.4   Student Voice

Focus group interviews were undertaken with junior and senior cycle students across the ten case-study schools. Students were highly reflective on the issues raised and conveyed a high level of engagement with the topic, in some cases identifying additional relevant issues not previously considered by the research team. For students, the optimum learning environment typically involves active engagement, which may or may not involve the use of technology. However, the introduction of a fast, reliable broadband connection has given teachers another avenue through which to actively engage students. This is generally viewed as a positive development by students, who note the increased enjoyment and overall better experience of most teaching methods drawing on ICT and online resources. That said, students remark that certain teachers can use ICT to the detriment of the overall learning experience, resulting in students becoming disengaged with the learning material.

Overall, students appear to be receptive to most of the changes that have occurred in classrooms thus far. From a planning standpoint, students are broadly supportive of class content being provided through presentation software (e.g. PowerPoint). Students also appreciate the use of multimedia content, where relevant, in the classroom setting. Another key development was in the use of e-

learning platforms, which students found helpful. In terms of ICT competencies, it is clear that students do receive quality information regarding online responsibility at school.

Regarding personal devices, students provided balanced views on the benefits they provide, in addition to listing the problems they have encountered. Students generally feel tablets are beneficial through the convenience of a lighter schoolbag and as an easy method of accessing the internet for research and project work. However, students also raise concerns, ranging from the quality of the electronic textbook application to aspects of content filtering which they perceive to be overly restrictive. Students also cite the high cost of a tablet as a burden on families, alongside the ongoing costs of repair and maintenance incurred. It is also clear that the introduction of personal devices achieves very little in isolation, the broader school context being important. In particular, there is a need for a clear vision at the school management level on the role and use of personal devices, and a school ICT infrastructure which is built to support the increased demands that widespread personal device use requires.

Overall, high ICT-rated schools demonstrated the importance of all 'pillars' working in tandem: how a reliable internet connection paired with good equipment and connectivity empowers teachers to use ICT in class creatively, if they so wish. The student focus groups reaffirm the role of the teacher as the catalyst of the student learning experience. ICT-based teaching methods can be leveraged by teachers, provided they know how to use them effectively and the barriers to seamless use are minimised. However, students are also cognisant of areas in need of improvement in their school context, including teacher professional development. Similarly, students took issue with problems that disturbed their learning experience, such as an inadequate classroom setup for viewing electronic content.

In line with international literature, this study found that ICT contributed to school improvement in a number of ways: for students, ICT use had the potential to enhance the learning experience. For teachers, ICT provided an opportunity to use more innovative teaching approaches. However, embedded use of ICT should be underpinned by appropriate professional development, as well as infrastructural investment and technical support. In addition to teaching and learning, ICT also had a significant role to play in enhancing the efficiency of administration and monitoring tasks in schools.

10.2   POLICY IMPLICATIONS

The findings of this study have implications for a range of policy issues and provide an evidence base to help inform the implementation of the Digital Strategy for Schools (DES, 2015c). Here we outline the implications for six key areas:

1. Support for school leaders and ICT co-ordinators, while valuing flexibility and context-specific approaches;

2. Promoting collaboration, within and across schools and teachers;

3. Professional development for teachers;

4. Addressing structural and curricular constraints;

5. Giving students a voice;

6. Investment in infrastructure.

10.2.1   Support for School Leaders and ICT Co-ordinators

School leaders are highly positive about the potential for ICT to enhance school organisation and administration, and teaching and learning. In many respects we have seen their views of, and behaviours regarding, ICT changing at a faster pace than those of teachers. The evidence highlights how effective leadership is crucial to the smooth and effective integration of ICT within schools. School leaders need support and clear guidelines and information in terms of the types of ICT options available, the value of planning and whole-school collaboration, the requirements in relation to infrastructure and teacher professional development, and their obligations in relation to informing students (and parents). The newly established Centre for School Leadership should play an important role in meeting these needs. Established by the Minister for Education and Skills, Jan O'Sullivan T.D., in April 2015, the Centre is intended to become a centre of excellence for school leaders, and the partnership is expected to have many benefits for the profession in terms of the quality of training programmes, co-ordination of provision, and increased accessibility.[30]

ICT co-ordinators play (and have the potential to play) a crucial role in the ICT ecosystem of the school. Case-study ICT co-ordinators cite the demands that maintaining the school ICT system places on their time. The time involved in managing and troubleshooting ICT issues often goes beyond what is currently allocated as part of their position as ICT co-ordinator. In addition to insufficient

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time resources, co-ordinators felt that they should adopt more of a role as a pedagogical leader in the school, assisting with improving the educational use of technology by teachers and pupils, rather than repairing equipment on a day-to-day basis. The recent influx of new technologies into the educational space places new demands on ICT co-ordinators. In light of this, we need greater discussion about clearly defining the role of ICT co-ordinators (particularly moving from a technical role to a more pedagogically-based role) and addressing the perceived deficit in resources to ensure that co-ordinators have the required time and training to effectively promote the efficient use of technology in schools.

10.2.2   Promoting Collaboration

The case-study evidence has highlighted a number of examples of innovation and forward thinking in relation to ICT integration. These schools, which could be seen as models of best practice, feature a strong emphasis on collaboration and a whole-school approach to development and change. This was illustrated most clearly in relation to development of ICT plans and ongoing ICT consultation, whole-school participation in professional development, and ongoing sharing (though learning platforms) within and across staff and student boundaries. It is clear that maximising the potential of ICT and other developments will require a willingness and enthusiasm to share and learn expertise, insight and vision within and across school contexts.

10.2.3   Professional Development

Professional development will play a large role in embedding broadband and ICT within teachers' pedagogical practices, increasing teachers' competence, skill and confidence in using ICT and achieving the desired teaching and learning outcomes. In line with international research, the findings have important implications for both initial teacher education and CPD, in particular highlighting the importance of not just giving teachers technical capability but equipping them with the understanding and insight to make judgements about the potential benefits and possible disadvantages of using various forms of new technology.

10.2.4   Addressing Structural and Curricular Constraints

The study has highlighted many structural issues that may discourage the use of ICT in the classroom such as rigid class timetables and structured syllabi for State Examinations that inhibits the use of pedagogies incorporating ICT. However, Ireland has recently taken a step that may address some of these barriers by reforming the junior cycle State Examinations (DES, 2015c). The reform of the junior cycle involves

a shift away from an exam-dominated mode of assessment, less detailed curriculum specifications, fewer subjects to be assessed than currently, a focus on embedding key skills in teaching and learning, and a concern with more innovative approaches to teaching and learning. (NCCA, 2011).

It remains to be seen whether similar measures will be applied to senior cycle education. In any case, there are further lessons to be learned from the Transition Year Programme, which teachers and students alike highlight as allowing space and flexibility to both draw on more innovative teaching and learning methodologies and to equip students with the ICT skills and competencies which they will require beyond their school years.

Students are keenly aware of the importance of ICT skills for their future, citing the need for computer skills in order to work across a variety of industries. Schools have a role to play in helping equip students with the ICT skills necessary to succeed in school and the labour market. It is important to note that students possess an appetite for formal computer classes throughout their time in second-level education, not just in first year and Transition Year. Despite the increased importance of ICT skills and digital literacy at a policy level, the absence of a formal computer studies curriculum at junior and senior cycle is notable. The latest Digital Strategy for Schools has outlined plans for the NCCA to develop the provision of digital learning at senior cycle level (DES, 2015c).

10.2.5   Giving Students a Voice

Students are the most important stakeholder in the educational system, yet have very little power to implement change on a national level. Their rich and insightful contribution to this research highlights the potential benefit of providing students a platform to participate in future policy discussions. On a local level, collaboration between students and teachers appears to improve the school atmosphere. Providing student councils with an opportunity to express their views on developments in their school would help to engage the student body, but also help to inform school leadership on future developments students feel would be most valuable to them. This report presents evidence that engaging students is a key to effective education, either through online or offline methods. In both cases, students note that the teacher is the catalyst of their learning experience, and that efforts should be made to help reduce some of the infrastructural barriers which hinder the learning experience on a day-to-day basis. Harnessing the enthusiasm of student bodies to interact with their peers can lead to some of the most effective forms of education, such as peer-to-peer

education on the importance of online safety (as in Alder Lane). Students across the case-study schools demonstrate an ability to be trusted with such projects, which help to enhance the school experience for all.

10.2.6   Investment

Across the schools surveyed, and the ten case-study schools in particular, the DCENR programme of providing high-speed broadband to second-level schools appears to have removed the barrier of an inadequate and unreliable internet connection. However, issues persist in most schools concerning the technical supports offered to schools, internal Wi-Fi networks, the state of ICT equipment and the online resources that are available (and accessible) by teachers. Additional issues remain around capacity and infrastructure to meet the requirements of the new junior cycle curricular arrangements, particularly pertaining to data storage, the availability of learning platforms and relevant hardware and software in schools. There will be a need for ongoing investment in schools to address these issues.

The Department of Education and Skills has recently published a Digital Strategy for Schools (DES, 2015c), setting out a range of broad policy objectives addressing teaching, learning and assessment using ICT; teacher professional development; leadership, research and policy; and ICT infrastructure. As the Department commences the process of implementing the Strategy, this research will provide an evidence base guiding such policy developments. The rich insights provided from school leaders, teachers and students raise a complex array of issues facing policymakers and schools as they develop the role of ICT in teaching and learning in Irish schools.

Appendix 1

Pre-Installation Survey Example

Roinn Cumarsáide, Fuinnimh agus Acmhainní Nádúrtha
Department of Communications, Energy & Natural Resources   ESRI   amárach research   OIDEACHAIS EDUCATION AGUS SCILEANNA AND SKILLS

ICT in Schools – Survey of Second-Level School Principals

The ESRI is carrying out a study of how broadband provision affects teaching and learning. All Irish post-primary schools are being supplied with high-speed broadband in the near future. This research aims to identify and measure the effects from a public programme to install 100Mbps broadband service and provide related facilities to approximately 200 post-primary schools in Ireland selected by the study team. Survey and administrative data will be collected before and after the intervention both for the group of schools participating in the first phase of the national roll-out and a control group. As a part of the study, we are asking you to complete this short questionnaire about ICT provision and use. In order to contextualise the findings we also need to ask some background questions. The information provided by you will be anonymised, no schools will be identified and all data collected will be used solely for the purposes of this study.

Questionnaire No. _____   Date: _____

SECTION A: BACKGROUND INFORMATION

Q.1 Please indicate whether you are   Male ☐ 1   Female ☐ 2

Q.2 To which age group do you belong?   Under 30 years   ☐ 1
                                                30-39 years   ☐ 2
                                                40-49 years   ☐ 3
                                                50 years or older ☐ 4

Q.3 For how many years have you been Principal:

(a)   in **this school**? b) in **other** post-primary schools

Less than one year	☐ 1	Less than one year	☐ 1
1-5 years	☐ 2	1-5 years	☐ 2
6-10 years	☐ 3	6-10 years	☐ 3
11-15 years	☐ 4	11-15 years	☐ 4
16-20 years	☐ 5	16-20 years	☐ 5
21-25 years	☐ 6	21-25 years	☐ 6
26-30 years	☐ 7	26-30 years	☐ 7
Over 30 years	☐ 8	Over 30 years	☐ 8

Q.4 In your opinion, approximately what proportion of students in your school have such literacy, numeracy, or emotional-behavioural difficulties as to adversely impact on their educational development? Please tick one box on each line to indicate approximate percentage.

a)   *Approximate percentage of children with each difficulty*

	None	less than 10%	10-25%	26-40%	More than 40%
i) Literacy difficulties	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
ii) Numeracy difficulties	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
iii) Emotional / Behavioural problems	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
iv) Other special educational needs	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

b)   *Please indicate the total number of students with assessed special educational needs in the school:*

_____ *students*

Q.5 Please indicate the extent to which you believe each of the following to be true of students, their parents and teachers in your school. Tick one box for each row.

	True of nearly all	True for more than half	True for less than half	True of only a few
Students enjoy being at school	☐ 1	☐ 2	☐ 3	☐ 4
Students are well-behaved in class	☐ 1	☐ 2	☐ 3	☐ 4
Students are motivated about their schoolwork	☐ 1	☐ 2	☐ 3	☐ 4
Students treat other students with respect, regardless of differences	☐ 1	☐ 2	☐ 3	☐ 4
Students show respect for their teachers	☐ 1	☐ 2	☐ 3	☐ 4
Students exclude those who are different	☐ 1	☐ 2	☐ 3	☐ 4
Students get into trouble for consistently not handing in homework	☐ 1	☐ 2	☐ 3	☐ 4
Parents attend parent-teacher meetings in the school	☐ 1	☐ 2	☐ 3	☐ 4
Parents are actively involved in school life (parents' council, events, fundraising, etc.)	☐ 1	☐ 2	☐ 3	☐ 4
Teachers are positive about the school	☐ 1	☐ 2	☐ 3	☐ 4
Teachers are open to new developments and challenges	☐ 1	☐ 2	☐ 3	☐ 4
Teachers treat all students with respect	☐ 1	☐ 2	☐ 3	☐ 4
There is a positive collegial atmosphere between teaching staff in your school	☐ 1	☐ 2	☐ 3	☐ 4

SECTION B: ICT INFRASTRUCTURE IN THE SCHOOL

Q.6a What ICT resources are currently available in your school for educational purposes (not including student devices)? *Tick all that apply in each row.*

	Shared between several students	Used by each student on their own	Shared between staff	Not available
Laptops, PCs, netbooks, tablets or mini-notebooks without internet	□ 1	□ 2	□ 3	□ 4
Laptops, PCs, netbooks, tablets or mini-notebooks with internet	□ 1	□ 2	□ 3	□ 4
Digital reader (portable device to read books, newspapers, etc. on screen)	□ 1	□ 2	□ 3	□ 4
Interactive whiteboard	□ 1	□ 2	□ 3	□ 4
Digital camera	□ 1	□ 2	□ 3	□ 4
Data projector	□ 1	□ 2	□ 3	□ 4
Other, please specify	□ 1	□ 2	□ 3	□ 4

Q.6b Does the school currently have a high speed broadband service (10Mbp/s)?   Yes□ 1   No □ 2

Q.7 Are any student devices used for educational purposes in the classroom? *Tick all that apply.*

Laptops, Netbooks, Mini-notebooks	□ 1
Tablets	□ 2
Mobile phones/smartphones	□ 3
Other, please specify:	□ 4

Q.8 What proportion of students use an individual device for educational purposes in the classroom?
Tick one box for each row.

	Most/all	More than half	About half	Less than half
Laptops, Netbooks, Mini-notebooks	□ 1	□ 2	□ 3	□ 4
Tablets	□ 1	□ 2	□ 3	□ 4
Mobile phones/smartphones	□ 1	□ 2	□ 3	□ 4
Other, please specify	□ 1	□ 2	□ 3	□ 4

Q.9 Does the school have an internal Wi-Fi network?   Yes □ 1   No □ 2

Q.10 How are ICT facilities [PCs, laptops, etc.) provided in the school? Tick all that apply.

In a separate computer lab	□ 1
Library	□ 2
Integrated into classrooms	□ 3
Brought into classrooms when necessary	□ 4
Staffroom	□ 5

Elsewhere, please specify _____

Q.11 Did the school provide some teachers with a laptop (or tablet PC, Netbook, e-reader etc.) for their own use in the last academic year (2012/2013)?

Laptop	Yes ☐ 1	No ☐ 2
Tablet PC	Yes ☐ 1	No ☐ 2
Netbook	Yes ☐ 1	No ☐ 2
E-reader	Yes ☐ 1	No ☐ 2

Other, please specify _____

SECTION C: USE OF ICT IN THE SCHOOL

Q.12 Please indicate your opinion with regard to the following statements about the use of ICT in your school. *Tick one box for each row.*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Teachers in this school recognise the value of computers/internet in teaching and learning	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
A good range of computer software (programmes) is available for use in this school	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Teachers use subject-specific software in teaching students	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
The use of ICT has changed the way teachers teach in this school	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
ICT is an important tool for teachers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Availability of high speed broadband is likely to facilitate the work of teachers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Availability of high speed broadband is likely to improve students' motivation for learning	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Teachers in this school generally require more ICT-related training	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Teachers in this school are generally reluctant to adopt new technologies	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q.13 Please indicate your opinion with regard to the following statements about the role of ICT in teaching and learning in your school. *Tick one box for each row.*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Using ICT in the classroom takes up too much teachers' time	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Students learn less when you use ICT in the classroom	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
ICT can enhance student participation	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
ICT can enhance collaboration among students	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Using ICT assists in developing independent learning skills among students	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
It is important to teach students about plagiarism and intellectual property	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
It is important to teach students about safe use of the Internet	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Computers and the internet allow students to retrieve information	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
ICT use in teaching and learning positively impacts on student achievement	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
ICT use in teaching and learning positively impacts on students' higher order thinking skills (critical thinking, analysis, problem solving)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
ICT use in teaching and learning positively impacts on student's competence in transversal skills (learning to learn, social competences, etc.)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
ICT use in teaching and learning is essential to prepare students to live and work in the 21st century	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Using approaches such as YouTube, Skype, video-links in teaching and learning increases student motivation	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q.14 Please indicate your opinion with regard to the following statements about the availability of information technology in your school. *Tick one box for each row*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
There is adequate provision of computing facilities in this school	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
There is adequate provision of audio-visual equipment in this school	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
There is adequate provision of Internet access for teachers in this school	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
There is adequate provision of Internet access for students in this school	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
There is adequate provision of technical support in this school	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
The maintenance of ICT equipment in this school is satisfactory	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q15a. What impact do you expect a high speed (100mbps) broadband to have on teaching and learning in your school?

High impact	Significant impact	Low impact	I don't foresee any notable impact
☐ 1	☐ 2	☐ 3	☐ 4

Q.15b Please give reasons for your answer to the previous question.

………

………

………

……

SECTION D: E-Learning Plan

Q. 16a Does the school have a written e-Learning Plan?

Yes, included in School Development Plan ☐ 1
Yes, included in another document ☐ 2
No ☐ 3

Q.16b If YES, Who was involved in drawing up this document? Tick all that apply

Principal/Deputy Principal ☐ 1

Board of Management ☐ 2

ICT Co-ordinator ☐ 3

Guidance Counsellor ☐ 4

Year Heads ☐ 5

Teachers ☐ 6

Parents ☐ 7

Students ☐ 8

Other, please specify _____

Q.17a Does the school have a policy on the use of student devices (phones, smart phones, tablets etc.) in the school?

Yes ☐ 1   No ☐ 2

Q.17b Please indicate if student devices are:

Allowed	Allowed in certain circumstances	Not allowed	Other
☐ 1	☐ 2	☐ 3	☐ 4

If Other, please describe: …………………………………………………………………………………….………...

SECTION E: CHALLENGES

Q.18 Please indicate your opinion as to the potential barriers for teachers in your school regarding the use of internet. Tick one box for each row.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Insufficient number of computers/laptops	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Insufficient number of internet-connected computers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Insufficient internet bandwidth or speed to distribute internet to classrooms	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Insufficient number of interactive whiteboards	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Insufficient number of laptops/ notebooks	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
School computers out of date and/or needing repairing	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Inadequate skills of teachers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Too difficult to integrate internet use into the lesson plan	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
School time organisation (fixed lesson time, etc.)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Insufficient training about how to use internet effectively in teaching and learning	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Lack of confidence among teachers in using internet	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

SECTION F: ICT Survey Questions

The following section contains questions copied directly from the recent ICT Survey undertaken by the Department of Education and Skills. While the level of duplication is acknowledged, for the purposes of this survey it is considered important to maintain control of the data without recourse to other studies.

Q.19 Please review the following statements regarding the use of ICT in your school.
Tick one box for each row.

	No	In some cases	Regularly
Students may use their own devices (e.g. tablets, smartphones, cameras) to support their learning within the school	☐ 1	☐ 2	☐ 3
A 'live' video two-way link is used to share one or more subjects with students in another school	☐ 1	☐ 2	☐ 3
ICT tools (e.g. email, video links) are used to communicate with other schools in Ireland	☐ 1	☐ 2	☐ 3
ICT tools (e.g. email, video links) are used to communicate with other schools internationally	☐ 1	☐ 2	☐ 3
The school uses content and resources on the local school server to support teaching and learning	☐ 1	☐ 2	☐ 3
The school uses content and resources accessed through an external virtual learning environment (VLE) to support teaching and learning	☐ 1	☐ 2	☐ 3
Online tools and/or other applications are used to support teaching and learning	☐ 1	☐ 2	☐ 3
Student-owned computing devices (i.e. where each student has their own device) are being used in some year groups	☐ 1	☐ 2	☐ 3
E-books are being used by some year groups as an alternative to paper based textbooks	☐ 1	☐ 2	☐ 3

Q.20 Do these statements apply to your school? Tick one box for each row

	Yes	No
ICT planning is an integral (rather than separate) part of the overall school planning process	□ 1	□ 2
The school has a written ICT (eLearning)planning section which forms part of the overall school plan	□ 1	□ 2
The ICT (eLearning)planning section is updated regularly to reflect overall school priorities	□ 1	□ 2
The school has a designated ICT co-ordinating teacher	□ 1	□ 2
The school has a designated eLearning(ICT co-ordinating) team which includes school management	□ 1	□ 2
The 'NCTE eLearning Handbook' and 'Roadmap' are used for ICT planning purposes, in the context of overall school planning	□ 1	□ 2
The school promotes the sharing of good practice in ICT integration among teachers	□ 1	□ 2
The school management and the ICT co-ordinating teacher jointly develop the ICT (eLearning)planning section	□ 1	□ 2
The school eLearning team, including school management, ICT co-ordinating teacher, and all teachers are involved in co-developing the plan	□ 1	□ 2
ICT/e-Learning is a regular agenda item at staff meetings	□ 1	□ 2

Q. 21 Responsible use of the Internet: Do the following apply to your school (Yes/No)?
Tick one box on each row

	Yes	No
There is an active internet Safety Acceptable Use Policy (AUP) in our school which guides responsible use of the Internet	□ 1	□ 2
The school AUP is reviewed and updated regularly	□ 1	□ 2
The AUP refers to Internet safety and guidelines	□ 1	□ 2
The AUP refers to online activities (e.g. searching, browsing websites, online research, online games)	□ 1	□ 2
The AUP refers to downloading or uploading of material	□ 1	□ 2
The AUP refers to copyright guidelines	□ 1	□ 2
The AUP refers to publishing a school website	□ 1	□ 2
The AUP refers to use of electronic communication (e.g. email, social networking, messaging)	□ 1	□ 2
The AUP refers to inappropriate, harmful and illegal use of online material	□ 1	□ 2
The AUP refers to sanctions and reporting mechanisms	□ 1	□ 2
Internet safety is taught through SPHE or CSPE provision in the school	□ 1	□ 2
It is taught on an on-going basis when the Internet is being used for teaching and learning purposes in the school	□ 1	□ 2
It is taught as stand-alone class-module at an agreed time during the year	□ 1	□ 2
It is taught in another context; if yes, provide details	□ 1	□ 2

Q.22 The following statements outline potential obstacles/challenges that hinder the effective use of ICT to support teaching and learning in your school. Choose the six most significant (where 'One' is the most significant, 'Two' the second most significant etc; Only six of the listed items may be rated).

	One	Two	Three	Four	Five	Six
Low level of teacher ICT skills	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Low level of teacher confidence regarding the use of ICT	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient teacher knowledge of how to use ICT effectively in teaching and learning	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient awareness of suitable ICT-related CPD opportunities for teachers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient access to suitable ICT-related CPD opportunities for teachers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient awareness of suitable digital content	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient access to suitable digital content	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient access to ICT for teachers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient access to ICT for students	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient access to high quality broadband	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Age of computing devices	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient technical support for teachers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient levels of pedagogical support for teachers	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Pressures relating to State Examinations	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Insufficient time for planning and preparation	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Blocked access to relevant websites	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Difficulties accessing computer rooms	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

We would like to thank you for taking the time to complete the questionnaire.

Appendix 2

Case-Study School Profile

School	DEIS	Size	Group 1	Group 2	Vision	Equipment	Connectivity	Total	ICT Rating
Alder Lane		400-599		✓	2	2	2	6	High
Beech Street	✓	200-399	✓		2	2	0	4	Medium
Cedar Avenue	✓	0-199		✓	1	2	0	3	Low
Daisy Road	✓	200-399		✓	2	2	2	6	High
Elm Road		600+		✓	2	2	1	5	Medium
Fern Avenue		600+	✓		2	2	1	5	Medium
Green Lane	✓	200-399	✓		1	0	0	1	Low
Holly Road	✓	0-199	✓		1	0	0	1	Low
Ivy Lane	✓	600+		✓	2	1	1	4	Medium
Juniper Avenue		600+	✓		2	2	2	6	High

Case-Study Interview Record (Number of interviews)

School ID	Principal Interview	ICT Co-ordinator Interview	Teacher Interview	2nd Year student focus group	5th Year student focus group
Alder Lane	1	1	2	2	2
Beech Street	1	1	2	2	2
Cedar Avenue	1	0	2	2	2
Daisy Road	1	1	2	1	2
Elm Road	1	1	2	2	1
Fern Avenue	1	1	2	2	1
Green Lane	1	0	2	1	1
Holly Road	1	1	1	1	0
Ivy Lane	1	0	2	2	2
Juniper Avenue	1	1	2	2	2

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