

Valuing Education Technology in Schools in Ireland North and South

a report for the Standing Conference
on Teacher Education, North and South
(SCoTENS)

VALUING EDUCATION TECHNOLOGY IN SCHOOLS IN IRELAND NORTH AND SOUTH

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A report for the Standing Conference on Teacher Education, North and South (SCoTENS)

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Executive Summary

This report sets out the findings from a research project funded by the Standing Conference on Teacher Education North and South (SCoTENS), under the terms of its seed-funding small research projects scheme. The case studies reported here were undertaken in two schools, one in the Republic of Ireland and one in Northern Ireland. Similar case study reports have been prepared for schools in the USA, Australia, England and Portugal under other funding and organisational arrangements. It should be noted from the outset, that there is no intention to compare the schools from these different jurisdictions. Such a small sample could never fully represent the 'typical' in such complex education systems. However, although differing in scope and approach, there is a clear focus in both case studies on trying to determine the value that schools place on the role and integration of educational technologies in learning and teaching. The primary purpose of the case studies therefore was to develop an innovative method of assessing this value.

The central approach in the case studies is based partly on the Total Cost of Ownership (TCO) model, used widely in business contexts to assess the total cost of technology to an enterprise. TCO was first developed in the 1980s by Gartner Inc in the United States and since 2003 has been used in over 2,000 schools in the US under the joint auspices of Gartner and the Washington (DC)-based Consortium for School Networking (COSN), amongst others. The system is designed to identify the 'real' cost of the use of technology in schools, including not just the cost of the technology and its periodic updating and renewal (amortisation), but also additional costs such as staffing and professional development or training.

However, perhaps the most important aspects of the case studies is their attempt to focus in on the concepts of *tangible* and *intangible* assets arising from technology ownership and usage. Tangible assets are the computers and other information and communication technologies, ICTs¹ (whiteboards, scanners, printers, projectors etc), for which costs are relatively easy to identify. Costs that are more difficult to identify, but are not quite 'intangible', are those associated with people's time (for example, technical personnel supporting classroom processes or teachers trying out software or creating materials). Intangible assets include such matters as the competence of staff in using the technologies and the impact of technology usage on school processes and student outcomes. The value and benefits of such assets are more complex to identify and measure than the technology assets themselves, and the major theme of the studies

in this report was to use the TCO methodology as an innovative approach to do this.

As mentioned, the research is the subject of case studies in several counties working under the general project title of Measuring the Value of Educational Technologies in Schools (MVET). The objectives of these studies, and specifically the two reported here, were therefore to:

1. Investigate how the value of technologies used in teaching and learning can be measured;
2. Identify the role of intangible assets in teaching and learning with technologies;
3. Investigate the relationships between educational technologies/ICTs and intangible assets in schools.

Context

The schools have been given pseudonyms to protect their privacy and these are Northtown High in Northern Ireland and Southcity College in the Republic of Ireland. The collaborating and sponsoring bodies include:

- *The National Centre for Technology in Education (NCTE), Dublin, Republic of Ireland*
- *South County Dublin County Council, Republic of Ireland*
- *The Department of Education & Skills, Republic of Ireland.*
- *C2K, Northern Ireland*
- *British Education Communications and Technology Agency (BECTA), UK*
- *Consortium for School Networking (CoSN) in the USA*
- *South Australian Department of Education and Children's Services, (DECS)*

Analysis and interpretation of the data collected through the case studies have involved a number of approaches, with a particular focus on a leadership perspective to assist in making sense of the multiple data sets that may be used to inform decision-making in schools. To investigate the value of technologies in these education contexts, the extent of alignment between the intangible assets relating to their usage has been explored in relation to each school's proposed strategic approaches, its performance as an organisation and the quality of students' learning as perceived by students and teachers.

Both studies have been informed by the work of Kaplan and Norton (2004a; 2004b), who categorise intangible assets into *human*, *information* and *organisation* capital. However, as befits the complexity of schools as organisations, the case studies reported are in many ways different in approach and outcomes.

¹ The terms educational technologies, information and communications technologies (ICTs) are used interchangeably throughout without distinction.

The Southcity College case study, for example, is largely based on an analysis of the school's engagement with a local 'pro-social' community development agenda. As such, it is more interpretative of the school circumstances in relation to its societal strategies and aspirations than the Northtown High study. This latter study draws much of its interpretation from the perceptions of the key actors involved and the various measures of the school's performance.

The study was therefore to contribute to our knowledge and understanding of the role of technologies in education, teaching and learning and particularly within a framework of the following key dimensions of benefit:

- **pedagogical benefits** such as fostering information and communications technology (ICT) capabilities that can be applied across the range of subjects and content standards; the development of higher order thinking skills; and the ability to apply ICT capabilities to a range of different problems and contexts;
- **information benefits** such as the quality, quantity and availability of information and research findings available to those who require it;
- **strategic benefits** such as creating advantages and gaining alignments between the overall educational goals in each jurisdiction and those of the technology goals;
- **transactional benefits** such as those that enable efficiencies in teachers' and students' work; and
- **transformational benefits** associated with achieving positive organisational change; and enabling high quality teaching and learning.

Methods

This investigation has used a case study research method, broadly implemented. Case study research involves undertaking an empirical inquiry that investigates a phenomenon within a real-life context and can include both qualitative and quantitative evidence, drawn from multiple sources (Yin, 2003). In this investigation, the case study method has been used as a research strategy to build knowledge and understanding about the value of educational technologies in the schools.

Value is contextual: it depends upon the alignment between the value proposed and the strategic approaches used to achieve those propositions. In this case study, investigating the value of educational technologies has involved tracking the value propositions in relation to the value of educational technologies in learning, and identifying the human, organisation and information capital in place to meet those propositions. The data collection

and analysis has been premised on the view that the value of intangible and tangible assets comes from how well they align to the strategic priorities of the school.

Data collection and analysis for this case study has involved:

- Identifying the value propositions outlined by the school;
- Tracking evidence of the value propositions;
- Examining alignment between the strategies and the value propositions.

The data collected have been analysed to determine any common themes relating to human, organisation and information capital.

Sources of Data

The following sources of data have informed the development of this case study:

- Documents were collected to provide insights into the school's and teachers' plans and aspirations concerning educational technologies;
- Electronic sources were used to provide insights into how the school is incorporating education technologies into its work;
- A staff self-assessment survey of teacher capabilities was used to gain an indication of the knowledge and skills of staff concerning educational technologies;
- Total cost of ownership data were collected to provide insights into the costs of tangible assets; and
- Interviews with staff and students and an additional questionnaire from the students were used to gain further data and to assist in the verification processes.

Findings

The outcomes of the study rely for full elaboration on the extensive analyses and the sets of graphs and figures from the quantitative analysis of the surveys that were undertaken. However, for the purposes of this executive summary, they may be represented briefly as follows (note that these represent the combination of findings from both schools and therefore may not be common to both or may not be manifested to identical levels of benefit in each).

Human Capital

- There is a strong focus on the pedagogic use of ICT to improve learning;
- There is evidence of effective leadership of the strategic development of ICT across the school and the alignment of investment to learning outcomes;
- Strategic benefits are underpinned by the development of staff capabilities and knowledge, skills and capabilities, and a high level of use of technologies;

- There are useful frameworks for subject departments to build on and extend their known strengths.

techniques involved can be refined for wider usage by schools in both jurisdictions.

Organisation Capital

- ICT is an area of clear curricular strength, which has good levels of attainment;
- Pedagogic benefits are underpinned by an effective and evolving culture of monitoring and self-evaluation through an exemplary action plan, based on recognised ICT research and inspection findings, with realistic targets;
- There is a strong sense of purpose around the inclusion of education technologies into teaching and learning;
- The school has given a high priority to the development of ICT within and across subject areas with a continuing emphasis on the pedagogic capability of teachers to employ the appropriate active learning and assessment for learning methods, which are supported through the use of ICT;
- The range of policies and strategic plans available within school provide documented directions about the aspirations and approaches being used to include technologies in classroom practices.

Information Capital

- There are high levels of investment in ICT resources by the school to the benefit of both the staff and the students;
- There is an increasingly robust, extensive and reliable ICT infrastructure;
- There is investment in innovative additions to move beyond core practices;
- Documented change management strategies are outlined in Specialist School and School Development Plans;
- There is increased availability of infrastructure to partners outside the school;
- There are high levels of confidence and the growing levels of use by teachers and students;
- There are high levels of attainment achieved by the students in external specialist examinations.

Future work

There is clearly considerable benefits to schools in being able to assess the extent to which their investments, especially investments in educational technologies, contribute to both success and sustained improvement in their key goals. The human, organisation and information capital model has proven very useful – as has the framework of key dimensions of benefit (pedagogical, information, strategic, transactional and transformational), and work will continue to ensure that the

Introduction and Methods²

It almost goes without saying that the inclusion of technologies in the daily lives of students in schools is resource intensive. These costs place requirements on governments and schools to have financial accountability methods to enable them to account for and justify information and communication technology (ICT) expenditures. However the capital expenditure on technologies in schools represents but one part of the ongoing costs associated with incorporating technologies into teaching and learning. In addition, the decisions made today with regard to technology infrastructure directly influence the costs that a school will incur tomorrow. Understanding the relationship between decisions about such key areas as technology infrastructure, curriculum and assessment, teaching and learning, professional learning of staff, infrastructure management, and technical support, means that senior leaders in schools have to undertake careful planning and ensure that the technology provision is sustainable over time. These are issues facing school leaders around the globe.

Many of the vendors who provide ICT hardware and software are multinational companies who also operate on a global level. As such, to get an agreed international approach to the calculation of the costs of tangible technology assets would provide valuable information to schools and to governments that is currently unavailable. In theory, such information would also allow schools to compare costs and vendors, to ascertain the best value for money.

The investigation into the cost and value of education technology reported here has used a case study research method as recommended by Moyle (2007). Yin (2003) argues that case study research enables a phenomenon within a real-life context, in this case the use of technology in schools, to be investigated empirically, drawing on both qualitative and quantitative evidence from multiple sources. This multi-source, multivariate approach allows for reasonably secure judgements to be made about the very complex systems under investigation in the two studies reported here.

In these case studies, investigating the value of educational technologies has involved tracking the value propositions of key actors in the environments being explored in relation to the value they hold for educational technologies in learning. These key actors include selected teachers and students along with the head teachers of the schools, and the model of approach seeks to identify what human, organisation and information capital is in place to address their value propositions.

Central to the approach behind the international project on Measuring the Value of Educational Technologies in Schools (MVET) is the framing of a school's valuing of technology as including both the 'tangible' as well as 'intangible' assets. Tangible assets are those items that have traditionally been measured and are usually defined as physical assets owned by an organisation or individual which can be seen or touched. Technology tangibles include objects such as computer hardware, technology peripherals and telecommunications costs and their worth is usually presented in quantitative financial terms. Schools can determine the costs of the purchases of the technology tangibles from their financial records and can map these costs over time.

The onset of the 'knowledge economy' has facilitated the notion of 'intangible assets'. In the business sector, these assets include 'goodwill', brand names and the social capabilities of employees and strategies such as the readiness of employees to learn new approaches to work and organisational learning (Hadjiloucas and Winter 2005). Related to this type of asset are employees' competencies. In accounting terms, the notion of financial worth is being applied to intangible assets such as goodwill in relation to the worth of an organisation in much the same quantitative manner as that used for tangible assets. Nation-states, for example, are placing value on their air space as an intangible asset (Roos, Ross and Edvinssen 1997). Similarly, research has highlighted that a company like Microsoft can be valued by the stock market at a price many times the value of its tangible assets (Roos, Ross and Edvinssen 1997). But in considering the question: 'What is the value of educational technologies in schools?' Moyle (2007) quotes Drucker (1964) as making the following observation:

Other resources, money or physical equipment, for instance, do not confer any distinction. What does make a business distinct and what is its peculiar resource is its ability to use knowledge of all kinds – from scientific and technical knowledge to social, economic and managerial knowledge. It is only in respect to knowledge that a business can be distinct, can therefore produce something that has a value in the market place (Drucker 1993/1964: 23).

Replacing 'business' with 'school' and 'market place' with 'students and community' in this quotation highlights the transferability and appropriateness of these sentiments in an education context that also replaces the pursuit of profit with the pursuit of high quality learning outcomes.

There is a growing awareness in the school sector that social and

² Parts of this section draw on and reproduce, with permission, aspects of Kathryn Moyle's published work.

human capital have critical links to structural inputs and policy outcomes. As in business and public service accountability, there are moves away from only measuring resource investments to including measurement of processes, outputs and outcomes. However the theoretical and practical dimensions of the interactions between the tangible capital and assets, and the intangible social, cultural and behavioural actions relevant to school performance require better understanding. It is a premise for this research that 'knowledge-based assets' (or 'intangible assets') are increasingly important for the success of schools.

Traditional financial accounting systems, however, do not provide a suitable foundation for measuring the value created by enhancing these assets. Yet at both the micro and macro levels within school education, intangible assets can drive long-term value creation. A challenge for schools is to focus and align their value propositions with their strategic approaches. As such, the approach being taken in this research is to develop and trial the application of a measurement system that focuses on a school's strategy in relation to integrating educational technologies into teaching and learning, and with seeking evidence of the outcomes from that strategy, particularly those related to student learning.

As argued above, the value of intangible assets comes from how well they align to the strategic priorities of the school and this requires a means of tracking their benefits. Creating value from intangible assets, however, differs from that created from financial assets. Research in the business sector (e.g. Kaplan and Norton, 2004a) suggests that intangible assets such as knowledge and the deployment of technologies rarely have directly measurable impact on financial outcomes. Similarly, research in school education is struggling to 'prove' that educational technologies have significant measurable impact: the value is indirect. The value rests in relationships – often causal relationships. For example: professional development of teachers is conducted with the assumption that improved teacher capabilities, e.g. in integrating educational technologies into their teaching, will in turn improve student learning outcomes.

This case study has been informed by the work of Kaplan & Norton (2004a; 2004b), who categorise intangible assets into human, information and organisation capital. Here, however, their concepts have been adapted to school education.

Over the past few years, independently of each other, schools in the US, UK and Australia have been investigating how the Total Cost of Ownership (TCO) model, used widely in business contexts to assess the total cost of technology to an enterprise,

can contribute to a school's understanding and assessment of its tangible assets. TCO was first developed in the 1980s by Gartner Inc in the United States (www.gartner.com) and since 2003 a web-based version has been used in some 2,000 schools in the US under the joint auspices of Gartner and the Washington (DC)-based Consortium for School Networking (COSN – www.cosn.org). CoSN has worked with Gartner to provide school leaders with online TCO tools to help them to evaluate the total cost of ownership of their investment in educational technologies.

In the UK schools have also been investigating models and tools to assist in TCO calculations. For example, BECTA has developed an online tool³, the 'ICT investment planner', to assist schools gather cost-based data. The tool shares similarities with the Gartner TCO approach and is designed to allow schools to gain an in-depth view of technology costs over a three-year period. It includes mechanisms for collecting financial data and a questionnaire for staff, which can be used to ascertain teachers' perceptions of ICT reliability, access to facilities and services, and to evaluate the use of the ICT tools for teaching and learning purposes.

The respective TCO models used in the USA, UK and Australia offer schools the capacity to quantify data previously left uncollected and not analysed. Although the current approaches to TCOs in schools tend to be time-consuming and arduous, the tools can contribute to developing understandings about the costs of tangible ICT assets. They can also go some way to measuring intangible costs such as peer-to-peer tutoring and professional development. The TCO approaches however, are often based upon relatively simple business models where profit is the overall motive rather than the construction of schools as learning organisations. For example, a simplistic view might consider professional learning and peer-mentoring of staff to be costs to an organisation, but in schools they can also be constructed as investments, beneficial to continuous learning opportunities within those schools.

Given these difficulties with existing approaches to the calculation of a TCO, the following alternative approach to counting the costs of intangible assets in schools is proposed. The aim of the MVET project mentioned above has been to achieve a common approach that is applicable internationally. Three types of 'capital' assets are identified:

Human capital refers to the skills, knowledge and capabilities of the people in the school and to their roles concerning the inclusion of technologies in teaching and learning. The

³ BECTA ICT investment planner, www.becta.org.uk/bestvalue.php

contribution human capital makes to the value of educational technologies in schools rests on the skills, knowledge and capabilities about technologies and their roles in teaching and learning. It is these highly valuable intangible assets that enable the underlying value propositions to be addressed.

Organisation capital refers to the culture in the school and to the ability of staff and the school leadership to share information. It also refers to how the human capital (i.e. the people) is aligned with the strategic goals of the school. The value of a school's organisation capital can be determined through a mapping of the combination of processes, procedures, and communications within the school. The use of technologies such as database software systems, email and other communication systems (i.e. information capital), in addition to the culture, customs and mores of the school, contribute to the school's organisation capital. The way a school mobilises and sustains the change necessary to execute strategic plans can also be considered a part of a school's organisation capital.

Information capital refers to the physical assets such as the technological infrastructure of a school and includes databases and networks. Information capital also refers to the information held in or carried over these systems. The value of information capital is high when there is alignment between the information capital and the organisational strategy, and that the information capital is accessible and can be used by the people for whom it is intended. Although contextualised, information capital in schools can support:

- Broadening of the classroom practices of teachers and students;
- Achievement of strategic plans;
- Decision-making based on school data;
- Monitoring and recording of students' achievements; and
- Communication strategies.

The value of information capital is reflected in how well the school's and/or the school authority's ICT infrastructure portfolio supports their internal processes. The costs for the ICT infrastructure of the school, and the reasons for these costs, also provide insights into the value a school places on its information capital.

Consideration of how the technology infrastructure is funded within a school links organisation and human capital. Indeed, when applying the categories of human, organisation and information capital to a school, the different categories should not be considered as completely self-contained; there are overlaps

between them and they interact with each other. For example, professional learning builds the capabilities of teachers (i.e. the human capital) in a school, but professional learning also builds the organisation capital of the school. Clearly, too, there must be interactions between the tangible capital assets within a school, and the intangible social, cultural and behavioural assets. In any given situation the main indicators of human, organisation and information capital may include (but will not be limited to) the aspects listed in the following Table 1:

Table 1: Main indicators of intangible assets

Intangible Assets	Indicators
Human Capital	School leadership Technology Leadership Staff readiness to teach with education technologies Qualifications and experience of leaders and staff Technical capabilities among support staff Attitudes to change
Organisation Capital	Culture of the school Distributed leadership Documented policies, plans and practices: <ul style="list-style-type: none"> • School development plan • Specialist school plan • School technology plan • ICT replacement schedule Professional learning
Information Capital	Robust and reliable infrastructure: <ul style="list-style-type: none"> • Fast and economical bandwidth • Databases and warehouses and their use • Wide area and local area networks Communication strategies

Data collection and analysis

The research approach taken has been to identify the school's tangible and intangible assets, and investigate how closely aligned the ICT assets are to the school's value propositions and strategic approaches of the school, thereby identifying 'strategic readiness'. Such an approach has required the collection and analysis of multiple sets of data and this variety of data has in turn allowed a

process of verification and triangulation of findings. If the evidence from one set of data is corroborated by another set and from another source, the findings are made that much more dependable.

Data collection and analysis for the case studies have involved:

- Identifying the value propositions outlined by the school in discussion with the key actors and from key items of documentation;
- Tracking evidence of the value propositions; and
- Examining alignment between the strategies and the value propositions.

The data collected have been analysed and collated to determine whether there are common themes emerging, according to the categories of human, organisation and information capital.

Sources of data for the school studies

Southcity College (RoI)

The following sources of data have informed the development of this case study:

- 40 hours of one to one and focus group interviews with school management and the 'core group' of teaching staff who are leading the project. This included the ICT coordinator, year heads and subject specialists as well as SEN staff and pastoral tutors for each year group.
- "Southcity College". Project Outline Document (2005) including cost projections and strategic planning materials provided by the County Council, original Department for Education and Science / National Centre for Technology in Education correspondence and school position papers and bid materials.
- "Southcity College". Waystage Review (Internal, 2007)
- Review of School Year (2006/07)
- Teacher Online Survey (2008); 87% completion rate
- Mid-term review of "Southcity College". Project (2008)

Northtown High (NI)

The following sources of data have informed the development of this case study:

- Documents were collected to provide insights into the school's and teachers' plans and aspirations concerning educational technologies;
- Electronic sources were used to provide insights into how the school is incorporating education technologies into its work;
- An online staff self-assessment survey of teacher capabilities was used to gain an indication of the knowledge and skills of staff concerning educational technologies; completed by 69%

of the teaching staff (61/88) in June 2008;

- Interviews (individually or in groups) with the school Principal, Vice-Principal/Bursar, Head of ICT, Specialist School Coordinator/Convenor of Education Technology Strategy Team, Head of Technology Support, 12 students in years 9 and 11;
- A user survey completed by 20% of the students and by all of the staff in May 2009;
- Figures relating to the managed ICT services supplied for Northtown High School by C2k⁴ (formerly called Classroom 2000, this organisation is responsible for the ICT infrastructure and services in all grant-aided schools in Northern Ireland) for the four financial years from March 2005 to April 2009.
- Annualised figures relating to the school's additional spend on top-up ICT infrastructure and service support for the financial year 2008/09.

⁴ www.c2kni.org.uk

Case Study 1: Southcity College

National Context for the Southcity College Project

The importance of developing information and communication technologies (ICTs) in education and responding to the opportunities provided by the development ICTs more widely in society has long been recognised by the Government of the Republic of Ireland. For example, the 1995 White Paper on Education *Charting Our Education Future* stated that “all students... will have achieved... competence and understanding in practical skills including computer literacy and information technology”⁵ (1995: 49) within the junior cycle curriculum. By 1997 the first dedicated policy document on ICT in education entitled *Schools IT 2000*⁶ was published by the Government and established the basis for the development of ICT within the education system. Responsibility for the implementation of the policy was given to the newly formed National Centre for Technology in Education (NCTE), whose brief also included the development of ICT policy proposals and the provisions of ICT policy advice to the Department of Education and Science. The *Schools IT 2000* initiative had three separate strands: a technology, a teacher education, and a support and development strand.⁷

Two Schools ICT initiatives, *Networking Schools*⁸ and *Schools Broadband Programme*⁹, have since been put in place specifically with the goals of providing broadband access for every school in the Republic and to provide inter-school connectivity. Taken together, over €183m has been allocated since 1998 for ICT education policy initiatives by the Irish Government to date. The breakdown of this funding is shown in Table 2, below.

Table 2: Funding of ICT in education policy initiatives in Ireland, 1998- 2007¹⁰

Initiative	Year Commenced	Funding (€)
Schools IT 2000	1998	52m
Blueprint for the Future of ICT in Irish Schools	2001	78m
Networking Schools	2004	23m ¹¹
Schools Broadband Programme	2005	30m ¹²
Total		€183m

A reference to further funding of €252m is contained within the 2007-2013 National Development Plan (NDP) under the sub-programme for ICT in Schools. This investment is to be set within the context of a national ICT strategy and is to be used to cover a variety of activities, including the development of an e-learning culture within schools, further teacher professional development, maintaining a national broadband network for schools, upgrading and renewing hardware, providing software and digital content, and addressing support and maintenance requirements.

The 2008 report of the Minister of Education’s ICT Strategy Group, *Investing Effectively in Information and Communications Technology in Schools 2008-2013*¹³ was commissioned to advise on the prioritisation of measures within the NDP and recommended frontloading investment in the areas of new ICT equipment, adequate broadband, technical support services and pedagogical guidance into the first three years of the NDP period. The report also noted that while the NDP investment would allow schools to update equipment and facilities and provide supports for innovative practice, it was insufficient to provide the overall level of ICT that would be required by schools during the period of the NDP. The development of ICT in education is also referenced within the 2008-2012 strategy statement for the Department of Education and Science (DES). This strategy includes proposals to provide financial support for schools to develop their ICT infrastructure and to working with the NCTE in promoting the integration of ICT in teaching and learning.

In 2007, the National Council for Curriculum Assessment (NCCA) also issued *ICT Framework: A structured Approach to ICT in Curriculum and Assessment*¹⁴. This framework is intended to offer schools a structured approach to using ICT in curriculum and assessment by identifying the types of learning for ICT (including knowledge, skills and attitudes) appropriate for students during the period of compulsory education – particularly the primary phases. The NCCA points out, however, that the ICT Framework is not a curriculum area or a syllabus, but rather is a tool to help teachers to integrate ICT in teaching and learning – recognising that use of the Framework will vary from school to school depending upon a range of school factors including access to ICT equipment and resources; teacher competence and confidence with ICT, and a school’s level and stage of planning for ICT in curriculum and assessment. The ICT Framework is organised in four inter-related areas of learning with ICT across three levels of progression (lower primary to completion of the Junior Cycle).

5 Government of Ireland (1995) *Charting our Education Future; White Paper on Education*. The Stationery Office: Dublin.

6 Department of Education and Science (DoE) (1997) *Schools IT 2000 - A Policy Framework for the New Millennium*, Government of Ireland, Dublin.

7 See Mulkeen, A. (2000) *The place of ICT in Irish Schools: early indications of change since Schools IT 2000*, Dublin: NCTE, for a detailed description of this initiative.

8 NCTE (2004a) *NCTE Guidelines on Computer Networking in Schools*. NCTE: Dublin.

9 NCTE (2004b) *The Schools Broadband Programme – Information and Guidance for Schools*. NCTE: Dublin.

10 ICT in Schools, Inspectorate Evaluation Studies, Department of Education, 2008.

11 Expenditure to August 2007

12 Estimated cost of set-up and continuing costs to June 2008

13 Department of Education and Science (DoE) (2008), *Investing Effectively in Information and Communications Technology in Schools, 2008-2013*, Government of Ireland, Dublin.

14 NCCA (2007) *ICT Framework: A Structured Approach to ICT in Curriculum and Assessment*, NCCA: Dublin.

Clearly, the current financial situation is set to impact heavily on NDP funding, the agenda of the DES and on the activities of other agencies.

The County Context for Southcity College

The Digital Citizenship Initiative¹⁵ (DCI) is an initiative of the local council and comprises a range of projects and strategies that are being implemented at district and at county level to achieve a vision where everyone in the county uses the internet as an everyday tool to improve their quality of life. The DCI mission is to deliver free, easy to use service that enables local communities to use technology in innovative ways to achieve their goals and to put local content on the world wide web. Four complementary projects and strategies are being used to achieve this vision:

1. **DCI Me:** DCI Me is a web-based facility that aims to store, retrieve and display extensive information about the county. It provides an online mapping system with the aim of creating a location where people can easily find accurate information about a range of business, community and public services available in the area;
2. **DCI Web:** This project enables local community and voluntary groups to have a web presence through creating and supporting a website for them free of charge along with training to enable them to update and maintain it themselves. The project is designed to facilitate improved information management and to develop new ways of interaction between community groups;
3. **DCI Centres:** DCI Centres is the creation of a network of 'Digital Learning Hubs' across local community centres and libraries with the aim of improving accessing and learning about technologies within communities;
4. **DCI School:** The focus of this section, the Southcity College project, is concerned with developing student-centred technology through an innovative learning culture in order to improve school attendance, participation in class and educational outcomes for the students.

The Southcity College project is both innovative and challenging. To better grasp the scale of this, it is helpful to place it within the context of ICT in education policy in the Republic of Ireland. The importance of developing ICT in education has been recognised by government for almost 15 years with the first policy initiative on ICT in education (*Schools IT 2000*) being developed in 1997. Since then the provision set out in public policy has been patchy, with current and capital expenditure under successive National Development Plans approaching €200m but with arguably no agreed national strategy or policy base to underpin this investment. Consequently, the reality of ICT in education within

individual schools is one of variable utilisation that can depend upon accidents of interest among teachers and others with an enthusiasm for ICT in schools, and on geographical location. While there are several other potentially significant education ICT initiatives in Ireland¹⁶, but these are not directly comparable to the Southcity College project – either in terms of scale of investment or underscoring vision.

The overarching vision of the broader social initiative within which the Southcity College project is set is to create a platform for improving quality of life and access to opportunities for the local community through a series of diverse and complementary interventions which include the Southcity College project. These interventions are grounded in a *pro-social* philosophy which seeks to target the root causes of anti-social behaviour and community disengagement by means of an innovative, technology-centred approach. They focus on meaningfully integrating technology into the activities of youth groups, local voluntary agencies, access to local government services (e-government) and education provision within a single county council area.

The initiative seeks to harness the power of the local community through a virtual model of participation and engagement in order to improve quality of life in the area across a variety of spheres. These include improved educational participation and attainment in addition to the realisation of safer communities and the delivery of enhanced economic competitiveness. Ultimately, the initiative is intended to enable the community to move up the economic value chain and to attract investment from the industries of the future. The Southcity College project seeks to contribute to this vision by reaching out to disengaged citizens including students and their families. The overarching initiative has done this by providing technologies and supports to the college not normally available to schools. In doing so, the project provides on-demand access to hardware and software – including laptops, data projectors and advanced learning tools – to the students and teachers of Southcity College.

In rolling out the Southcity College project, the local county council has taken the lead in implementing an innovative and pro-social measure within a learning environment. It has done this in a way which goes beyond the traditional role of the local authority sector in this jurisdiction. For instance, the steps taken by the county council include, but are not limited to, the following:

- The provision since 2008 of approximately €500,000 to fund the procurement of laptops and tablet laptops for all teachers

¹⁵ This is a pseudonym for the initiative.

¹⁶ For example, the Alexandra College Laptop Initiative – www.apple.com/uk/education/profiles/alexandra/ and the Microsoft School of the Future, Dunshaughlin www.microsoft.com/ireland/smarteconomy/case_studies/MEATH_VEC/

and more than 300 students and to co-fund the procurement of data projectors (alongside Southcity College);

- The provision of an e-Champion within Southcity College – the e-Champion is a local authority employee who works on-site throughout the school year to manage the roll-out of the Southcity College project and to provide administrative and technical support to both school management and the teaching staff (i.e. webpage management, ICT maintenance, procurement, etc);
- The design and delivery of training programmes – including the establishment of an On-line Community of Practice – through the work of the e-Champion; and
- Working with the project partners (see below) to ensure the availability of high-quality internet links into Southcity College.

Without the multi-agency approach that the council has been able to marshal, it is extremely unlikely that the initiative would have advanced as far as it has. For example, it is arguably unlikely that the project could have been realised without the commitment of a number of key *project partners*, including the Department of Education and Science (DES) and the National Council for Technology in Education (NCTE - <http://www.ncte.ie/>), the local third level institute of technology and the local community group. The enthusiasm and willingness of both the school management and teaching staff to embrace new ideas and give pro-actively of their time and energy was also crucially important. Indeed, the approach taken is considered to represent an important step-up in meeting the need for innovative and pro-social public policy interventions articulated by the National Economic and Social Council's *Developmental Welfare State* report¹⁷. As such, it can be argued that the county council and its partners have sought to initiate the mainstreaming of what NESC referred to as an '*activist measure*' – that is, the deliberative, focused introduction throughout the council's administrative area of systemically supported interventions that seek to engage the causes of social alienation and disengagement. This is referred to as *pro-social* action.

Consequently, the Southcity College project is a unique articulation of leadership for the use of information and communication technologies (ICTs) – combining vision at a societal level with an inter-agency approach to articulating and funding an education-led pro-social intervention. This has resulted in a significant investment in hardware and software provision and an equally significant commitment to the training and development of both staff and students in Southcity College. The project has ensured that Southcity College is uniquely funded and supported nationally. Such a situation presents both opportunities and challenges for

teachers, students and the wider school community alike. Many of the anticipated benefits proposed for the Southcity College project have been realised over the past four years, including improved attendance and increased engagement of students, and increased levels of staff retention. Other interventions locally and other education programmes operating at the school will also have contributed to these outcomes. Nevertheless, it is clear that the marked improvements associated with the Southcity College project appear to have contributed to wider and positive impacts upon the local community. There is also some optimistic academic commentary emerging around the project. The initiative has been positively remarked upon by the DES Inspectorate with both a *Whole School Evaluation* and a *Subject Evaluation for Mathematics* praising the positive impact of the initiative particularly in terms of school and subject development planning.

In brief, the Southcity College model represents a novel, pro-social, education intervention which seeks to meet the emergent learning needs of students in the 21st Century and is directly focussed on activities and outcomes that are seen to support these. The approach adopted sits well with certain key ideas from *Investing Effectively in Information and Communications Technology in Schools 2008-2013*, the recent report of the Minister's ICT Strategy Group. This recommended frontloading investment in the areas of ICT equipment, adequate broadband, technical support services and innovative pedagogical activity. It also reflects the first and to date the only major engagement with the principles of pro-social activism advocated in the National Economic and Social Council (NESC) *Developmental Welfare State* report. This report seeks to chart a course for Ireland's social progress and advocates working across three overlapping areas of welfare state activity – services, income supports and activist (or innovative) measures – where integration across these areas '*are developmental for individuals, families, communities and the economy*'. The NESC suggest that such innovative measures '*are akin to the R&D sphere of the developmental welfare state*' whereby service providers – community, voluntary, public and private sector organisations – can take steps to respond to emerging or unmet social needs and where key features of successful interventions can be adopted into mainstream service provision.

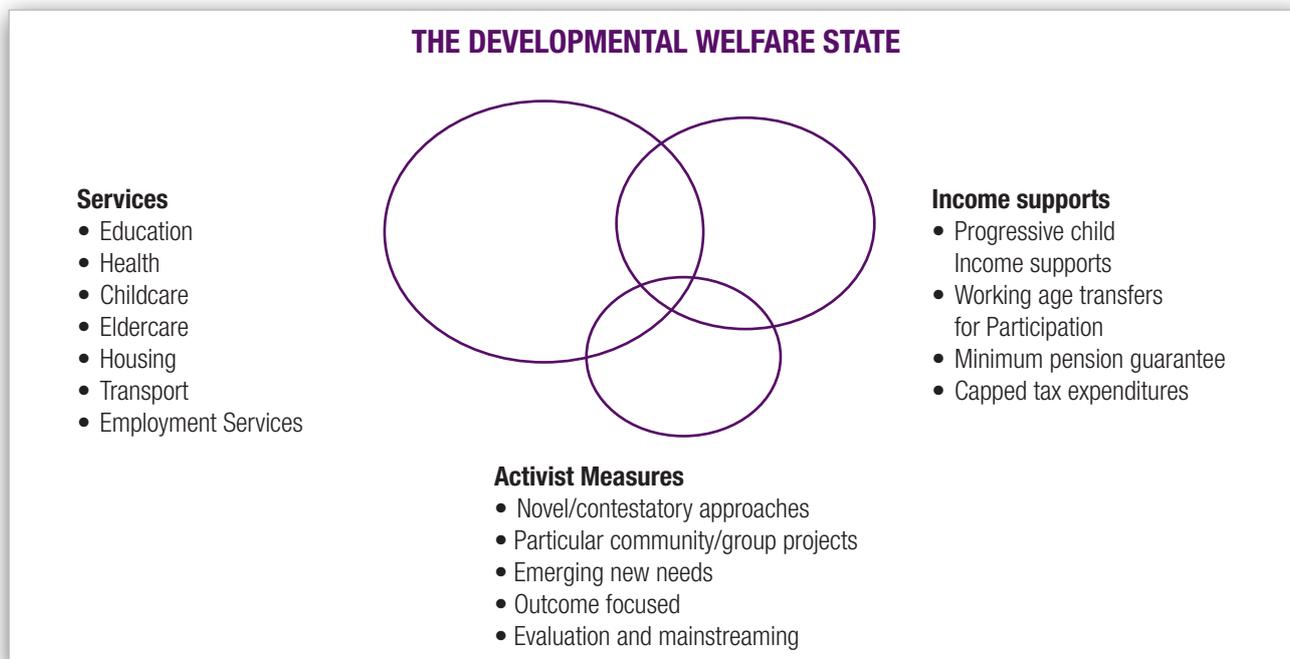
The Southcity College project represents one of the first attempts, nationally, to mainstream what NESC referred to as a pro-social '*activist measure*'. In other words, the Southcity College model represents a novel education-related intervention which seeks within the context of a broader social agenda systematically to meet the emergent learning needs of local students in the

17 NESC (2005) National Economic and Social Council, The Developmental Welfare State www.nesc.ie/inside_development.asp

21st Century and is clearly focused upon social outcomes, as illustrated in Figure 1.

Figure 1: The Developmental Welfare State (NESC 2005)

across the State. In terms of family units the district has a high percentage of lone parents, which at 46% is over double that of the county more generally, 21%, and the national figure, 18%. Of these family units the vast majority (93%) are headed by women,



The Local Context for Southcity College

Southcity College is a co-educational post-primary school, which along with another area community school serves a large and growing community on the southwest of Dublin city. Based on the 2006 census¹⁸, the local electoral district has an increasing population with 53% of its community being under 25 compared to figures of 38% in the county and 35% nationally. The district is recognised as a disadvantaged area and makes up one of four designated RAPID (Revitalising Areas by Planning, Investment & Development) areas in the Dublin region. There are significant issues in terms of educational retention in the district with, for example, 28% of the population ceasing education prior to the age of 16. This compares to only 17% in both the county and the State. At the opposite end of the spectrum only 5% of those in the district go on to higher education – less than a fifth of the national figure.

The socio-economic profile of the area in which Southcity College is located is also radically different from national norms, with only 9% of the district population in the A-C socio-economic groupings compared to averages of 33% in the county as a whole and 31%

which is again higher than the averages for the county (88%) and the State (86%). Finally, the district also has a higher proportion of people from ethnic minorities – particularly members of the Traveller Community and the Black/Black Irish Community – than any other part of the State.

In 2008/09 Southcity College had 445 registered students supported by 60 teachers and seven special needs assistants. Of these, according to a 2006 DES report, traveller and international students make up 7% each of the college population. Its study options include the Junior Certificate and Junior Certificate Schools Programme (JCSP) in addition to the Leaving Certificate Syllabus and the Leaving Cert Applied (LCA). It also offers a post-Leaving Certificate (PLC) course in Computer Applications, leading to FETAC Level 5 accreditation in Business Studies. In terms of the student body, classes are banded into three groups according to ability, with those in most need of support being placed in small class groups. In the senior cycle, an *Access to Continuing Education (ACE)* programme exists for those students who have been identified as most likely to go on to further education. This is a small cohort but – strategically and socially – it is seen

18 All figures from CSO Census 2006.

as important to the life of the school and the local community. The ACE programme is undertaken in three schools regionally and provides additional support to selected students, including additional classes and financial support.

In addition to participating in the county's initiative, Southcity College also provides a range of complementary programmes and interventions to tackle educational disadvantage and to help provide equality of opportunity. For instance, the college has a Home School Community Liaison (HSCL) Coordinator under the aegis of the DES initiative: *Delivering Equality Of Opportunity In Schools* (DEIS)¹⁹. The HSCL programme provides resources for liaison between the school, parents and the community. Under the programme, parents and adult members of the community are also encouraged to attend classes during the day.

Attendance and completion are key challenges facing Southcity College²⁰. To address this issue the school participates in one of the more than 80 School Completion Programme (SCP) clusters across the State. The co-ordinator post for this programme is shared between several schools in the area. The SCP co-ordinator, the HSCL and the Traveller co-ordinators liaise with school management and class heads, and as part of its work within the SCP cluster, Southcity College provides a number of initiatives such as the Breakfast Café, the Lunch Club, the Friendship Club, and free guitar lessons at lunchtime.

In terms of support for disadvantaged and minority students, Southcity College has a designated co-ordinator for the Traveller students in the school and access to a visiting Traveller teacher. Both the co-ordinator and visiting teacher liaise directly with parents. Traveller students have their own room in the school, and access to learning support, a resource teacher and extra, targeted ICT training. With regard to minority students, two Southcity College teachers are involved in teaching English as a second language (TESL). The college also provides additional support for students with potential to go on to third level education.

Finally, the recent Whole School Evaluation of Southcity College was also highly complimentary about the pastoral care provided. The care team comprises the principal and/or deputy principal, guidance personnel, the HSCL officer, the teen counsellor, a local Youth Service worker, an art therapist, the SCP co-ordinator and the school chaplain.

The care team has been in place since 2001 and its aims are as follows:

- To ensure students are supported in and outside school;
- To ensure an integrated and co-ordinated service;
- To support all staff involved in the delivery of care.

Indeed, the Whole School Evaluation was extremely positive overall in its findings, noting in particular the *“caring and inclusive ethos that characterises the school”*, the *“dedicated and generous teaching staff”* and *“the students’ affection for and loyalty to Southcity College”*. It also drew on completed and ongoing projects reviews undertaken by the council of the project partners.

The data collection for the case study used a range of qualitative and quantitative techniques and drew on such sources as staff and student consultation, project documentation and statistics, and a review of all proprietary and non-proprietary hardware and software used in the education mission of the college.

The Southcity College Project: origins and development

Pre-Launch and Early Stages

Although formally launched by the then Minister for Education and Science, Mary Hanafin TD, in April 2007, the Southcity College Project had a 12-month plus lead-in period. During this twelve month lead in time a number of tasks were undertaken. Firstly the laptops were introduced to the teachers in May 2006 followed by the employment of an e-Champion in August 2006. The first ‘year’ of the project began in September 2006, with the formal launch of the project coming seven months later. During this period, a significant body of planning and related work was undertaken by the various project partners. This included the establishment of key structures and procedures, reviewing the available skills base and putting in place the necessary capital infrastructure.

Since then, the project has involved approximately 300 students including three consecutive intakes of 1st Year students. In addition to this, 5th and 6th Year students participating in the *Access to Continuing Education* (ACE) programme have also been included in the project. The functionality and reach of the project has continued to expand with the introduction of new applications and programmes such as Google Apps and literacy classes. The ambition and success of this project has been recognised by honours such as the “Open Source Project of the Year” Award and the “Excellence in Local Government” Award in addition to continuing interest from the national media.

¹⁹ Delivering Equality Of Opportunity In Schools (DEIS, 2005), http://www.education.ie/servlet/blobServlet/DEIS_action_plan_on_educational_inclusion.pdf?language=EN

²⁰ Whole School Evaluation Report Issued for School Response, Department of Education and Science, 2006.

'Real-school' Relevance

At the outset, it is important to note that the Southcity College Project is not just a digital initiative. It has had a beneficial impact upon the *real* school environment (i.e. teaching and learning within a classroom setting). Specifically, the efforts of the project partners – including the county council and the management and staff of the college – have seen substantial progress made towards the development of a model of 21st century education that harnesses the power of ICT to the needs of the school environment. This progress is characterised by the development of student-centred technology and the growth of an innovative learning culture which seeks to improve school attendance, participation in class and educational outcomes for the students.

Project Virtual Learning Environment

To this end, the traditional classroom has been supplemented with a range of supports which facilitate teaching and learning. These include the provision of school-wide, high-quality, wireless internet access and the development of a Virtual Learning Environment (VLE) for use by both students and teachers which together allow the school community to access a world of information not previously possible. This allows access to an ever-expanding range of on-line materials and data sources including audio-visual lessons, primary source material, interactive lessons, on-line quizzes, and learning support software such as *Numeracy Workout*.

Interestingly, while the teaching and learning applications of the VLE are generally seen and accepted, the assessment and tracking possibilities it presents are not. The VLE offers the capacity for the teachers to conduct online student assessments rather than the traditional paper-based testing. But take-up of this option has been relatively low – only 4% of respondents in the case study survey indicated that they use the VLE to conduct online assessment either 'occasionally' or 'very often' whilst 72% never use this option.

In order to develop a clear picture of the costs associated with the technology used in Southcity College, its nature and extent needs to be determined. The first level of expenditure relates to the global costs absorbed by the project partners with contributions from the school.

Global Costs

Since 2007, cumulative total expenditure of almost €0.5m has been incurred by the county council in relation to the Southcity College project. This expenditure relates solely to the current and capital costs involved but does not include any labour costs (e.g. the e-Champion salary, etc) relating to the school.

As Table 3 below shows, the single largest expenditure category was ICT Infrastructure and Support Costs at just over €418,000 (or 86% of all expenditure over the two-year period since 2007). This category of expenditure includes the procurement of Computers (77%) and associated Trade Services (9%). The balance of the expenditure incurred related to Training and Expenses (3%) and Other Costs (11%).

With regard to Other Costs, the cumulative total for the various professional services and supports was almost €49,000 (or 10%), whilst much of the balance of the expenditure under this heading related to Advertising (0.6%). Table 3 summarises these costs.

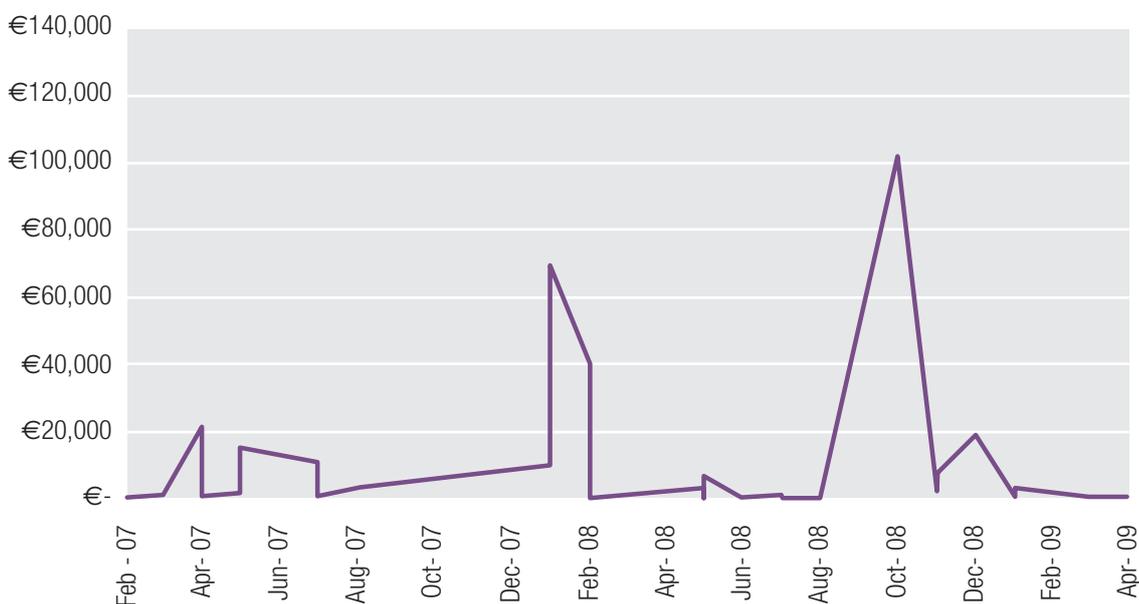
Table 3: Global expenditure (by cost category)

Category	Actual Spend €	% of Total
ICT Infrastructure and Support Costs	418,332	86
Computers	372,145	77
Office Equipment	793	0.2
Trade Services	44,885	9
Software and Maintenance	73	0.01
Other (i.e. Non-Capital Other)	437	0.1
Staff and Expenses Costs	13,322	2.8
Training	6,719	1.4
Travel and Subsistence	6,322	1.3
Other (i.e. Entertainment)	281	0.1
Other Costs	52,363	11
Advertising	2,708	0.6
Office Consumables	266	0.1
Consultancy	48,944	10
Miscellaneous Costs	444	0.1

Expenditure Trends, 2007 to 2009

Since 2007 the overall costs outlined above have been marked by 3 'spikes'. These occurred in January 2007 (€120,000), January 2008 (€69,000) and October 2008 (€100,000) and reflect the capital nature of the expenditure incurred (i.e. a series of once-off infrastructural investments). Over the course of the period examined, almost 54% (or €260,000) of this expenditure was incurred in 2008 with the balance attributable to 2007 (38%) and 2009²¹ (8%).

Figure 2: Southcity College expenditure, 2007 – 2009



The ICT infrastructure for Southcity College's everyday learning and teaching activities consists of a series of inter-related and mutually-reinforcing tiers of provision including the following:

- High quality broadband connectivity allowing the school community to access on-line learning-support materials and data sources including the NCTE's www.scoilnet.ie web pages for each subject on the national curriculum.
- An evolving VLE based upon the usage of Open Source software²². This has the capacity for future scalability and the creation of a county-wide on-line educational campus whereby both educators and students can develop and post interactive lessons and learning supports.

- The in-class provision of a suite of ICT hardware including a laptop for each teacher and more than half of the students, in addition to data projectors in every classroom.

The detail of these provisions is considered below.

High Quality Broadband Connectivity

The provision of a high-quality broadband 'pipeline' into the project at Southcity College is a key aspect of this project. At its inception, the project had a connectivity of 2 Mbps @ 20:1 'contention'²³. This was subsequently upgraded

to 4 Mbps @ 4:1 contention. Although this upgrade delivered a real-time speed increase of a factor of 10, the 'pipeline' began to become insufficient as many teachers moved to creating multimedia resources using video and audio. Consequently, Southcity College has been selected as one of 60 schools nationally to get a broadband upgrade to 100 Mbps. This upgrade is being provided by the DES, the NCTE, and the Department of Communications, Energy and Natural Resources and represents an increase of a factor of 25 (depending on contention) thereby reducing capacity barriers to utilising multimedia and streamed resources in the classroom.

²¹ Up to April 2009 only

²² Open Source software was chosen because it is free and readily customisable.

²³ Contention refers to the number of clients (other customers) you are sharing your connection with. The smaller the contention the better. For example, 4 Mbps @ 4:1 contention with equal upload and download meant that the College had a guaranteed 1Mbps at all times.

Usage of Open Source Software

The VLE for Southcity College is hosted by the county council and is based on Moodle, a form of non-proprietary (or Open Source) software in line with the policy of the council to use such software throughout the DCI initiative. International standards with regard to VLEs are evolving with those of the IMS Global Learning Consortium (www.imsglobal.org) being arguably the most significant. The Moodle system used by the college supports IMS content as do all of the other leading VLEs such as WebCT/Blackboard with which it shares many similar features, namely:

- Discussion forums;
- Synchronous chat facilities;
- Quizzes, tests;
- Drop boxes;
- Course calendars;
- Student enrolment facilities;
- Restricted access where appropriate;
- Customisation;
- Uploading facilities for users (e.g. Word docs, PowerPoint, audio files).

The Moodle software therefore offers the same functionality as comparable proprietary software and has allowed the teaching staff at Southcity College to develop and share interactive lessons using other non-proprietary software such as *Hot Potatoes*. It has also facilitated the usage of new teaching supports including *Numeracy Workout*. Indeed a number of lessons have emerged from this experimenting, and ongoing training and on-site support has helped teachers and students to overcome any initial lack of familiarity with non-proprietary software. Although the Southcity College VLE is still evolving, it is clear that there is a real potential for the participating educators (i.e. teaching staff at Southcity College and beyond) to develop a critical mass of on-line lessons and interactive learning supports over time which can be accessed by any school in the broader, council area.

Secondly, non-proprietary software offers an efficient and value for money opportunity for scaling-up the Southcity College (i.e. replicating the model developed in Southcity College in other schools). The low cost, open and collaborative nature of non-proprietary software means that scalability of this initiative is feasible over time. By contrast, any move towards comparable proprietary software would likely incur substantive costs. In other words, the cost of replicating the Southcity College in multiple schools in the county would likely be prohibitive unless a non-proprietary line is taken.

In a planned move away from branded products and applications, Linux trials commenced during the academic year 2008/09, and by mid-2009 it had been agreed by all stakeholders that Linux

would be introduced into the Southcity College project alongside a new e-Portal at the commencement of the next academic year. Consequently, Linux is now in use and the project will in future use Netbooks rather than laptops (as at present). This followed from a recommendation by the Technology Subgroup of the Project Steering Committee which was established to review the overall technology provision at Southcity College.

This software is compatible for the devices currently used in Southcity College such as data projectors, digital cameras and USB drives. In addition to meeting the operating needs of the Southcity College, the introduction of Linux will also go some way to ensuring that students are exposed to a range of alternative operating systems (whether proprietary or non-proprietary), an important consideration in the workplaces of the new century.

In-class Provision of ICT Hardware

Since the inception of the Southcity College project in 2006, a concerted effort has been made to embed a high standard of ICT hardware within the school (see Table 4). The provision of a laptop to each student has been central to the roll-out of the project. In addition to the standard laptops, a further 10 Tablet laptops were provided to science and maths teachers. These devices differ from a regular laptop in that the screen is touch sensitive and offers greater mobility (i.e. the screen can be twisted around and placed flat), thereby enabling the user to write directly onto the screen using a stylus (or digital pen) rather than a keyboard or mouse. These devices are particularly useful in subjects such as Maths or Science as teachers have found it difficult to create resources involving mathematical notation because of subscript, superscript, special characters, etc. This device allows teachers to write up mathematical notation by hand and show via a data projector.

Table 4: Overview of project ICT hardware provision

Device	Volume	Provider
Standard Laptops	300 +	County Council
Tablet Laptops for Science and Maths Teachers	10	County Council
Servers	2	County Council
Webcams	12	County Council
Microphone Headsets	12	County Council
Data Projectors	23	County Council with Southcity College
Digital Cameras	2	Southcity College

The broadband infrastructure and hardware resources provided has enabled the college to develop a multi-sensory teaching and learning environment unmatched in the majority of post-primary schools throughout the State. This provision has meant opportunities to both teachers and students, a claim supported by both this research and the college's recent *Subject Inspection of Mathematics* by the DES.

When considering value in ICT usage it is important to remember that the fundamental considerations are access and functionality. In other words, the key to the DCI initiative overall – including the Southcity College project – is robust and ready access to a fast, dependable internet link. The initiative is deliberately device (i.e. laptop) and platform (i.e. software) 'agnostic', meaning that it has been possible to change these over time without loss of momentum.

Selection and Performance of Hardware and Software

At the outset of the project, it was decided to purchase 120 high-end laptops (or 110% of the required devices), each with an enhanced battery to allow for day-long usage and each with a specified software configuration. The additional machines are kept in reserve fully charged and available as back-ups in those cases where batteries fail during the school day. The tender to supply laptops was awarded to a local computer service provider. It was agreed initially with the supplier that delivery constituted the imaging and booting of each machine and its joining the School's wireless network successfully, thereby ensuring the functionality of the wireless network cards of each laptop. The supplier also provided an image of the laptop build on DVD which was used to recover problematic laptops. Since this image was greater than 8 Gigabytes, a dual-layer DVD reader was also required. As few as 6 out of the 120 laptops needed to be re-imaged and the extended battery proved enough to power each laptop through a full school day in the majority of cases.

At the outset of the project, the selected supplier provided a sample laptop preloaded with Windows XP. The operating system was then customised to suit an educational setting by removing games and DVD authoring software, unwanted program icons etc and setting up appropriate Administrator, Teacher and Student access privileges. The sample laptop was then loaded with a pre-selected suite of Open Source software and thoroughly tested for faults. When satisfied with the robustness of the system build – including the suite of applications – the sample laptop was returned to the supplier and the other 119 laptops were imaged from this.

Microsoft Office was retained through the build and subsequently it was decided to use Open Source software from the Open CD Project (<http://www.theopencd.org>), since the functionality and compatibility of these programs have been extensively tested. These are also all platform agnostic, which means they will run on either Windows or Linux. The full suite of Open Source (or non-proprietary software) currently utilised by in the project is listed below:

- Mozilla Firefox - Web Browser
- 7-Zip File Manager - File Compression
- Audacity - Audio Editor
- Celestia - Planetary Tour Program
- Inkscape - Vector Graphics
- Irfanview - Image Editing
- NVU - Web Authoring
- Scribus - Desktop Publishing
- Stellarium - Planetarium
- Tuxpaint - Paint Program
- Google Earth - Geographical Information System
- QuickTime Player - Media Player
- Adobe Flash - Web Content Player
- AVG - Anti-Virus Program

Maintenance and Replacement

A 4-level support policy to troubleshoot problems with the laptops was developed as follows:

1. The teacher in the classroom is the first line of support;
2. A member of the Core Group²⁴ is the second line of support;
3. Either the e-Champion or the college's ICT Coordinator is the third line of support;
4. The last line of support is the laptop vendor.

As vendor support is paid for on a contractual basis, and could be easily used up, the 'lines of support' arrangement was developed to keep the need to go to the vendor to a minimum.

The student laptops have in practice caused very few maintenance problems for a number of reasons. First, all students have limited user rights and so cannot install software. Second, all students have an exact copy or image of the original build, resulting in it being relatively easy to resolve problems by reimaging faulty machines. Such faults as do arise are then also easily recognised if they arise again on other laptops.

Nevertheless, as the project has grown maintenance has become more demanding. An operational system image server solution (ISS) is being actively researched at the moment, using Clonezilla (www.clonezilla.org). This automates the process of re-imaging

²⁴ The 'Core Group' is the group of teachers who volunteered to be involved in the design and development of the project from the outset. They received a considerable amount of training and support and had 'own-use' laptops, data projection equipment etc. from the start of the project.

laptops. A trial has already shown that by using this alternative method, the redeployment of a faulty laptop has been reduced from two and a half hours to 20 minutes. The next step is to scale this ISS up so that 10, 20 or 50 laptops can be rebuilt in the same time.

Laptop maintenance and replacement has occasioned no additional cost for the project and its partners as the initial purchase of additional devices has proven sufficient to maintain roll-out to date. In addition, all maintenance work is carried out by the e-Champion.

Laptop Distribution and Collection

The laptops used by students are distributed and collected each morning and evening at the school. Each morning at 8:35am students collect the laptop bags and the Class Reps²⁵ wheel the trolleys known as 'lapcabbies' from the secure storage 'strongroom' to the corridor. When the tutorial begins the tutor gives the key of the lapcabby to the Class Rep who then distributes the laptops to the other students.

When the school bell goes at 9:00 am the Class Reps lock the lapcabbies and return the keys to their tutor. If a student has not collected their laptop by this time, they lose its use for the day. During lunchtime students store their laptops in their laptop bags in a cloakroom that is locked for the duration of the break. If a laptop needs to be recharged during this time a replacement can be obtained from the e-Champion.

In the evening time, each Class Rep collects the lapcabby for their class and brings it to the last class of the day. The lapcabby is opened at 3:20pm and the students return their laptop. Although it is the students' responsibility to collect their laptop and to ensure that their laptop is returned to the lapcabby each evening for safe-keeping and recharging, a proportion of the student population do not do so. For instance, an examination of laptop collections on a daily basis in November and December 2009 for 2nd year students found that on average almost 20% of students did not collect their laptops. This issue is currently being investigated.

Bring IT Home Policy

The Bring IT Home Policy relates to the usage of the laptops in the evening time in the student's own home. The laptop use rules set out the circumstances and responsibilities involved in students bringing their laptops home as part of the eBook pilot. Primarily, the responsibility for the laptop lies with the student to whom it has been assigned. The laptop must be handled with the utmost

care and respect at all times. When not in use the laptops must be stored in their carry cases and students must bring the laptop to school each day. In the event of a laptop becoming damaged, the student is expected to notify the school immediately and in addition to this the laptop must be returned to the school for maintenance when required.

Parents are encouraged to supervise usage of the laptop as much as possible, because while internet access at the school is firewalled (as per the college Acceptable Usage Policy) this may not be the case at home. The college's Acceptable Use Policy was introduced to ensure that students benefit from learning opportunities offered by the school's ICT and internet resources in a safe and effective manner. The policy states that internet sessions will always be supervised by a teacher and internet usage is regularly monitored by the school. Risk to exposure of inappropriate material is minimised through the filtering of software and equivalent systems. Internet safety training is provided for students and teachers and the uploading and downloading of non-approved software is forbidden. The policy document outlines the legislative provisions on the use of the internet and provides information to teachers, students and parents on the following:

- Data Protection (Amendment) Act 2003.
- Child Trafficking and Pornography Act 1998.
- Interception Act 1993.
- Video Recordings Act 1989.
- The Data Protection Act 1988.

Virus protection software is updated on a regular basis and the use of memory sticks etc. is dependent on the teacher's permission. The policy is reviewed annually by both the school and parent representatives. It sets out the rules for use of the laptop at home but much of it focuses on use of the World Wide Web, email and the college website. The strategy is to maximise the learning opportunities for the students along with reducing the risks associated with internet usage. The use of ICT and access to the internet is considered by the school to be a privilege.

Southcity Project Goals

Since May 2006, the Southcity College project has been developing as an inter-agency initiative with the school, the county council, a local Institute of Technology, and the Department of Education and Science and its associated bodies such as the National Centre for Technology in Education. The project has three main goals, each of which has a number of associated priorities or outputs as set out in Table 5.

²⁵ The Class Reps are students from each classroom who assist with the distribution and collection of the laptops.

Table 5: Goals and actions for the Southcity College project²⁶

Goal 1: To develop student centred technology and create a virtual learning environment for the students and teachers
<p>Priorities to achieve this are:</p> <ul style="list-style-type: none"> • to develop the leadership, skills and confidence of the teachers enabling innovative use of information and communication technologies in the school curriculum; • to develop a culture of innovation in learning among the students; • to create a virtual learning environment for use in the school by students and teachers; • to support the teachers to create and develop interactive curriculum content integrated across the subjects and classroom learning; • to provide each student with a personal online learning space where they can store their own course materials and assignments in digital form and record their assignments.
Goal 2: To deliver a high standard and range of technologies available to the school
<p>Delivered through:</p> <ul style="list-style-type: none"> • employment of an ICT coordinator to support the project in the school on an ongoing basis; • sourcing, developing and distributing laptops for all teachers and First Year students for personal use of technology in the classroom; • identifying and providing other digital technologies for use by the students and teachers; • ensuring fast wireless connectivity throughout the school; • providing the technical capacity required to support the development of a Virtual Learning Environment through the Moodle site; • ensuring ongoing communication/feedback with the teachers in the technical development.
Goal 3: To develop awareness of the project within the local community, the education sector and other stakeholders, creating leverage of and disseminating project achievements
<p>Efforts will be focused on:</p> <ul style="list-style-type: none"> • encouraging the involvement and support of the parents and local community through awareness-raising activity and ICT skills development; • developing a sound reporting structure and cross-organisational information channels; • developing working relationships and partnerships with other key educational institutions • establishing an evaluation framework to ensure full identification and articulation of outcomes.

These goals and actions have been translated into a number of intended outcomes and impacts for the project as shown in Table 6, below.

Table 6: Intended outcomes and impacts of the Southcity College project

Intended Outcomes
<ul style="list-style-type: none"> • access to shared ideas and lesson plans for teachers; • development of e-learning resources; • adaptation of the curriculum to learners needs and interests; • students receiving better feedback on their progress; • support being given to teachers in managing marking and assessment; • lessons becoming more exciting; • better engagement with 'hard to reach' students with more motivating ways of learning; • development of new teaching methodologies; • increased awareness and application of information and communication technologies; • integration between home, school and the community.
Intended Impacts
<ul style="list-style-type: none"> • higher school attendance rates; • improved participation levels in class; • reduced incidence of early school leaving; • better educational outcomes for students; • more progression into third level.

Key Themes

Leadership

The overarching vision of the broader social initiative within which the Southcity College project is set, is to create a platform for improving quality of life and access to opportunities for the communities of the county using a series of diverse and complementary interventions including the Southcity College project. These interventions are grounded in a pro-social philosophy which seeks to target the root causes of anti-social behaviour and community disengagement by means of an innovative, technology-centred approach.

The Southcity College model represents a novel education intervention which seeks to meet the emergent learning needs of students in the 21st Century and is clearly focused upon outcomes that are seen to support this. The adopted approach sits well with certain key ideas in *Investing Effectively in Information and Communications Technology in Schools 2008-2013*, the recent report of the Minister's ICT Strategy Group.

²⁶ Sourced from the *Southcity College Project Outline Document (2006)*

For instance, this recommended frontloading investment in the areas of ICT equipment, adequate broadband, technical support services and pedagogical guidance.

Consequently, the research suggests that the Southcity College project is a unique articulation of leadership for ICT – combining vision at a societal level with an inter-agency approach to articulating and funding education-led pro-social intervention. This has resulted in a significant investment in hardware and software provision and a commitment to the training and development of both staff and students in Southcity College. Moreover, the project has ensured that Southcity College is uniquely funded and supported nationally. This presents both opportunities and challenges for teachers, students and the wider school community alike.

Student Learning Impact

A principal goal of the Southcity College initiative has been to develop student centred technology, which supports an innovative learning culture. It is clear to the authors that the initiative has had a positive learning impact upon the student body. In general, teachers noted improved student engagement and in-class participation as a result of VLE and ICT usage within the school. The interactive and multi-componential nature of the project was judged to be useful to students, especially among the weaker and middle band students. It is clearly apparent that the environment has improved the ICT skills of the students and has fostered independent learning, although, unsurprisingly, the level of independent learning is variable across classes and individuals, with the older, more motivated Access to College Continuing Education (ACE) students proving most capable of independent learning. At present there is no data available as to whether the Southcity College project will ultimately lead to more progression to third level for students at the college, but the early indications are hopeful and this is an element of the project that should continue to be tracked over time.

Teaching Impacts

A strong message emerging from this study is that using ICT has had a positive effect on the teaching and classroom practice generally of the teachers at Southcity College and that they have generated noticeable change in the college learning environment. This is now multi-componential, more task and enquiry-based, and technology-rich. The project has provided them with the opportunity to develop interactive materials that support higher quality educational experiences. It has also added more motivation to the learning setting for the majority of the students. These are subtle but significant developments. When used properly, the

Southcity College technologies have been found to assist in both the productivity and enjoyment levels of classroom activity.

This highlights both the quality and quantity of resources that have been allocated to Southcity College and the paucity of such resources elsewhere in the system. It also points to a unique if *ad hoc* series of developments in relation to the practical applications of ICT in the school setting.

The role of the specifically appointed e-Champion has been a key aspect of the project, bringing important ICT knowledge into the school and playing a central part in the project management and roll-out of the project.

The provision of individual student laptops has been a central tenet of the initiative since its inception. To date, there have been few issues with the maintenance of the laptops; however there have been concerns about students not always bringing their laptops to class. The research noted that at least in part as a consequence of this, consideration was being given to putting in place a fully-equipped *teaching grid*²⁷ in the school that could be booked as required in addition to actively sourcing alternative personal computing devices such as netbooks.

Pedagogical Developments

It is understandable in some ways that the focus of the Southcity College project over the past 4 years has primarily been on embedding technology within the learning environment, with associated efforts to improve awareness and to upgrade the skills of the teaching staff. The unprecedented nature of the project and the decision to front-end the technical aspect helped determine this. Consequently, the project has essentially been a technology-driven rather than a pedagogically-led intervention to date. Indeed, the pedagogical applications of the resource base have been almost collateral to the project. The focus has been on what the virtual learning environment in particular makes possible in terms of storing and sharing teacher-built resources, and accessing selected programmed learning opportunities mediated by the technology.

However, for the Southcity College project to be truly effective it must ultimately be grounded in an acceptance that what is required is a shift in pedagogy. This shift may be articulated as a highly principled, coherent and carefully structured approach to teaching and learning that is understood and consistently utilised throughout a school, accompanied by a deeper realisation that technology is a mode of delivery and not pedagogy *per se*.

²⁷ The 'teaching grid' is a flexible, open-plan teaching space with easy access to a bank of fixed PCs, data projectors, peripherals such as digital cameras and scanners etc., which can be used on a 'walk-in and go' basis.

The findings of the research suggest that the pedagogical assumptions underpinning the project as currently structured are under-developed but that the Southcity College project is now well placed to take the next step in order to achieve improved educational outcomes on foot of the investments made to date. In other words, it is very possible at this point to move away from an over-focus on using ICT to a model that focuses more on teaching and learning with ICT and which systematically develops ways of supporting teachers through this move.

Development and Usage of the VLE

The project's Virtual Learning Environment (or VLE) is a key part of the interface between the virtual and real school learning environments and as such provides a number of useful metrics around take-up, engagement and usage. For instance, the data on VLE log-ins indicate a broadly upward trend in the level of usage over time. Usage statistics, such as those for 2008/09, demonstrate a pattern which is broadly comparable to the cycle of the school year. Markedly higher levels of usage were recorded during busy school times such as September to late December and late January to early March.

The teachers have developed a variety of interactive materials for individual classes using the VLE. The 'Core Group' of teachers, that is, the teachers who volunteered to be involved in the design and development of the project from the outset, has led the way on this. However, the quality and quantity of this material varies within and across subject areas and it has been interesting to note a lack of usage particularly of online assessment and reporting tools by the teaching staff. There are also some findings around the decisions of the teaching staff to put time into developing more technically challenging materials. Some have invested heavily in terms of time and effort in this area of the project while others – for various reasons explored later – have been less willing to do so. Notwithstanding this, there are many examples of innovative practice, notably in Environmental and Social Studies, French and History, and these provide a glimpse of the potential of the VLE.

Staff Training and Development

Training has been central to the roll-out of Southcity College project since its inception and it is clear from the research that this training has served to significantly 'upskill' the teaching staff of the school and to advance the broader project. Much of this training has been led by the 'Core Group' whose members are relatively highly ICT-literate and who plan and provide the training to the rest of the staff. Since the outset, this training has been offered on an 'all-staff' basis focusing on the VLE and improving

related ICT skills. However, due to capacity constraints, the 'Core Group' has increasingly found it difficult to plan and provide 'all-staff' training days.

The peer approach to learning has proven to be a worthwhile model – both for the development of technical ICT skills within the school and in achieving buy-in from all staff. Teachers saw their colleagues being up-skilled and developing confidence and this motivated staff. However, the research also suggests that the training offered to date is neither comprehensive enough to generate the level of fluency necessary to power the levels of pedagogical change required by the project nor appropriate to the developmental needs of teachers being asked to work in an ongoing way with technology in the classroom. In this context, the value of further 'all-staff' training days needs to be questioned. It is interesting to speculate how training sessions on a subject-by-subject basis could facilitate the use of ICT in the planning and teaching of their shared subject.

The research also noted initial moves in relation to a proposed *Community of Practice* to help teachers maximise utilisation of the interactive potential offered by the project VLE. This community, made up of other interested teachers and third level institutions, is seen to have the potential to allow the teaching community of Southcity College to both learn, and contribute to, knowledge of technical and usage issues around using Moodle. Training is currently unaccredited and this community is seen to offer a means of facilitating the accreditation of Continuing Professional Development (CPD) for the teaching staff.

Value for Money, VFM

Value for money analysis proves complex where the sourcing, utilisation and utility of education technology is concerned. In part, this project is an attempt to draw out some ideas on how to begin to research and describe this element of a school's activity. Most of the starting points and informing assumptions used came from the wider study context of the Measuring the Value of Educational Technologies project (see Moyle 2007). The application of even these proved challenging within the Southcity College setting; consequently what is presented here is a best-analysis rather than a complete one. It does however raise a number of useful and informative points.

As outlined earlier, since the first quarter of 2007, almost €0.5m has been spent by the sponsoring county council on current and capital costs of the project. This figure does not include labour costs (e.g. e-Champion etc). The largest single expenditure of €418,000 was for the category ICT Infrastructure and support

costs, including the procurement of computers. The technology acquired included over 300 standard laptops for use by students and teachers, 10 tablet laptops for Maths and Science teachers, two servers, 12 webcams, 12 microphone headsets, data projectors and digital cameras. The remaining spend has been accounted for by costs such as consultancy, training and travel and subsistence. Since 2007, these costs have shown as three 'spikes', reflecting the capital nature of the expenditure. Some 38% of the expenditure was incurred in 2007 with 54% occurring in 2008 and the balance in the period up to April 2009.

Since its inception the project has been developed using open source software such as Moodle, Mozilla Firefox and Audacity. To date, this software has been running on Windows XP although a move towards use of Linux as an operating system was scheduled for the academic year 2009/10. The adoption of a platform 'agnostic' stance by the project partners is an interesting and informative one. In essence they consider that open source software can provide similar levels of functionality to established proprietary packages while offering considerable benefits in terms of value for money and scalability of the overall project. However, there is a clear need to ensure staff members support this roll-out and to monitor its impact to capture the success rates of the venture. This has not always been a marked feature of the development, as suggested below.

Short to medium-term decisions around scaling of the project now need to be made, probably requiring a full value for money analysis of the project to be put in place. It is evident from this study that the current absence of such arrangements reflects the pace and school-centred nature of the project and does not reflect any lack of attention by the college or the steering partnership. However, if the Southcity College project is to achieve its potential and be rolled out further as a ground-breaking intervention into teaching and learning in this country, it needs to be contextualised with the type of VFM analysis that is regularly conducted in other constituencies.

The MVET model has an advantage in that it provides a framework for actively researched, data-driven decision-making for school leaders concerning the measurement of the value of educational technologies in schools.²⁸ The principal attribute of this model is that it concerns itself with value in a pedagogical sense as well as financial and seeks to factor in issues such as usage levels, learning outcomes and teacher facility as opposed to simply addressing cost and budget. The principal difficulty encountered in the Southcity College research setting is that disentangling the cost bases for the various strands involved

has proven – in the short timeframe – less comprehensive than initially expected.

The Southcity College Project: summary

The Southcity College project commenced in 2006 with the aim of improving the educational experience of students through investment in ICT in the delivery of education. As outlined earlier, the project is one strand of a broader local social-economic redevelopment initiative. The various interventions comprising this initiative involve collaboration between a number of local interests and government agencies and are grounded in a pro-social philosophy which seeks to target the causes of anti-social behaviour and community disengagement by means of an innovative, technology-centred approach. Effectively, the initiative seeks to harness the power of community via a virtual model of participation and engagement in order to improve quality of life in the local area across a variety of spheres. These vary from improved educational participation and attainment to the realisation of safer communities and the delivery of enhanced economic competitiveness. Ultimately, the initiative is intended to enable the local community to move up the economic value chain and to attract investment into the area from industries of the future.

To this end, the Southcity College project seeks to contribute to this pro-social vision by reaching out to students and their families. The technical hallmark of the project is that it seeks to provide on-demand access to hardware and software – including laptops, projectors and advanced learning tools – to the students and teachers of Southcity College. The pedagogical hallmark is that it seeks to generate and facilitate constructivist, task-based classroom activities that engage and develop the students.

Underpinning the direction of the project are the following objectives:

- To develop student centred technology that supports an innovative learning culture in the school;
- To deliver a high standard and range of technologies available to the school that enables the development of a Virtual Learning Environment for the students and teachers;
- To develop awareness and ownership of the project within the local community, the education sector, and other stakeholders, creating leverage of and disseminating project achievements.

In pursuit of these objectives the project focuses on a number of key outcomes, the achievement of which is based on the enhanced school environment at Southcity College, particularly

²⁸ See <http://ijl.cgpublisher.com/product/pub.30/prod.1904>

the utilisation of ICT-enabled classrooms and embedded use of ICT by students and teachers. The targeted outcomes of the project include improvements in three areas: school attendance, classroom participation and the educational outcomes of students. There has been marked success in all three noted in this study.

Essentially, the background against which the Southcity College Project was conceived and operates is unique and not unproblematic. On the one hand, the importance of developing ICT in education and responding to the opportunities provided by the introduction of ICT has been recognised by Irish Governments since the mid-1990s and a firm basis for the development of ICT within the education system was articulated in early policy document on ICT in education (*Schools IT 2000*, 1997). However, the practical reality of technology usage in education within individual schools in the Republic of Ireland is very mixed with variable experiences that depend, to a considerable degree, on interest among teachers and others with an enthusiasm for ICT, and on location. Nevertheless, there are many instances of ambitious and successful innovation across the Irish educational landscape whereby individual beacons of excellence have emerged to do interesting and educational work with technology. The Southcity College Project is very likely in time to become another such beacon.

Case Study 2: Northtown High

National Context for Northtown High

In Northern Ireland, a managed ICT services model is used to support teaching and learning with technologies. The past decade has seen a significant investment in school technology infrastructure under the auspices of C2k (www.c2kni.org.uk) amounting to a spend of £500 million over 10 years. C2k's centralised approach to private-public partnership brings in private industry to fund the up-front costs of an ICT service in classrooms. Government contracts the service, paying the provider for an accountable service delivery over the lifetime of the project – in other words, the delivery and availability of the service to the user at the desktop determines the payment. The industry owns and is responsible for the hardware and ensures that a reliable and working service is available to the classroom teacher. In practice, the availability of the network service at any time for any user is consistently high. Technical problems are normally remedied remotely online or within hours by a visiting engineer. As a consequence, project delivery of ICT in Northern Ireland schools lives up to expectations and teacher satisfaction remains high (PwC 2004, PwC 2005)²⁹.

The system is refreshed on a regular basis, keeping up to date with technological developments (such as wireless) on a 3 to 5 year cycle. At no cost to themselves, all 1220 grant-aided schools in Northern Ireland have access to a system comprising³⁰:

- an infrastructure of 85,000 networked computers (including 20,000 laptops (the equivalent of one per serving teacher) giving a computer/student ratio of 1:4 in post-primary schools and 1:5 in primary schools;
- access to a wide range of content and services to support the Northern Ireland Curriculum – including 250 centrally-licensed curriculum software titles;
- an integrated suite of services for school administration and management;
- broadband connection of schools' networks into a single wide-area education network and the Internet, connected directly to all of the public libraries in Northern Ireland, to the UK's higher and further education network (JANET and to HEAnet in the Republic of Ireland) and the National Education Network (NEN) across the UK;
- e-learning tools in an online learning environment service to facilitate the development of online teaching and learning – including online curriculum content; and
- first line support through a central help desk.

In terms of the policy environment for Northtown High's work, the Department of Education's emPowering Schools Strategy for ICT (Department of Education, Northern Ireland, 2004) set milestones for 2008, within a context of transforming education by 2020. The overarching goal of the Strategy is:

that all young people should be learning, with, through and about the use of digital and online technologies.

The key consideration of the Strategy is the deployment of digital, multimedia and communication technologies 'to enhance, improve and, ultimately to transform, education'. Systemic change is in the foreground of the strategy which seeks to 'embed ICT into practice, transforming that practice where appropriate, rather than computerising existing processes'.

The key strategic priorities of the strategy for education technologies that provide the framework of action are:

- Enhancing practice for learners;
- Enhancing professional practice for teachers and leaders;
- Enhancing professional support services for schools; and
- Innovating with the infrastructure, the connectivity and the school estate.

The goals of the emPowering Schools Strategy build upon and can be compared with the achievements of the Department's first Education Technology Strategy from 1998 to 2003 as follows in Table 7:

Table 7: comparison of the goals of the Department of Education's Education Technology Strategy 1998-03 and the emPowering Schools Strategy 2003-08

Main Changes under DE's Education Technology Strategy 1998 – 03
<ul style="list-style-type: none"> • Common infrastructure and network • Universal broadband connectivity • Reliant managed ICT service • Common curriculum content • Sustainable and affordable • Teachers' professional development • Instances of excellent practice • Awareness of need for change

²⁹ PwC (2004) C2k Primary Customer Satisfaction Survey, PricewaterhouseCoopers, Belfast. April 2004 <http://www.c2kni.org.uk/news/pwcppp.htm> PwC (2005) C2k Post-Primary Customer Satisfaction Survey, PricewaterhouseCoopers, Belfast. September 2005 <http://www.c2kni.org.uk/news/publications.htm>

³⁰ Current details of the C2k service are available on www.c2kni.org.uk

Main Focus of DE's emPowering Schools Strategy 2003 - 08

- Changed practice for the learner
- Enhanced professional practice for the teacher and the school leader
- Whole-school improvement
- Building collaborative approaches to curriculum provision and professional development
- Capacity-building across the service
- A context of systemic change
- Technology service enhancement and innovation

The Department of Education is currently preparing a revision to the 2003-08 strategy with a focus on:

- Greater access to, and reliance on, technology as a means of conducting daily interactions and transactions;
- A knowledge-based economy where it will be possible to compete with developing and global markets only by offering products and services of high quality, matched closely to customers' needs;
- Demanding employers, who are clear about the skills their businesses need and value;
- Complex pathways through education and training, requiring young people to make choices and reach decisions;
- A sharper focus on sustainability, the role of individuals within their communities, and their impact on the environment;
- An ethnically and socially diverse society in which the gaps in achievement, and prospects for people from different social and ethnic backgrounds, will not be allowed to persist.

Local Context for Northtown High

A Specialist School

Northtown High School is located in a market town to the north of Belfast and is a controlled, grant-aided 11-18 selective grammar school. It has 1225 students, 82 full-time equivalent members of staff and a teacher: student ratio of 1:15. It has 36 feeder primary schools spread widely over rural and urban areas, serving almost 1,000 families. The school consistently retains around 80% of students to complete their advanced level studies in Years 13 and 14 (16-18 years age range) and approximately 70% of the students go on to study at university, 20% study vocational education and training courses and some 5% move directly into work. The total number of students registered as coming from a socio-economically disadvantaged background is small (34) and a similarly small number of students have registered special education needs (36).

Examination results for Northtown High are above the Northern

Ireland average for grammar schools on published performance indicators. In 2007-08, 83% of Year 14 students achieved three 3 A-levels at grades A to C, in comparison to the Northern Ireland average for grammar schools of 74%. Over the past four years 100% of Year 14 students have gained 2+ A-levels at grades A to E each year, consistently above the Northern Ireland average. At GCSE (for 16 year olds), 93% of students gained 7+ A* to C passes including English and Mathematics compared with a Northern Ireland average for similar schools of 87%. This standard has climbed steadily from 88% in 2004-05.

Across the school there are 514 desktop and laptop computers, with 10 servers and a broadband link running at a minimum of 4Mbps. As a grammar school it had, at the time of the study, an academically selected intake. Of those who enrolled in Year 8 (the intake year with pupils approximately 11 years of age) over the three years preceding the study, 73% obtained grade A and 24% obtained a B grade in the selective transfer procedure. Of the teachers, 19% have been teaching for more than 20 years and 58% for less than 10 years.

Northtown High is one of 44 post-primary schools in Northern Ireland which have been designated, competitively over the past four years, with specialist school status. The project was conceived under direct rule from Westminster in 2004 as an opportunity to explore the concept of specialist schools, as it existed in England, but tailored to meet the particular needs of Northern Ireland's education system. It was intended that the specialist schools would specialise in different curricular areas including, for example, performing arts, information and communication technology, business and enterprise, science, technology, mathematics, music and languages.

The Department of Education's specialist schools' project was established with the aim that the selected schools would:

- identify and build on their particular curricular strengths;
- by sharing good practice, secure whole school development;
- contribute to the development of good leadership in schools; and
- take forward a community dimension, such as with other schools, further education colleges, business and industry and the wider community.

At the heart of the specialist school concept is school improvement through self-evaluation and the application of aspects of an existing curricular strength as a whole school development process. The Department of Education's stated intention was that this would help to move schools from an

environment characterised by competition to one of co-operation and collaboration.

The core objectives of the project are to:

- provide opportunities for pupils to benefit from wider learning experiences, and to ensure maximum impact of the available expertise and resources by promoting co-operation and collaboration among schools and between schools and other providers of education and training for 14-19 year-olds;
- provide parents with greater choice among a range of schools, which have differing areas of focus;
- raise standards and realise performance improvement for all young people;
- develop links between schools, their local communities and the economy to ensure that all young people are given a strong foundation for lifelong learning and work.

It was envisaged from the outset that the range of specialisms selected, including vocational areas, would enable schools to be innovative and to develop strengths that are relevant to the emergent needs of Northern Ireland as well as the needs of the pupils in the local area served by the school. Participating schools receive additional resources of £100 per pupil per year for four years and a one-off capital grant of £100,000.

On 22 April 2009, the Minister for Education announced that all 44 specialist schools would reach the end of their designation in August 2011 and that her intention was to draw on the evidence and experiences from the existing specialist schools to develop a more inclusive model with a sharper focus on:

- raising standards;
- tackling the barriers to learning that too many of our young people face;
- sharing and learning from one another;
- ensuring that the voice of pupils is sought and listened to in schools.

Northtown High was designated as an ICT specialist school in 2006, but had already gained a deserved reputation for its promotion and uptake of the use of ICT. In recent years the school had won a number of prestigious awards reflecting the influence of ICT in its learning and teaching activities. These included:

- BECTA (British Education and Communication Technology Agency) ICT Manager of the Year 2002
- Education Technology Laureate Award 2002
- Institute of Information Technology Trainers' Gold Award for staff training 2002
- NEELB Sharing Good Practice Award in ICT 2002

- International School Award 2003
- Modern Languages Department - best website for French (QUB 2003)
- German Teacher Award 2005
- Investor in People Award 2006
- Becta ICT Mark for Schools 2007
- Microsoft Innovative Teacher of the Year Award 2007 (Physics teacher)
- UK National Training Award for ICT 2007

By 2020 the students at Northtown High will have joined the main body of the workforce in Northern Ireland. The aspiration of the leaders within the school is not only to teach students the skills of using particular software programmes, but to prepare students for unknown futures where they can apply their knowledge of technological processes in different contexts. The school therefore offers skills-based courses in text and word-processing, and computer literacy (ECDL³¹) and is an accredited Microsoft Academy³². Curriculum at the school also focuses upon developing all students' ICT skills across the curriculum, and it offers courses for senior students which develop higher-level ICT, design and multi-media capabilities. The courses include the General Certificate of Secondary Education (GCSE) ICT and General Certificate of Education (GCE) Advanced Level courses in ICT, Applied ICT and Moving Image Arts.

According to its documents, the school focuses upon moving students and teachers beyond learning how to 'use' technologies, to supporting them in knowing how to apply technologies to solve problems in a variety of contexts. It is investing in the human and physical infrastructure required to achieve these aspirations and is implementing the revisions to the Northern Ireland Curriculum which place a strong statutory emphasis on generic skills (including literacy, numeracy, thinking skills, personal capabilities and work-related skills - such as problem solving and group work) infused throughout the curriculum³³. The use and application of ICT tools is integral and essential to the exercise and development of many of these skills in contexts promoted across the curriculum.

Northtown has documented plans for change and redevelopment of technologies over a four year period through its Specialist School Plan and over the three year cycle of its school development plan, both of which are linked to improving students' achievements. The school uses the BECTA Self-Review framework³⁴ strategically in order to ensure that quality indicators for ICT have been embedded into all schemes of work. All subject areas set targets, implementation strategies and success criteria

31 <http://www.ecdl-courses.co.uk>

32 <http://www.microsoft.com/education/msitacademy/default.aspx>

33 www.ccea.org.uk; www.rewardinglearning.org.uk

34 <http://schools.becta.org.uk/index.php?section=srf>

for the development of their subject within the Specialist School framework.

Funding for these developments is made available through the resources provided by C2k, from a significant commitment in the school's own delegated budget, together with contributions from the NEELB. In addition the school has attracted £588,000 over a four year period as a consequence of the award by government of ICT Specialist School status. This has enabled it to invest in significant enhancements to the centrally provided online learning services. The school licenses Studywiz³⁵ as a learning environment and has invested in the Etech platform³⁶ to enable it to provide personalised portals for various target groups.

Expenditure on Technologies

The costs of ICT at Northtown High are borne both by the Department of Education through the C2k Project and by the school itself, drawing in part on its budget as a Specialist School. The total funding to support the implementation of the C2k managed service in all schools is £50 million per annum. This amount includes the total cost of the contracted ICT services, including the school infrastructure, the local area network, the wide-area network and the Schools Data Centre, upgrades, technology refreshes, a Helpline, ICT and some curriculum support staff and in-service training at the user level. The service provided is designed as a core service to schools, which are encouraged to extend and develop the provision with funds from their delegated budgets. Northtown High is provided centrally with a core service of 262 devices (174 PCs and 88 teacher laptops) at an annual managed service charge of £135,472 (annualised average) and itself spends a significant annualised amount of £153,900 to extend the networks by a further 252 PCs and laptops to a total of 514. This provides a ratio of computers to students of 1: 2.38.

The average annual technology spend per student is £236, which is 6% of the annual cost, per student, of a post-primary education. The school's contribution is just less than 3% of the school's total annual delegated budget of £4.69 million for 2009-10.

The following table illustrates the breakdown of the average total costs of ownership (TCO) of technologies at Northtown High. The C2k costs for hardware reflect the managed service charge for the school infrastructure and associated services. Their costs for networks include the wide-area network and the schools data centre, which is located in Belfast, and associated services. Software costs reflect systems and management software only.

Table 8: Summary of the annual £ sterling cost of educational technologies at Northtown High³⁷

Item/ Cost per Personal Computer	Total Spend ³⁸	C2k Teacher Laptops Spend ³⁹	C2k PC Spend ⁴⁰	School Spend ⁴¹
TCO	563	163	696	611
Hardware	340	112	478	324
Software	43	13	75	30
Networks	63	21	89	60
Support ⁴²	116	13	54	198

The cost of perpetual regional licenses for some 250 curriculum software titles are components of the hardware and network costs which cannot be separated out. For these reasons, the figures in the school and C2k columns cannot be compared directly with each other.

The Northtown High Study

At Northtown High, education technologies are seen as integral to students' learning and achievements, with the use of technologies embedded throughout the whole school development plan and the school's four year plan (2006-10) for Specialist School status in ICT. The school was awarded an extension of its designation of ICT status for a fifth year to 2010-11. The intention for students to learn with technologies is also reflected in the Department of Education's policy for education technology in schools. The school's plans have been fully consistent with the Department's strategic plans since the time of the first Education Technology Strategy in 1998 (Department of Education for Northern Ireland, Bangor, 1998). The strategy focused mainly on putting the technology provision in place and introducing it to teachers. The school's planning documents reveal their central aspirations and strategies and are summarised below.

Whole school development plan

The major emphasis of the school's development plan is to implement the school's mission of '... developing lifelong learners in a caring creative community'. The principal believes that the school's '... participation in the Specialist Schools' programme allows us to develop more rapidly the impact of ICT on learning and attainment and to disseminate our best practice to other schools and the wider community'. Accordingly, improvement targets have been set for the ICT department, for the whole school, and for its work with the wider community and its thirteen primary and one secondary partner schools.

³⁵ <http://www.studywiz.com/>

³⁶ <http://www.etchgroup.com/>

³⁷ Extracted from the Northtown High *Total cost of ownership*, CoSN, Gartner

³⁸ An average over all 514 PCs/laptops

³⁹ An average over 88 teacher laptops in 2008-09

⁴⁰ Average over 174 PCs centrally provided by C2k over the four financial years from 2005-06 to 2008-09

⁴¹ Average over 252 PCs/laptops supplied by the school

⁴² Support can be identified as having the following components: formal in-house support: i.e. planned support provided by internal IT support resources; and planned support provided by an external body

The school development plan contains 24 curriculum-related actions, including teaching, learning and assessment, seven actions related to staff development and nine related to the school's pastoral provision.

Nine actions are directly related to advancing the information and organisational ICT capital within the school, namely:

- develop procedures for e-assessment and e-testing incorporating an e-portfolio strategy;
- implement the use of ICT 'blitz' strategies with KS1 primary pupils to meet 'Empowering Schools' milestones;
- develop guidelines for teaching in the Learning Centre;
- expand the use of SIMS systems for storing data for tracking assessing and reporting on pupils;
- begin installing wireless connectivity at strategic locations in the school;
- continue to achieve consistency with wireless laptop trolleys;
- continue to expand video-conferencing opportunities including shared lessons with international partner schools;
- review development of subject websites, with consistent feel to showcase learning;
- continue to develop the use of Studywiz with the departments.

The Specialist School Plan similarly reveals the school's goal to raise standards by employing technology to:

- extend, enhance and effectively manage the learning experience of pupils;
- further challenge, support and develop teachers;
- support the curriculum and implement curriculum change;
- collaborate with the community by sharing effective practice;
- enable these goals through improving the ICT infrastructure.

As the documents state, Northtown High aspires "... through ICT, to share the very best practice with our global partners and to ensure that our name is known throughout the world".

The specific objectives based on their ICT specialism are to:

- (at 11-14) improve quality of learning experiences and the number of Level 7 and Level 8 certificates that are awarded in the CCEA IT at KS3 scheme; embed ICT in a meaningful way into at least eight departmental work schemes and their delivery in such a way that it enhances the quality and equity of learning and teaching experiences while, at the same time, fostering creativity and independence;
- (at 14-16) increase significantly the numbers of high level grades and, at the same time, eliminate the small number of very low grades at GCSE ICT; and
- (at 16+) widen the choice and opportunity for gaining ICT-related qualifications post 16.

Across the whole school, the plan seeks to recognise, plan and embed ICT opportunities to enhance the quality and equity of learning and teaching at Key Stage 3 (11-14). It also seeks to monitor, evaluate and build upon consequent ICT competences in order to create personalised learning experiences that match the needs and abilities of all pupils, to develop autonomous learners and to enhance the quality of learning outcomes in all school-based contexts, including external exams. The school will use technology appropriately to foster independence and create personalised learning opportunities, to provide opportunities to evaluate the visual image and respond to musical or recorded material, and to use the computer for presenting work, completing research and communicating with others. In relation to its working with partner schools, the plan aims to focus on ensuring that there is robust curriculum continuity and learning progression.

The technology plans aim to meet human, organisational and informational requirements to allow students to include technologies in their learning. To support the implementation of the respective policies and plans, alignments are outlined and reinforced through articulated operational processes.

Taken together, the development and specialist school strategic plans point to aspects of the value of education technologies perceived for students and teachers at Northtown High. This value derives from the realisation of a multi-dimensional array of purposes including:

Fostering skill acquisition. Technology usage is designed to improve students' literacy skills, ensure they have information literacy skills, provide increased opportunities to develop basic and advanced technical, academic, and job-related skills, and provide for the acquisition of computer/technology proficiencies that can evolve as the technologies continue to develop.

Developing higher order thinking. Technology usage is designed to help students develop innovative methods in their work, based on higher thinking and problem solving skills. It is also aimed at fostering innovative critical thinking through the acquisition of research skills.

Improving student performance in external, high stakes examinations. Technology usage is able to support learning activities through access to resources on the Internet and personal productivity tools such as wordprocessing.

Varying teaching and learning methods. Technology usage is designed to improve the quality, flexibility and provision of

teaching and learning, enhance access to the curriculum for the entire learning community and motivate students to participate in their own academic growth.

Ensuring students have access to technologies. Sufficient resources and access to them is a key requirement for ensuring success in the other value dimensions.

Using technologies for recording, monitoring, tracking and reporting on students' achievements. Technology usage enables the progress of students to be monitored to ensure problems are identified in a timely fashion.

Developing communication channels. Technology usage is design to improve communications between home and school and within and beyond the school.

Measuring the Value of Educational Technologies in Northtown High

It can be argued that the value of education technologies is reflected in what is gained from the investments in it. The value of intangible assets, such as human, organisation and information capital, in turn depends on how they are used to enable a school to include these technologies in its teaching and learning, so that the benefits of the investments are realised and the students can achieve as highly as possible. The value of education technologies in teaching and learning and the development and role of intangible assets at Northtown High has been examined through extensive surveying of the staff and students, school documentation (including external reports) and interviews with samples from these groups. The results of the analysis are presented in the following sections:

- Measuring strategic readiness;
- Measuring the value of education technologies in teaching and learning;
- Linking learning and strategic planning: measuring the alignment;
- Linking learning with intangible assets: measuring the value of human, organisation and information capital

Measuring Strategic Readiness

In their planning and decision-making approaches, Northtown High demonstrates that education technologies are considered an integral part of teaching and learning. They also recognise there are some pre-conditions that have to be met, in order that technologies can be integrated into classroom activities. These pre-conditions can be considered as indicative of the 'strategic readiness' of the school to support students' learning with

technologies. In the sub-sections below these pre-conditions are noted along with the nature of the evidence that indicates the readiness of the school to meet them.

Under the Human Capital heading three pre-conditions, and the evidence indicating the school's readiness towards them, are identified as follows:

Effective Leadership, as evidenced through the:

- personal commitment of the principal;
- distributed strategic and personal leadership for ICT and learning;
- appointment of support staff for technology and learning;
- inclusion of ICT development as an objective in Performance Review and Staff Development, PRSD⁴³;
- 97% of teachers in the survey who recognised the importance of value being placed on ICT by the senior leadership team;
- January 2006 Investors in People⁴⁴ report, which found that the school's managers are committed to supporting staff in their aim to provide 'an extensive, enriched modern and relevant curriculum'.

Capable and Motivated Staff, as evidenced through the:

- 97% of teachers in the survey who indicated that their understanding of the power and potential of education technologies is increasing;
- 75% who hold the European Computer Driving Licence;
- 70% who have completed additional training on the use of interactive whiteboards.

Staff Recognition of the Value of Teaching and Learning with Technologies, as evidenced through the:

- 92% of teachers in the survey who acknowledged the importance placed on including technologies in teaching and learning;
- 97% who indicated that the knowledge of technologies by the leadership senior team has enabled them to include technologies into their own teaching and learning.

Under the Organisation Capital heading two pre-conditions, and the evidence indicating the school's readiness, are identified as follows:

Positive and Supportive School Culture, as evidenced through the:

- 89% of teachers in the survey who indicated that there is a positive culture in their school;

43 PRSD is a statutory exercise in which each teacher engages in an annual appraisal of their performance and professional development needs

44 archive.nics.gov.uk/el/060517f-el.htm

- engagement and success of staff in national and international awards;
- positive orientation of the students to using ICT to support their learning.

Legitimation of Policies, Processes and Committee

Structures, as evidenced through the:

- award of ICT Specialist School status;
- award of the BECTA ICT Mark;
- embedding of ICT in teaching and learning through the School Development Plan;
- 4-year development plan for Specialist School status which includes the targets to increase uptake and attainment in ICT as a specialism, to raise standards generally and to benefit the local community;
- effective operation of the school's education technology strategy planning group;
- 66% of teachers in the survey who indicated that integrating educational technologies into teaching and learning is a focus in their school education board area;
- school gaining an extension for a fifth year of its specialist school status following an inspection in 2009 (Education and Training Inspectorate, 2010) where it was recognised that: the school has identified a range of significant strengths including: the commitment of the senior management team; long term planning for integrating ICT in the curriculum; the enthusiasm and expertise of many teachers; the high priority given to ICT by some departments.

Under the Information Capital heading one pre-condition, and the evidence indicating the school's readiness, are identified as follows.

Access by the Whole School Community to Robust and Reliable ICT Infrastructure

- as evidenced through the:
- significant investment by the school in additional technology;
 - provision of a high-quality open-plan ICT Learning Centre, including video conferencing facilities;
 - recognition as a Microsoft Academy;
 - high levels of attainment of the students in ICT qualifications;
 - high levels of attainment of the students in high-stakes examinations;
 - 100% of teachers in the survey who indicated there is an increased access to computers and other technologies;
 - 90% who indicated that they believe there is good desktop infrastructure set-up at the school (24% rated it as excellent);
 - 91% of teachers who indicated that they believe the network is good (26% rated it as excellent);

- 72% of students in the survey who indicated that they rate the infrastructure as good;
- increasing use of data to improve the effectiveness of teaching, assessment, support for the students and for decision-making.

Figure 3 presents the information relating to the types of intangible assets (i.e. human, organisation and information) that enable the teachers to be strategically ready to include technologies in their teaching and learning.

In the student survey 72% did not believe the quality of the infrastructure in the school needed improvement and in interviews there was evidence that they considered the infrastructure at the school to be better than for other schools with which they were familiar. As one student said, 'We have a lot more advanced stuff in our school than a lot of other schools.'

Although ICT was not perceived as a particularly strong focus within their education board area (66%), teachers at Northtown High experienced a high level of internal support through the resourcing committed by the Board of Governors and for capacity-building, drawing heavily on individuals with expertise in the context of their own school.

On the basis of a good infrastructure within the school (90%) all staff agreed that they experienced increased access to computers and other technologies (100%) within a positive culture (89%) in which an internal education technology strategy team of senior teachers focused on embedding ICT into classroom practices (79%). This was supported by teachers' own understanding of both the power and potential of ICT (97%) and enhanced through training targeted at their learning areas. Overall, this focus within the school was driven by a combination of the value placed on ICT within the leadership team together with their own knowledge of ICT (97%).

Thus, the Human Capital as modelled both by the leadership and the education technology strategy team was matched by teachers' own attitudes to the potential of ICT and the training opportunities to expand their understanding. This was enacted through Organisational Capital in which ICT was positively promoted and supported through both a very good infrastructure on site and a good access to a range of different technologies (the Information Capital). This meant that the preconditions necessary to include education technologies had all been met to a high degree within the school itself, capitalising on the core ICT service in NI.

Figure 3: Overview of staff views about the preconditions necessary to include education technologies into teaching and learning

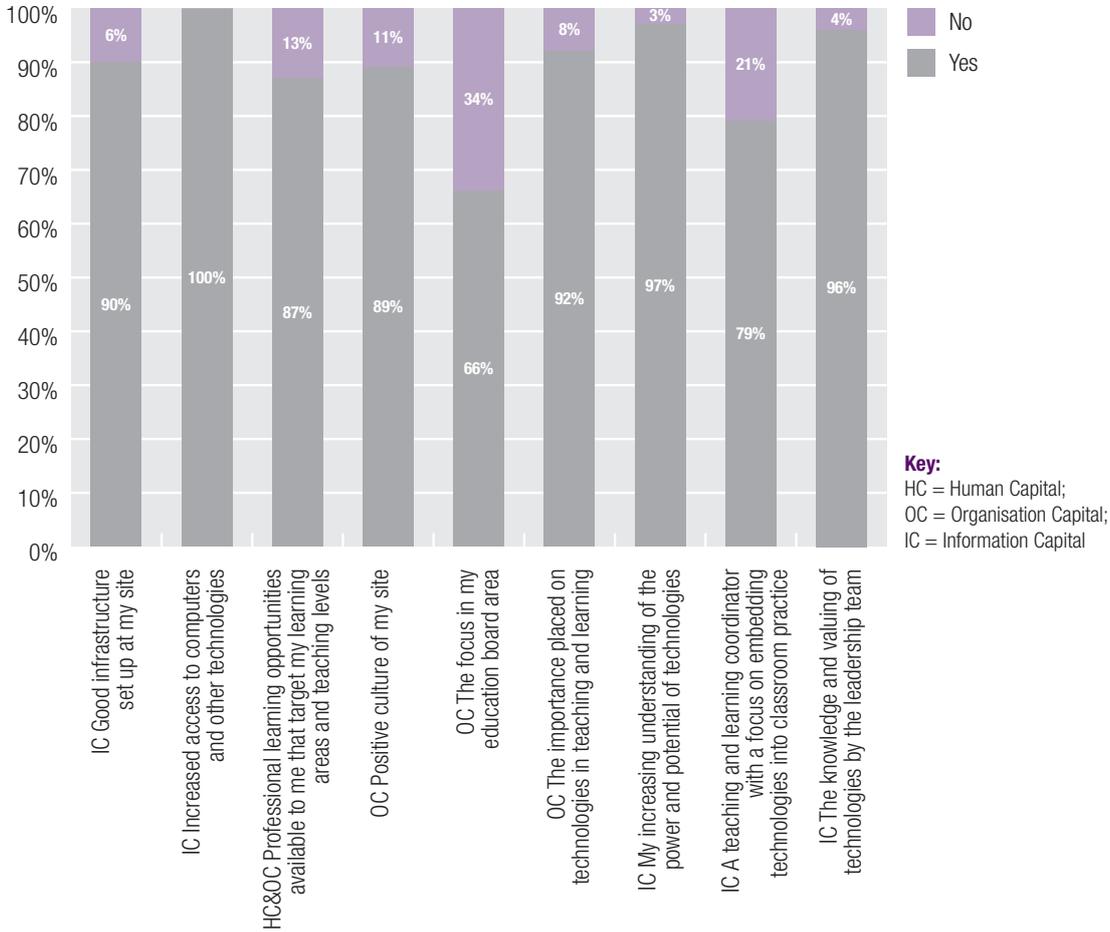
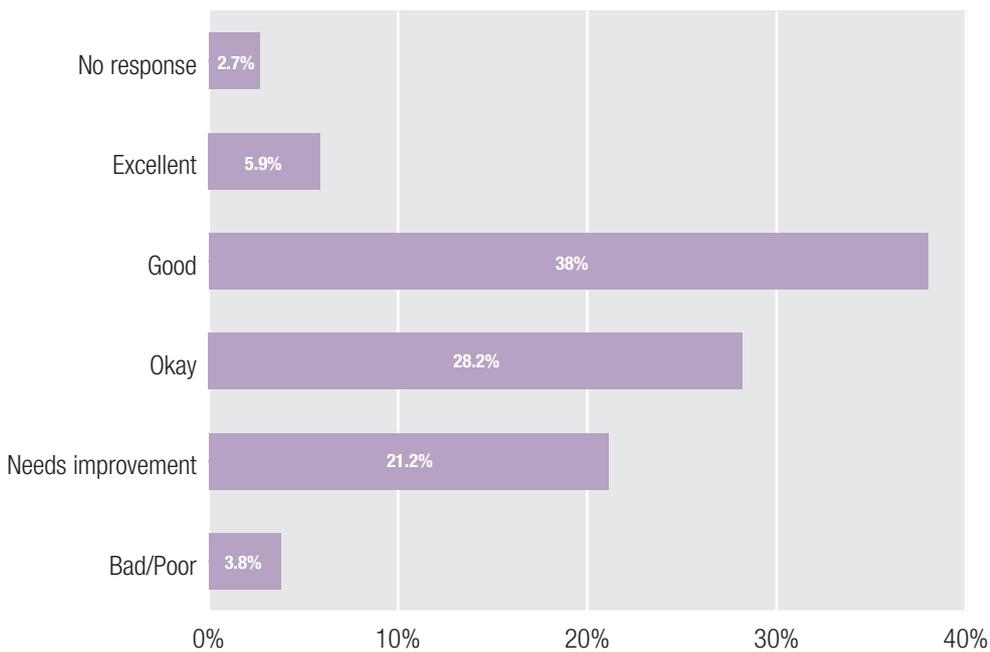


Figure 4: Students' rating of the quality of the infrastructure in the school



Measuring the Value of Technologies in Teaching and Learning

The core business of schools is teaching and learning, and students will learn with technologies if teachers can meaningfully include technologies in their classroom practice. One way of determining the value of technologies in learning is to consider teachers' and students' views of what they do with technologies in their daily work, and in the ways in which technologies are integrated into classrooms, teaching courses and students' studying requirements.

When asked if they see education technologies contributing to their students' learning outcomes, all of the teachers respondents in the survey indicated that they think technologies make some contribution to students' learning, as Table 9 indicates.

Students also reported using technologies to assist in their learning, including the following:

- computers for school work generally;
- Internet for research;
- writing / recording their own music tracks;
- printers for assembling legible and orderly coursework.

Students also reported that teachers use technologies in the classroom to assist them in their teaching and recounted:

- interactive games for foreign language development;

- DVDs for background information and context;
- diagrams and notes via Smartboards (interactive whiteboards);
- interactive electronic quizzes and games.

Linking Learning and Strategic Planning: Measuring the Alignment

As argued above, enabling the learning outcomes to be achieved by students is underpinned by the human, organisation and information capital available to the school. The evidence of value for students and teachers from the investments in technologies can be matched against the value-related purposes mentioned above, namely:

- Fostering skill acquisition;
- Developing higher order thinking;
- Improving student performance in external, high stakes examinations;
- Varying teaching and learning methods;
- Ensuring students have access to technologies;
- Using technologies for recording, monitoring, tracking and reporting on students' achievements;
- Developing communication channels.

Fostering skill acquisition

Students' ability to recognise and apply good, reliable information and to be able to read and understand the multiplicity of media

Table 9: Extent to which teachers see technologies contributing to students' learning

Educational Technologies Contribute to Student Learning Outcomes by	Degree of Contribution %				
	None	Low	Moderate	Strong	Very strong
Providing student learning opportunities?					
Providing opportunities to practise skills	0	8	48	28	16
Stimulating students to learn	0	5	21	61	13
Monitoring student learning	5	28	51	13	3
Individualising teaching	5	21	34	38	2
Supporting students to learn to work collaboratively	5	21	33	30	11
Developing students' problem solving skills	8	18	26	39	8
Developing students' higher order thinking skills	3	26	28	34	8
Stimulating creativity	2	10	26	44	18
Broadly transforming teacher practice	2	7	26	46	20

available to them is central to their ability to be successful at school and in their lives life beyond school. As such, a priority for Northtown High is that all students develop basic information and literacy skills through text and word-processing courses and the basic European Computer Driving Licence qualification. Furthermore, Northtown High offers vocationally-oriented courses for students interested in emerging new technology through its status as a Microsoft Academy.

In addition to offering general education qualifications in ICT (GCSE and GCE A Level ICT), Northtown offers GCE A-Level in Applied ICT, an A-Level course in Moving Image Arts and a short Diploma course in Digital Applications.

Working with Momentum (an agency which promotes careers in the IT industry⁴⁵), the school has piloted the government's 'e-skills passport'⁴⁶ and this has led to the establishment of a computer club to promote ICT skills for girls.

As seen in Figure 5, in a school week of 30 hours, 63.5% of students spend up to one lesson in six (approx. five hours) using

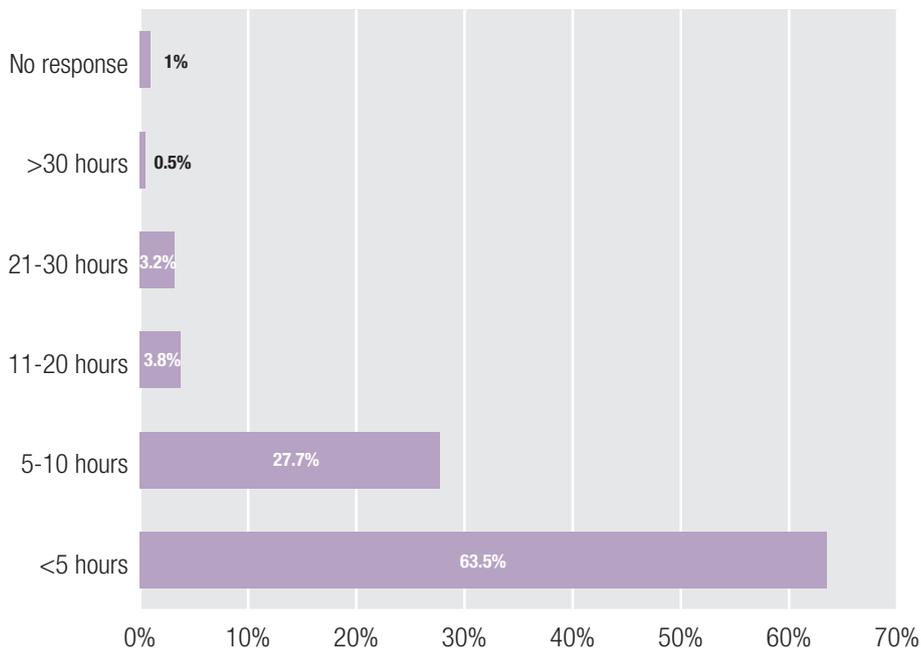
computers as part of their learning and 28% spend up to one lesson in three (up to 10 hours).

Students reported that 'most of our GCSE coursework is ... computer based', which was seen by some as integral to their success with schoolwork generally. Looking after their own notes was 'a lot easier if they are on computer [since] we can also have a backup copy just in case we would lose the original or the teacher asks for another copy.'

Research was seen as 'much easier with the internet' and, in terms of presentation, 'work is greatly improved when things are done electronically', as well as being more efficient since 'if you have a big essay to write, writing it will take longer, (whereas) typing will take half the time.'

The most common applications reported by the teachers as being used with students are Internet browsing, email, word processing and presentational software. Figure 6 sets out the results in graphical form:

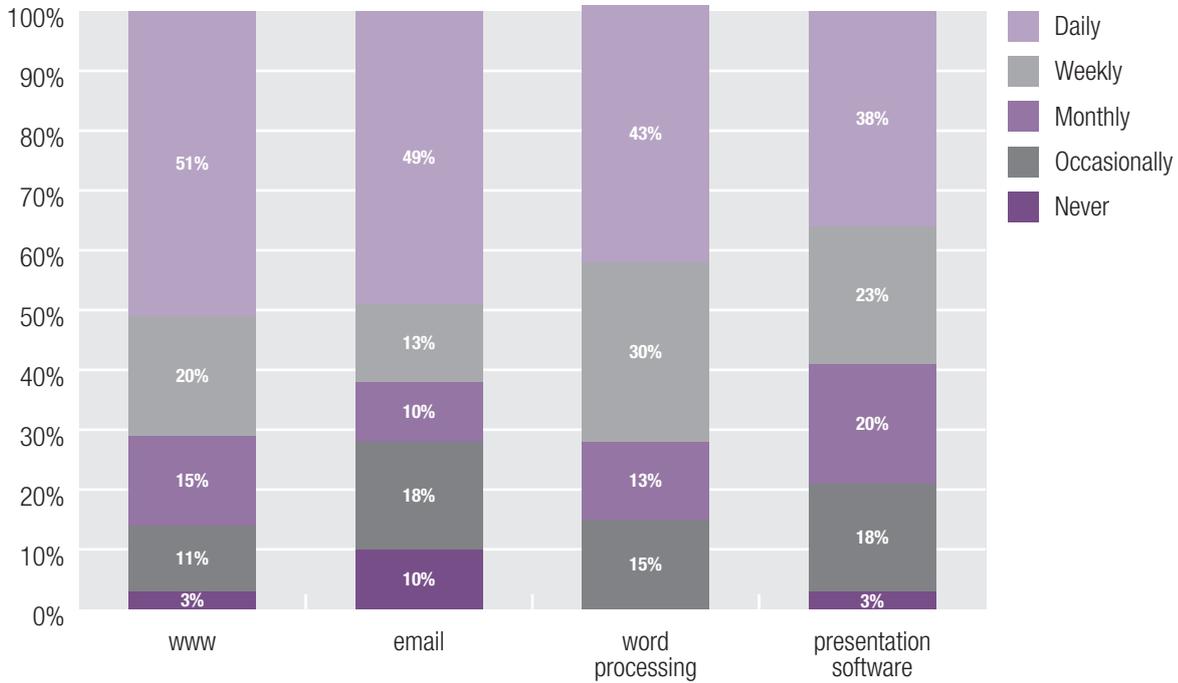
Figure 5: Hours per week students use school computers



45 www.momentumni.org

46 <http://www.e-skills.com>

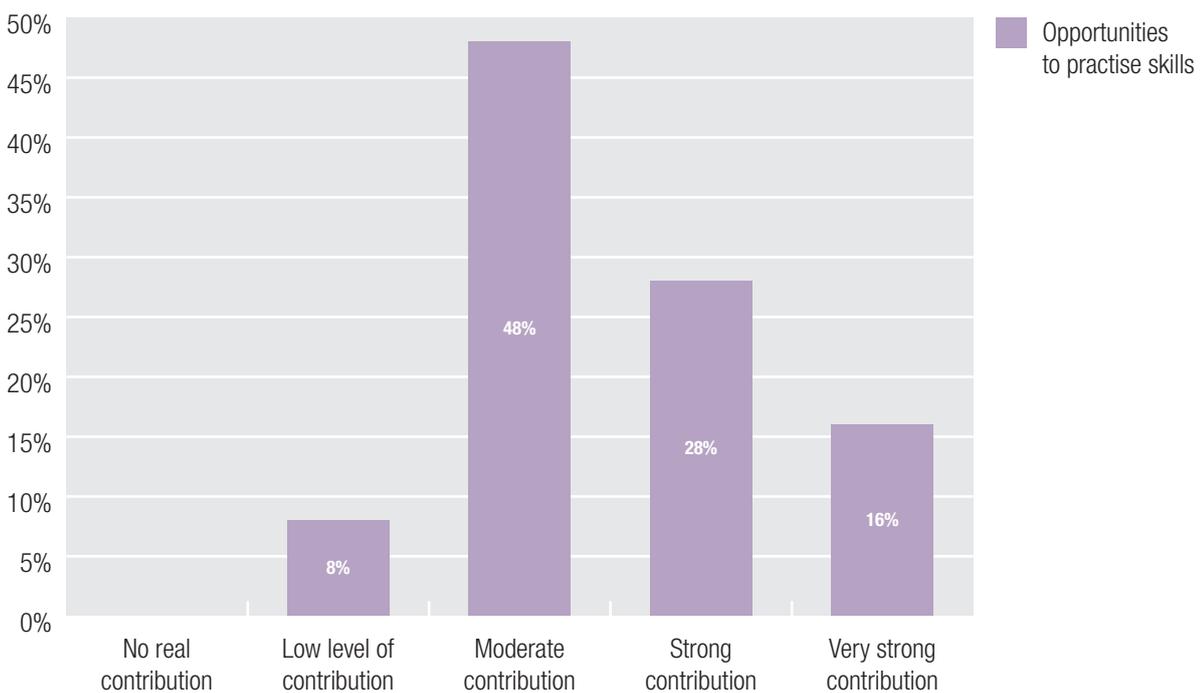
Figure 6: Software most used by students in class



In order to foster skill acquisition, teachers indicated that they include technologies in their teaching and learning to provide opportunities for students to learn both collaboratively and to personalise their learning. Technologies also assisted with developing students' capacity for higher order thinking skills and

the ability to solve problems. Figure 7, for example, indicates that all respondents, to varying degrees ranging from 8-48%, see value in using technologies for providing students with opportunities to practise skills.

Figure 7: Opportunities for students to practise skills



Technologies were also seen to be of value in introducing the basic skills underpinning a learning area. Figure 8 demonstrates that 44% of the respondents use technologies to a strong or very strong degree, and 48% to a moderate degree, to provide opportunities to assist students in developing the basic skills required in their learning area. It can also be seen in Figure 8 that 78% of teachers in the survey used technologies to a moderate

or strong degree to develop basic skills in their specific learning area, while 23% did not do so at all or did so to a low degree.

Figure 9 indicates that while 20% of the students rated their ability to use the school's computers as average, 76% rated their capability as above average or much higher.

Figure 8: Opportunities for developing basic skills in learning area (s)

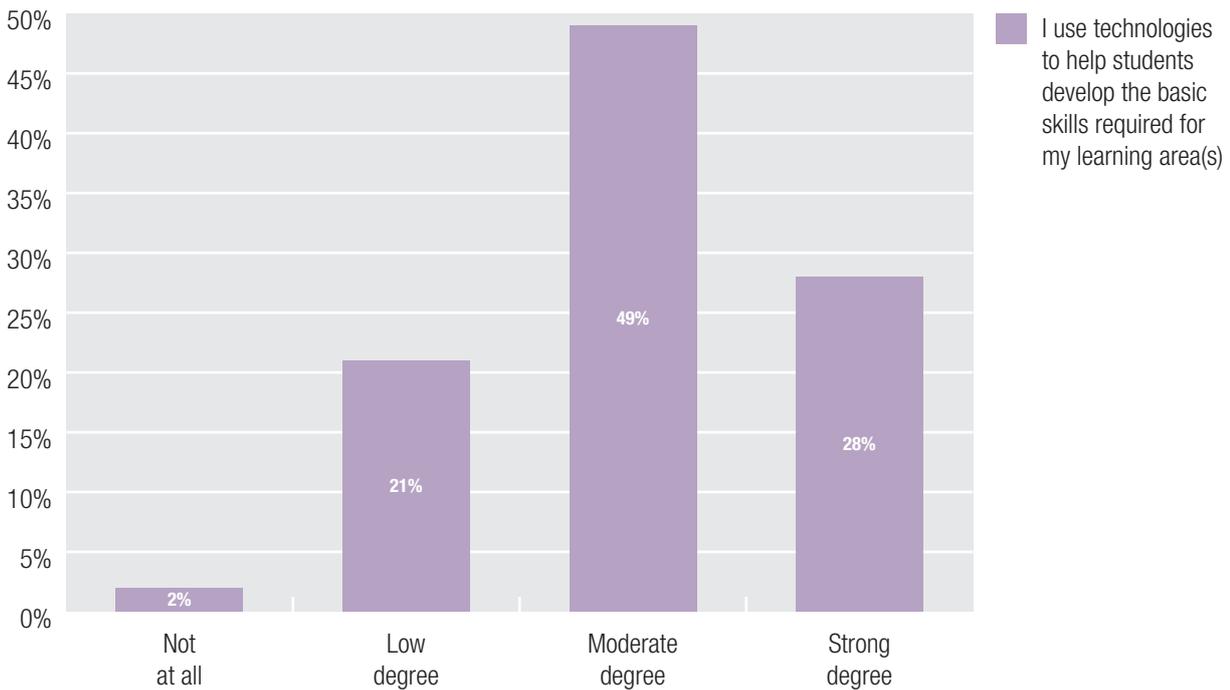
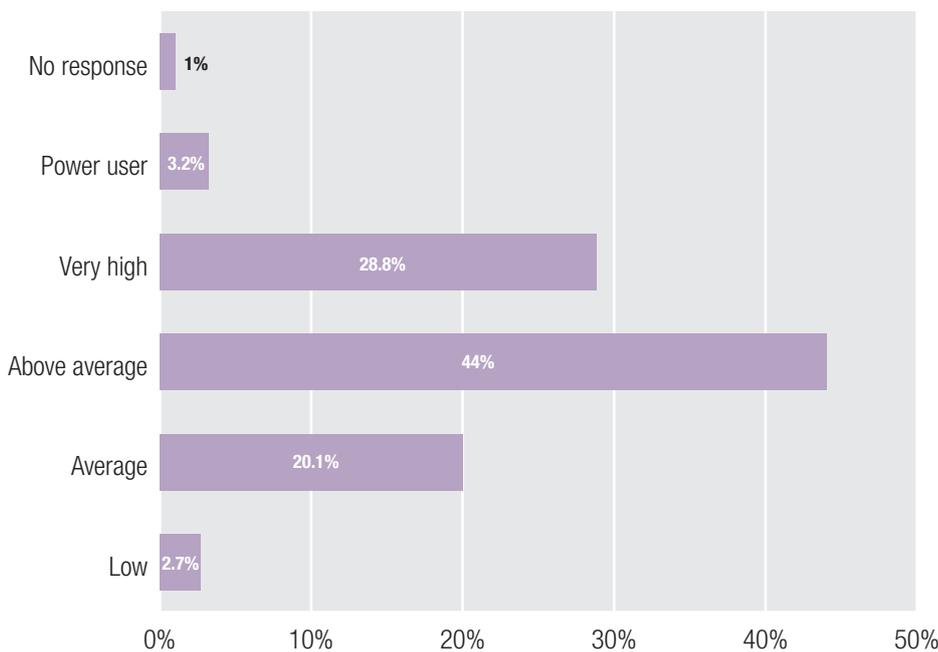


Figure 9: Student rating of their ability to use school computers



While teachers indicated that education technologies provide opportunities for them to help students develop the basic skills required for their learning areas, they also indicated they do not often use online games for practising skills, with 30% of respondents indicating that they never use games for skills practice, and 52% indicating they do so only occasionally.

In summary, it can be concluded that the overall value of technologies in fostering skill acquisition at Northtown High is high, with the following characteristics:

A high level of use daily of the ‘big four’ of computer applications (www, email, word processing and presentation software);

- A good to high rate of ICT use in daily lessons;
- A very good application to develop basic and higher-level ICT user skills;
- Good application to develop the skills related to learning with and through ICT;
- Excellent levels of attainment in ICT specialist subjects which is an area of clear curricular strength;
- A wide range of enrichment activities pertaining to the specialism of ICT.

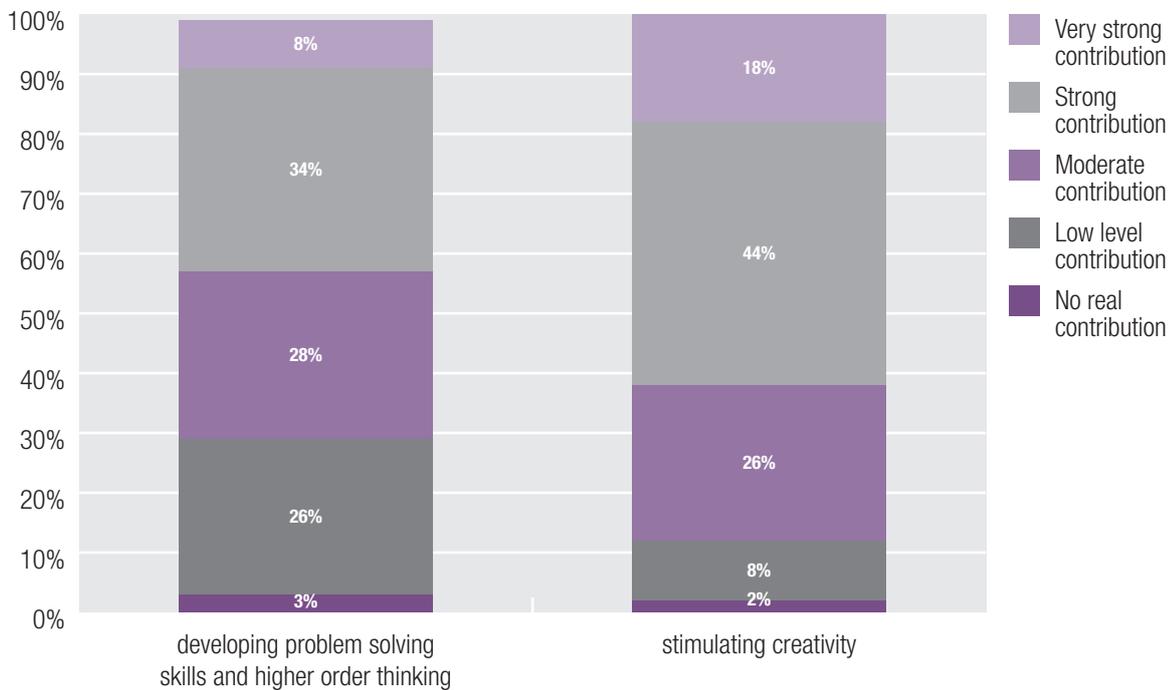
There is evidence that the pedagogic benefits of fostering ICT skill acquisition build up ICT capability amongst the students that can then be applied to lever transactional benefits such as efficiencies in the teachers’ and the students’ work. This in turn brings strategic benefits between the investment in ICT and the school’s educational values.

Develop higher order thinking

Northtown High’s School Development Plan and the plan for ICT Specialist School status make direct references to the integration of educational technologies into teaching and learning. Key capabilities such as critical literacy, problem-solving and research skills are central to the revised Northern Ireland curriculum; they underpin the content standards for students and are actively taught by teachers at the school. The teacher-librarian provides students and staff with assistance in how to support students to learn these higher order skills.

The data about the types of learning outlined in Figure 10 below, shows that over 50% of the teachers see technologies as contributing ‘strongly’ or ‘very strongly’ to ‘stimulating creativity’ and to ‘developing problem-solving and higher order thinking’

Figure 10: Contribution of technologies to fostering higher order thinking with technologies



skills' (taking both together). The table also indicates a greater spread in the teachers' views about the contribution that the use of technology makes to develop the students' problem-solving and higher-order thinking skills than for any other set of outcomes.

Similarly, over 42% of respondents indicated that technologies have a 'strong' or 'very strong' contribution to make in fostering students' higher order thinking skills and 62% to stimulating their creativity to the same high degree.

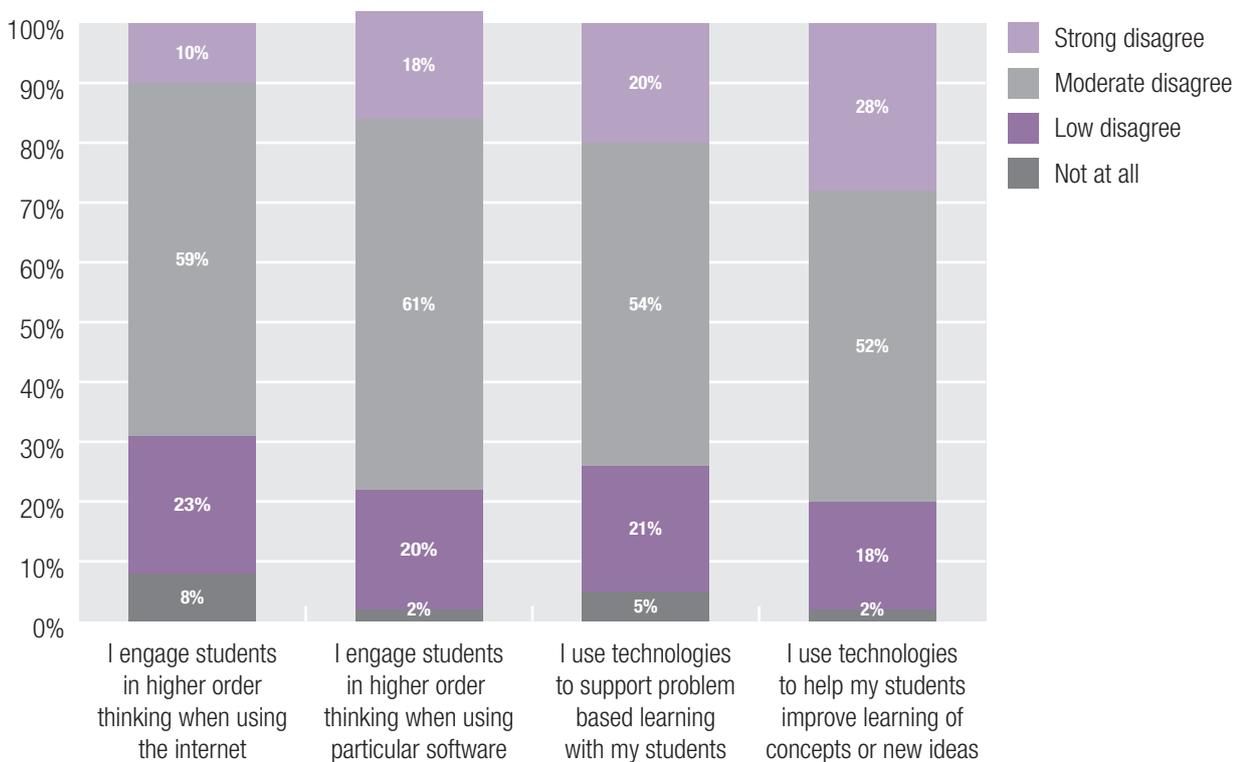
While the teachers in the survey indicated that they believe that technologies can be used to stimulate creativity and to develop students' problem-solving and higher order thinking skills, the respondents also reported that they use both the Internet and particular software to foster students' high order thinking skills. Figure 11 illustrates this.

Internal evaluation of the impact of Specialist School status has indicated that teaching and learning is used to support a variety

of higher order learning tasks including, for example, financial modelling as an element of the course on Learning for Life and Work. Further enrichment opportunities are scheduled for Year 2 students, including ICT-related competitions for the European Day of Languages, robotics programming courses and evening activities for students and the broader community of young people in Northtown.

School evidence of the increased use of ICT to present GCSE coursework has ensured that a target to make it 'a more enjoyable and manageable experience' has been met. Evidence from the departmental feedback sheets for the first year of Specialist School status would suggest that this target has been met by many students. The History department's self-evaluation noted, for example, '...coursework produced this year has been very impressive. Many diverse ICT tasks within History have stimulated enjoyment in the subject. Pupil biographies of Oliver Cromwell would be clear evidence of success'.

Figure 11: Higher order thinking skills



The Learning Centre affords great potential for independent learning, a fact recognised by the ICT Mark Assessor in January 2007, who commented on the 'very strong focus on independent personalised learning' and went on to state that 'ICT is seen as a core skill and fully embedded into all subject areas.' Some departments have now created model lessons which promote increased independence through structured activities. The Modern Languages department is one such department.

These activities meet the teaching and learning target to use the computer for presenting work, completing research and communicating with others. Students remarked that: '... using technologies is more engaging because you are not just sitting taking notes all the time, you are learning using a lot of different teaching methods.'

Smartboards, for example, were seen as 'more motivational than the old blackboards' which meant that 'the class is more engaged... especially as the teacher doesn't turn their back to the class to write.' Other comments included observations about interactive games 'which help us learn in a fun way' and 'make the lesson better' since it is 'easier to remember things that you have learned from playing games'.

In languages, one student observed that interactive games '... can help you understand complicated concepts such as grammar.' Quizdom was described as 'very good because you can see your result straight away and can learn lots of other things' which made it 'fun as well as easier.' 'I think the classes are, on the whole, more engaged' summarised one student on the impact of technologies, 'but there's always some people who mess about.'

In summary, it can be concluded that the overall value of technologies in developing higher order thinking at Northtown High is characterised by:

- Stimulating enjoyment and engagement in learning;
- Stimulating individual and collaborative learning;
- The contribution of ICT to creativity emerging clearly.

It should be noted that the conviction among all of the teachers of the value of technology for fostering higher order thinking and problem-solving is relatively lower than for other outcomes. However, this is an area where good practice is evident, providing a base of experience which can be shared by teachers to strengthen further the conviction more widely about the role of ICT in fostering higher order thinking and problem-solving as an important part of learning. This is especially so as the teachers become more confident with Thinking Skills and Personal

Capabilities⁴⁷ as a part of the revisions to the Northern Ireland Curriculum.

While there is evidence of emerging pedagogic benefits in applying ICT to develop higher order thinking skills, there is also evidence that there is more to be accomplished by the teaching staff if transformational and strategic goals are to be fully achieved.

Improving student performance in external, high stakes examinations

The value of technologies is very evident in the degree to which they enable teachers to assist students to meet their learning outcomes through attainment of high standards both in ICT specialist subjects and in high stakes examination results more generally. As a Specialist School in ICT, increasing the uptake of specialist subjects, raising standards and enriching the learning outcomes in both specialist subjects and in attainment across the whole school comprises a core set of targets. In so doing, it is clear that ICT in Northtown is and continues to be an area of clear curricular strength.

Examination results, which are above the Northern Ireland average for grammar schools on published performance indicators, indicate how the school is succeeding in improving student performance. As outlined above, in 2007-08, for example, 83% of Year 14 students achieved 3 A-Levels at grades A to C, in comparison to the Northern Ireland average for grammar schools of 74%. Over the past four years 100% of Year 14 students gained 2+ A-Levels at grades A to E each year, consistently above the Northern Ireland average. At GCSE level, almost 93% of students gained 7+ A* to C passes including English and Mathematics compared with an average for similar schools of 87%. This standard has climbed steadily from 88% in 2004-05.

With attainments levels rising, there is an argument to be made that the trend in performance improvement at GCSE level could be associated with the increasing strength in the use of ICT as an enhancement of teaching and learning. But the school does not maintain a narrow focus simply on examination outcomes, but also emphasises the importance of enriching the quality of the learning experience. A wide range of enrichment activities, which builds on the ICT specialism, has been put in place:

- Extra curricular ICT activities including podcasting, web-editing, Momentum Computer Club for Girls.
- The opening hours of the Learning Centre have been extended to increase access to ICT.
- Identification of and support for under-achievers in this area,

⁴⁷ http://www.nicurriculum.org.uk/key_stage_3/skills_and_capabilities/

through the learning platform StudyWiz, which is being used effectively to support GCSE and GCE A level ICT students.

- Sharing of practice and collaboration with a local non-selective secondary school in the subjects of geography, home economics and science and in the development of new activities for assessing ICT levels at Key Stage 3.
- Collaboration with other ICT Specialist Schools in the development of a regional web-based test to help identify the baseline of ICT knowledge and skill of students on transfer from primary schools into the post-primary school.
- A staff group has been set up to explore issues of coherence and consistency at the transition from primary to post-primary teaching of ICT.
- Accreditation as an ECDL centre and a Microsoft Academy.

Success is also evident in student performance in specialist ICT subjects. For example, at Key Stage 3 (for 14 year-old students), the Northern Ireland Council for Curriculum, Examinations and Assessment (NICCEA) provides an accreditation scheme for ICT⁴⁸, and in 2008, 55% attained the average (for the age cohort) of Level 7 and 45% attained the higher than average Level 8. In GCSE ICT continuous progress was experienced over the three years 2006-2008. The uptake of the subject increased from 46% to 51% of the year cohort, an increase matched by excellent achievement in GCSE grades. All students achieved A*-C grades in 2008 while 84% achieved the more demanding A* to A and 27% achieved the top A* grade. Attainment at grades A* to A increased from 54% in 2006 to 78% in 2007.

Provision at post-16 comprises a wide range of courses and variety of ICT experiences from which individuals may choose in order to meet their needs and interests. The percentage of the students now taking an ICT-related specialist course is 38%, and the school has plans to increase the numbers to 50% of the cohort undertaking ICT courses through the Microsoft Academy accreditation.

Despite the original syllabus at GCE A-Level being replaced by a more demanding Applied ICT syllabus, the percentage of students achieving grades A-C in 2008 was 86% and at A-B it reached 64%. The students achieve well at Advanced Supplementary level (taken after one year of advanced study) with their attainment increasing from 81% A-C in 2006 to 92% A-C in 2008.

In summary, the overall value of technologies in improving student performance on external, high stakes examinations is clearly very high. It is evident that ICT is and continues to be an area of clear

curricular strength with breadth of choice of extended courses, increasing uptake and raising standards which are out-performing schools of a similar type with comparable intake.

There is evidence of pedagogic benefits arising from the application of technology in a range of learning contexts. Transformational benefits are achieving positive organisational change and enabling high standards to be achieved through good quality teaching and learning across the board.

The school's strategy group has mapped student experiences in order to monitor equity of provision and delivery, and to put in place concrete proposals to ensure equity. There is clear evidence that ICT is contributing across the school to raise standards.

Overall the various benefits demonstrate the school's positive alignment between its goals for learning and its investment in technology.

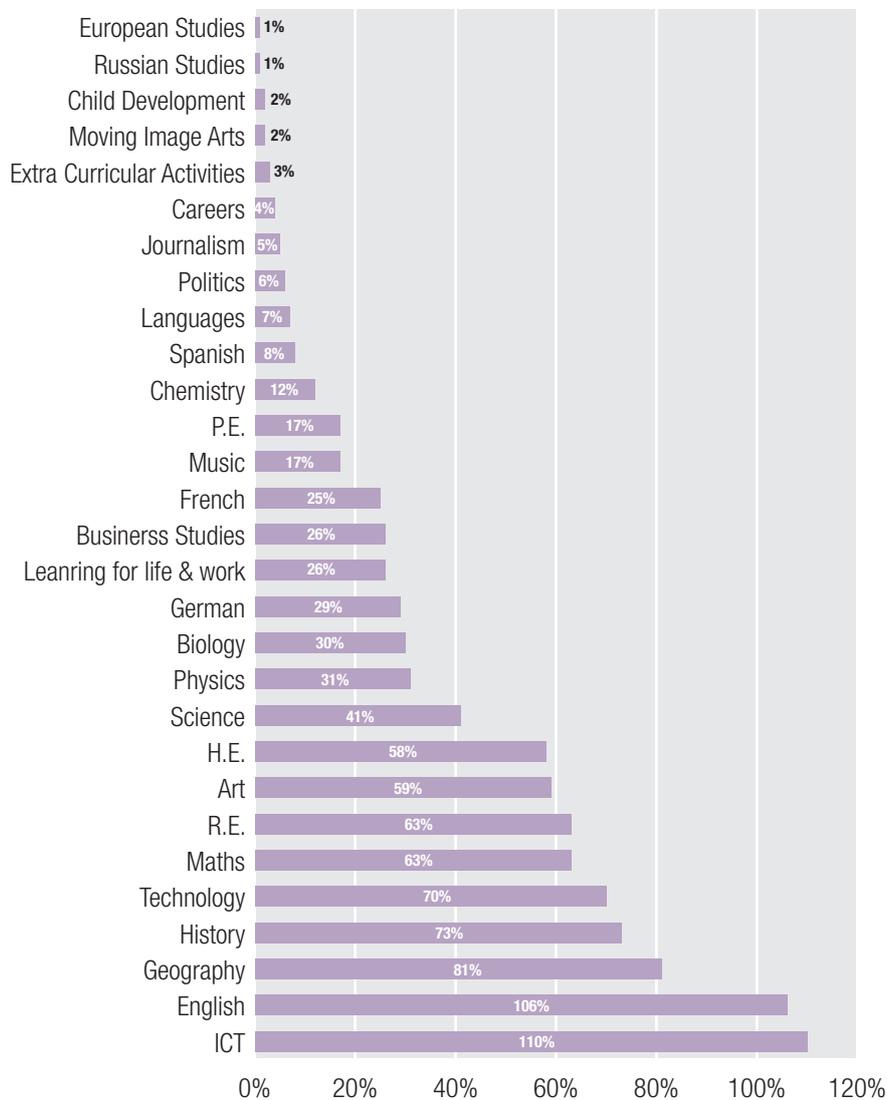
Varying teaching and learning methods

Technologies are often promoted to foster student engagement and motivation in their learning, and to accommodate different learning styles. With the assistance of the teacher, the use of education technologies by students in class can build the students' ICT capabilities and their ability to turn information into knowledge.

The use of technologies in classroom teaching and learning occurs across all of the subjects taught at Northtown High. As seen from Figure 12, students in the survey reported that they use technologies in every subject, with the most intensive usage in art and design, English, geography, history, home economics, ICT, mathematics, religious education, technology and the sciences. In some subjects ICT is used intensively (for example, Moving Image Arts) but appears to rate low as a consequence of the smaller number of students enrolled.

48 <http://www.rewardinglearning.org.uk/ias/index.asp>

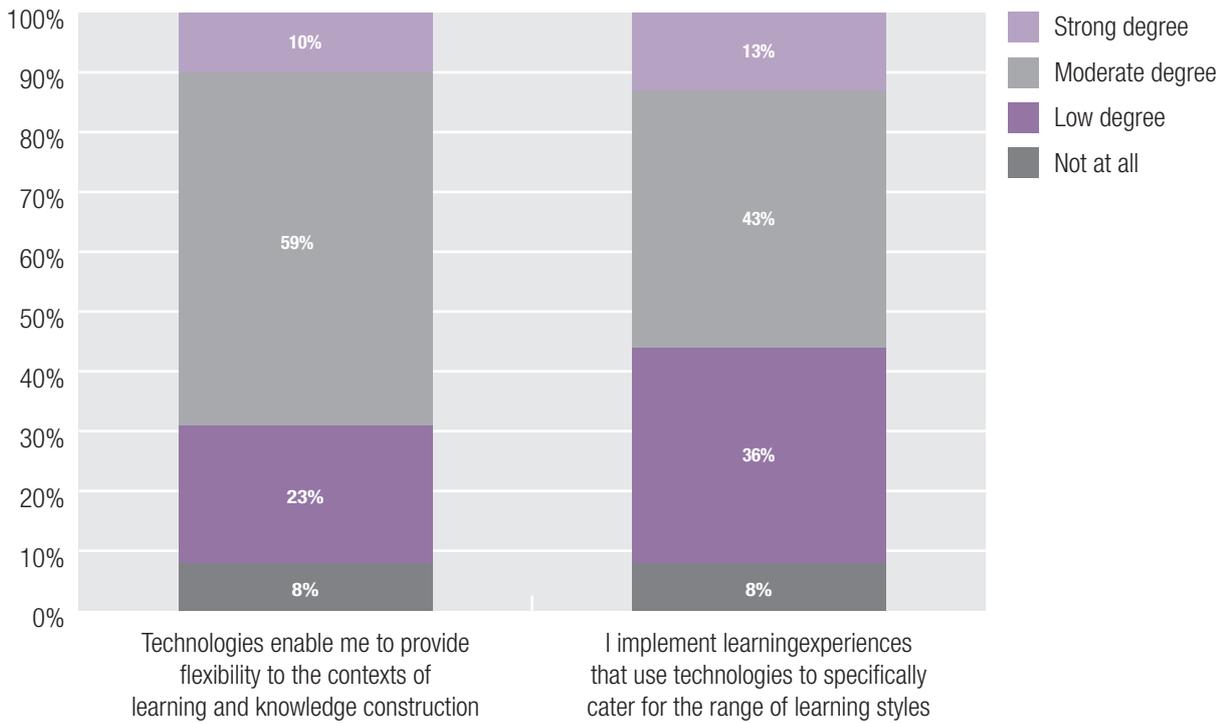
Figure 12: Use of ICT in subjects as reported by students



Asked if they implement learning experiences that use educational technologies to specifically cater for the range of learning styles of their students, 56% of the teachers indicated that they do so to a 'moderate' or 'strong degree'. Similarly, 69% of respondents

indicated that technologies enable them to provide flexibility in the teaching and learning contexts they provide, as Figure 13 illustrates.

Figure 13: Degree technologies assist in varying classroom practices



When asked about the degree to which the use of educational technologies influence their management of student learning activities, Figure 14 shows that the strongest use of technologies reported by teachers is to provide learning resources to their students (52%) and to communicate with colleagues (54%) in their management. This was closely followed by the medium influence of enabling collaborative classroom activities (43%) and communicating with students (41%). Several school technology goals relate to varying teaching and learning methods, and 35% of respondents indicated that technologies do influence the

management of their students' learning to either to a 'medium' or to a 'strong' degree. The results from the survey also indicate that 54% of respondents see technologies as having a medium or strong influence in breaking up class time into a range of different activities, but just over a quarter indicated that technologies have 'little' or 'no influence' in meeting the different learning styles of students. Furthermore, 11% of respondents indicated that they see technologies playing no part in accommodating different learning styles.

Figure 14: Degree of influence technologies have on the management of students' learning

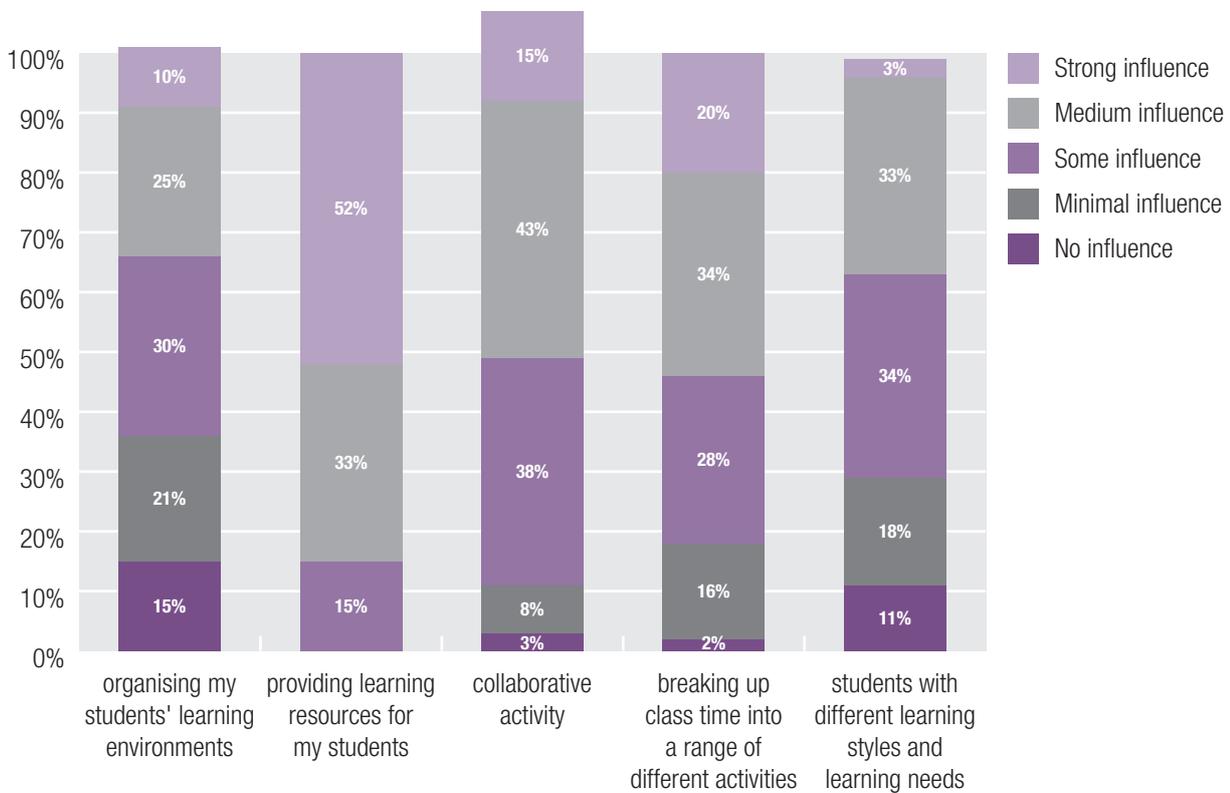
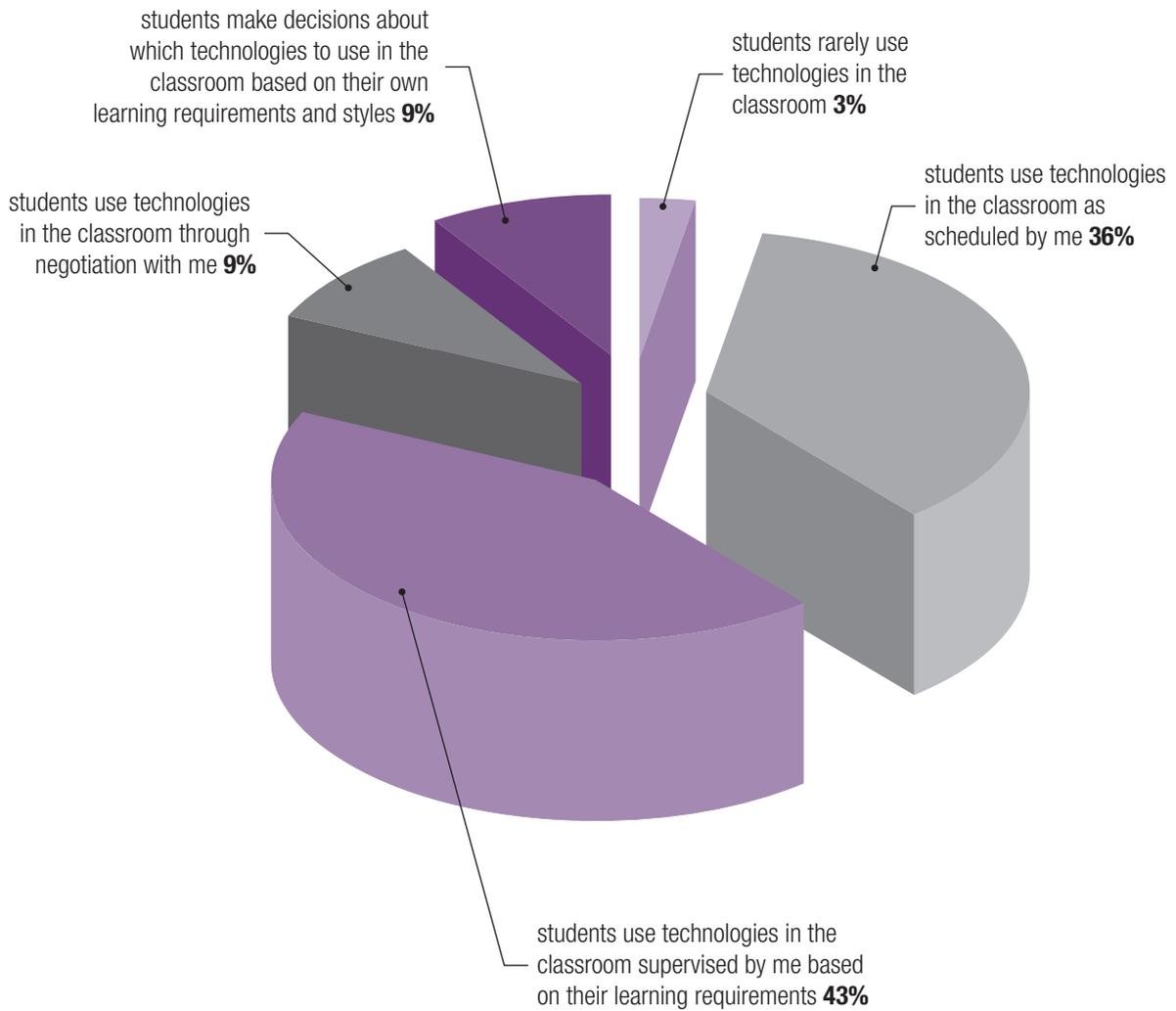


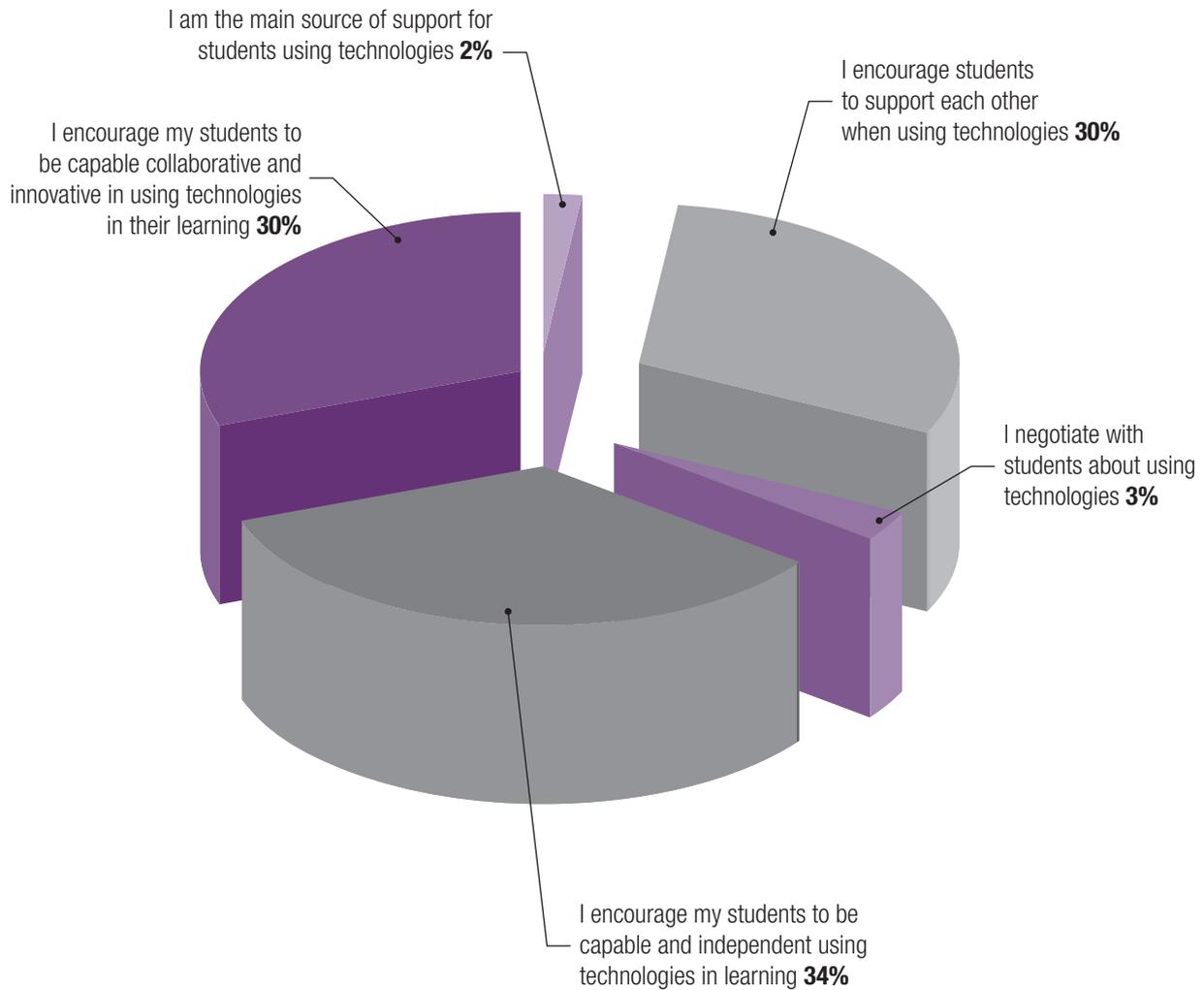
Figure 15: Nature of students' engagement with technologies



The extent to which teachers guide the students in their use of technologies is a question of judgement for teachers. On the one hand there is the goal of encouraging independent learning. On the other, while many school students may come to Northtown already competent in the basic ICT skills, a challenge for teachers is to assist students to use technologies not only to locate information, but to change that information into knowledge, and then to support students to be able to apply the knowledge to new issues, problems and contexts. Asked about the nature of

students' engagement with technologies at school, it can be seen in Figure 15 (above) that 9% of the respondents indicated that they encourage students to make their own decisions about which technologies are likely to address their learning requirements, while a further 9% negotiate over the choice of ICT tools. Another 3% of the respondents indicated that students rarely use technologies in their class. In the vast majority of cases the teachers direct or supervise the students' choice and use of ICT for learning.

Figure 16: Teachers' relationships with students about education technologies



Consistent with Figure 15, Figure 16 illustrates that respondents indicated that they encourage students to be independent learners with technologies. Both figures suggest that while the policy goal to develop independent learners remains important to the school, the day to day practice in many instances does not match the aspiration.

Students at Northtown High acknowledge that the inclusion of technologies in their learning occurs in different ways in different subjects, for example: 'all subjects are full with the use of technologies' and 'most of the GCSE coursework' is done on computers, which are used in 'nearly every single subject' besides

ICT. Various benefits were appreciated, including the ease of use for 'typing up notes', the speed compared to handwritten material and the 'many effects' that were possible for 'essays, homework etc,' thus improving presentation as well as 'looking after your notes.' Laptops were mentioned by several students in the context of school work for various purposes including 'accessing the school's extranet facilities, Studywiz.'

Access to the Internet, either through desktop or laptop computers, meant that 'research is much easier' and other sources of information could be readily explored since 'you can get an awful lot of information from websites that you might

not get in books' for example, 'using things like Wikipedia.' TV programmes mentioned by a few students included the Discovery channel as a source of background information contributing to different subjects.

The students understand that they are expected to become responsible for their own learning and that the technologies at the school provide mechanisms to achieve that. Students indicated that technologies were beneficial in a number of respects, including mastering new technologies such as the highly versatile Smartboards⁴⁹ which 'get used a lot' by students and teachers alike, or writing their own music tracks 'using music keyboards that are connected to the PCs'. Saving or submitting coursework was enabled by electronic means such as memory sticks, email and Studywiz.

The school undertakes, in a wide variety of ways, the variation of learning enhanced by the use of ICT. What started initially as 'blitz days,' when the timetable was suspended to allow for longer ICT-based projects to be undertaken, has now become a regular programme of 'off timetable' days involving a growing number of subjects which have created cross-curricular project work to provide a more holistic experience with ICT and learning.

These various components have been combined into a 'virtual day', where the school has twice joined with another, non-selective school in Belfast to mount a complete thematic study day. On this day, 200 students in Year 11 in each school stay at home and undertake joint learning and assessment tasks, using a range of ICT channels. These include video and audio conferencing, bulletin boards, online platforms and text conferencing by mobile phone to consult with teachers from both schools and with each other on project assignments. These days typically start as early as 8am and run until 6pm as the students seek to meet the deadline for submission of work. The virtual days are reported to result in higher than usual levels of engagement, motivation and on-task working than typically seen during a normal working day.

In summary, the value of technologies in enabling teachers to vary their teaching and learning methods is evidently contributing to a strong base of good practice.

There is evidence of a firm basis for pedagogic benefits such as making use of the students' ICT capabilities in a range of different problems and contexts. There is also strong evidence of transactional benefits in respect of efficiencies in the teachers' and the students' work, and some evidence of transformational

benefits in achieving progress in achieving positive organisational change.

The students' responses indicate that they are both familiar with and generally appreciative of the wide range of technologies used across their subjects, and that their competence extends beyond skills acquired in the classroom to affect other areas of their lives. In this respect, there is evidence of the enhancement of learning, but also of evidence of transformation of learning where e-learning is beginning to provide access to collaborative learning online with other schools. Mastering these benefits to move from exceptional to day to day curriculum opportunities would boost further the attainment of the school's strategic goals.

Ensuring students have access to technologies

Access to technologies at school is fundamental to ensuring the integration of technologies into teaching and learning, and at Northtown High it is also seen as fundamental to students' successful achievement. Access to technologies is also important for ensuring that those students who do not have access to technologies at home, and particularly the Internet, can get access at school.

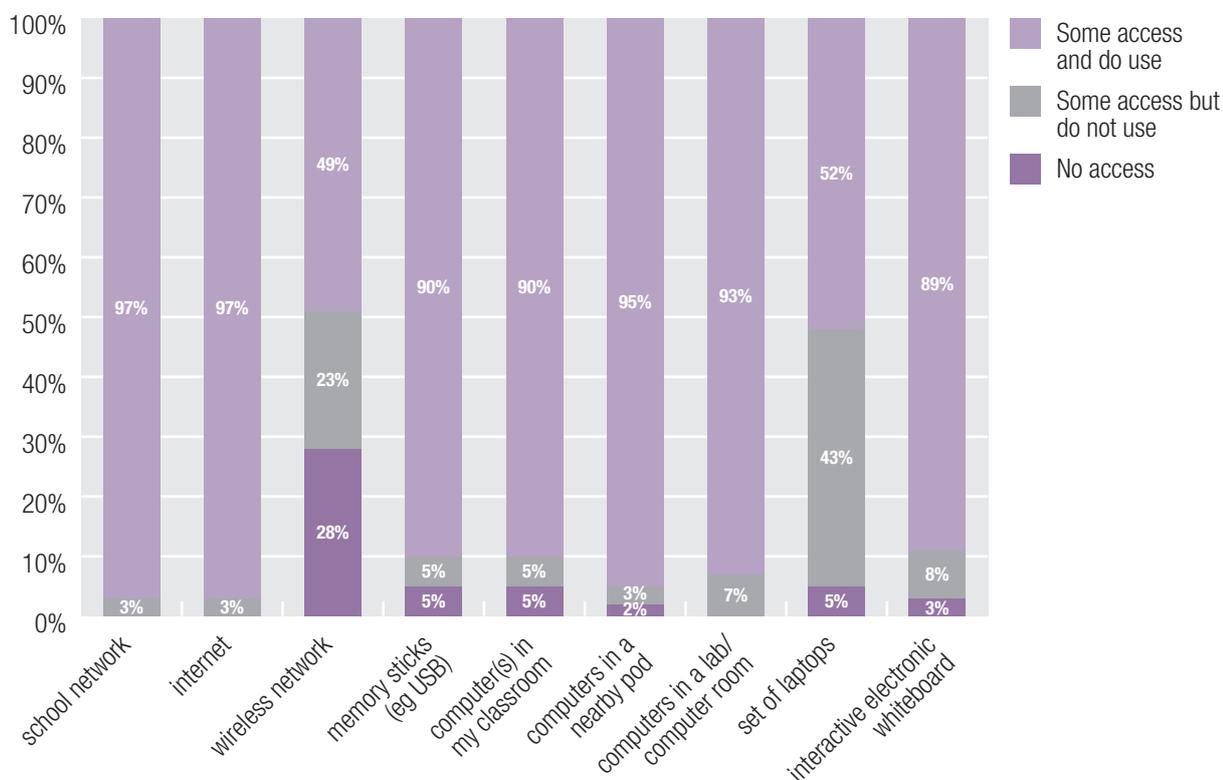
While the investment in and the spread of technology is already very significant, as described elsewhere in this report, Northtown is now developing a range of portals to enhance access at home for a variety of groups. For example, one of the school's GCSE students sustained major injuries while playing rugby, but was able to remain in the 'virtual' classroom for GCSE ICT during his stay in hospital. The principal and his hospital teacher immediately saw the potential of using this type of system in other contexts and, at the time of reporting, another student on long-term sick leave from school is studying online at home.

Access to technologies at home is possible for staff through remote access to their work files and for students through the development of a portal based on Studywiz. For example, in Year 8 students in a religious education class are able to access and complete online quizzes as part of their coursework. Planned developments will also enable parents to monitor their children's learning experience, progress and assessments.

Asked in the survey about their access to technologies for use in their teaching, the teachers indicated that while a range of different technologies are available for classroom activities, the main technologies they use are the school network, Internet, interactive whiteboards, computer laboratories, classroom computers and USB memory sticks.

49 <http://smarttech.com>

Figure 17: Technologies available at Northtown High (Part 1)



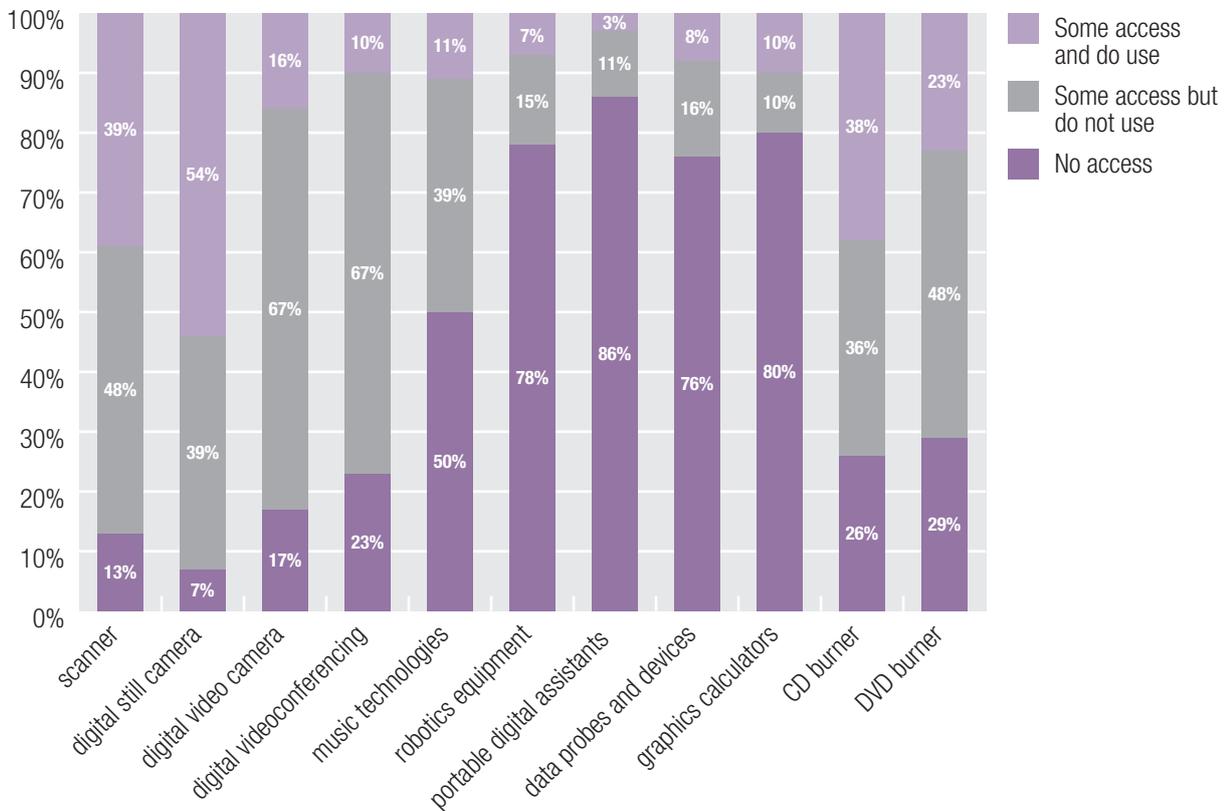
The technologies most readily accessed at Northtown High included lab (93%), pod (95%) and classroom computers (90%). These were employed to utilise the internet (97%) and school network (97%), but to a lesser extent the wireless network (49%). Memory sticks (90%) were widely used, as were interactive whiteboards (89%). Laptops were reported to be used by over half (52%) of the students, reflecting the balance of desktops and laptops available in the schools.

The investment in an open-plan Learning Centre, with a video-conference suite, and its long-hours opening policy (before the school day and in the evenings), and with the appointment of a Learning Centre manager, has enabled almost all of the teachers to take classes in the centre. It is used most significantly (50%) by those teachers who do not already have easy access to computer clusters near their teaching base. The use of the video-conferencing suite is experimental, in, for example, the 'virtual days' with two schools in Belfast, where classes in both schools share online drama teaching.

Technologies most commonly used by teachers at Northtown High include digital still cameras (54%), scanners (39%) and CD burners (38%). Access exists but is not taken up the same degree for various other technologies such as digital video cameras (67%), digital videoconferencing (67%), scanners (48%) and DVD burners (48%). Least take-up of technologies and corresponding lack of access can be seen in the use made of portable digital assistants (PDAs) (86%), graphics calculators (80%), robotics equipment (78%) and data probes and devices (76%). In the case of most of these devices, their use relates to specialist subjects.

Students indicated that while there were technologies available to them at school, when asked about their favourite technology, the two most preferred technologies reported were computers and TV. Considering the prevalence of mobile phones, it is notable that no specific mention was made of them when students were asked about their favourites technologies.

Figure 18: Technologies available at Northtown High (Part 2)



In summary, the overall value of ensuring access to technologies is very high, as evidenced by the high ratio of computers to students, i.e. 1:2.44, compared with an average Northern Ireland schools ratio of 1:4; the significant investment by the school in increasing the government's core provision by more than 200%, and the investment in an open-plan Learning Centre. For every £1 spent by government from central funds in Northtown High, a further £1.27 spend is levered from internal finances.

The evidence of this case study suggests that a computer/pupil ratio of between 1:2 and 1:3 is an essential requirement at whole school level. This level of technology investment is necessary, but is itself insufficient to bring about whole school transformation without the policy commitment and concerted effort in the development of teaching practice.

Using technologies for recording, monitoring, tracking and reporting on students' achievements

The value of technologies was less evident in the survey data in the degree to which the technologies enable teachers to improve their own efficiency and productivity and thereby assist students to meet their learning outcomes. It can be seen from Figure 19 below, the most commonly reported uses of technologies to assist students' performance in external examinations at Northtown High include:

- teachers' use of tools and templates;
- teachers being able to record data and to calculate students' achievements;
- teachers' personal record keeping purposes.

Figure 19: Frequency of use of technologies for assessment, recording and reporting purposes

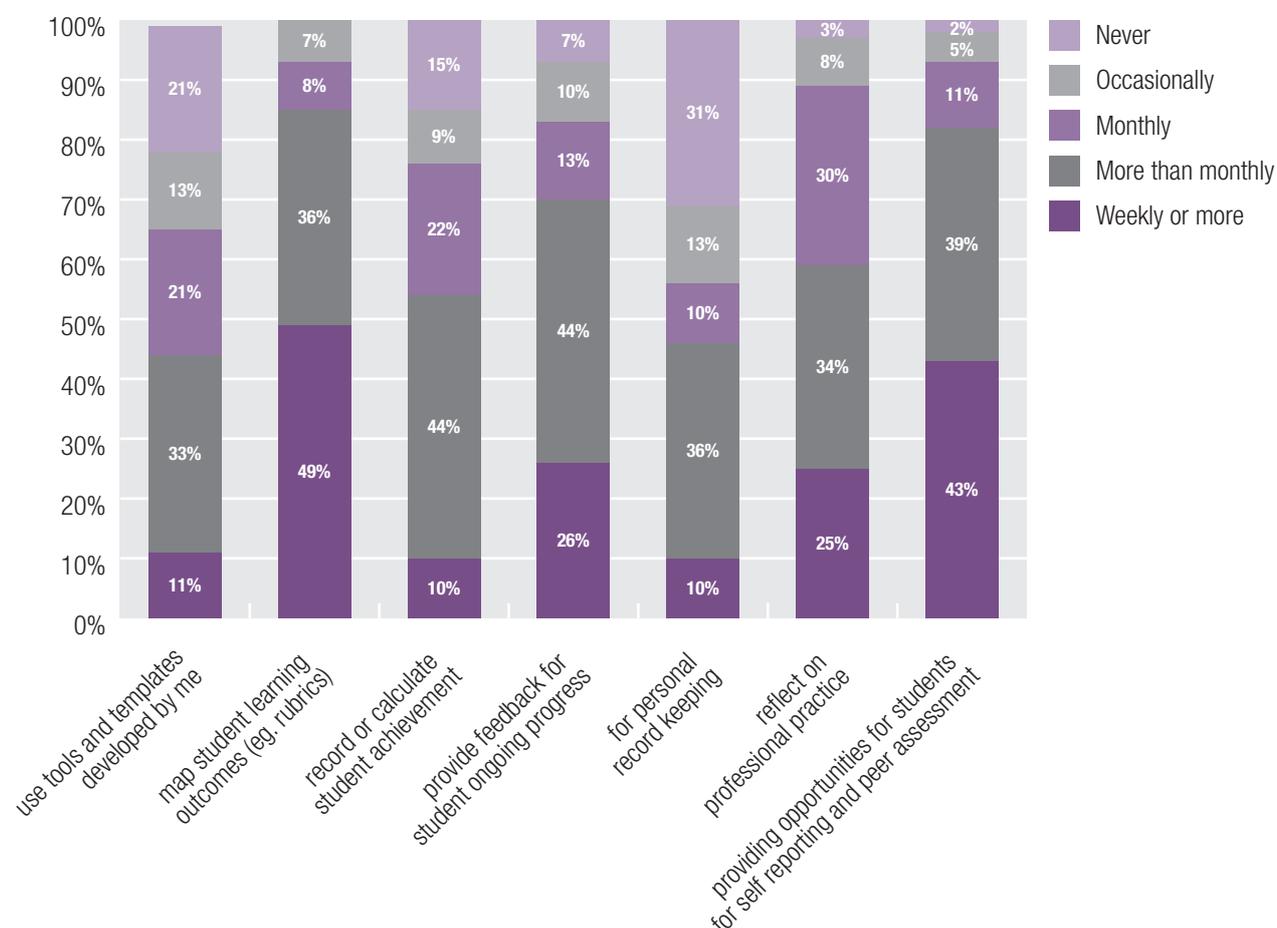


Figure 19 illustrates that the use of technologies to assist teachers in their calculation and recording of students' achievements was not prevalent in Northtown. For example, it can be seen that only 15% of respondents use technologies weekly or more to record and calculate students' achievements, whilst 54% do so only occasionally or not at all.

It is also interesting to note that teachers indicated they use technologies much less for providing feedback to students or for assisting students through self-reporting and/or peer assessment than they do for record keeping purposes. Only 7% of respondents indicated they use technologies on a weekly or more frequent basis to provide feedback to students. In terms of recording student performances, 82% of respondents indicated that they 'never' or only 'occasionally' use technologies to provide students with the opportunity for self-reporting or peer

assessment, while 2% indicated they do so on 'weekly or more basis'.

It can also be seen from Figure 19 that while 31% of teachers use technologies for personal record-keeping on a frequent basis, only 3% extend their use for reasons of professional self reflection. One of the strengths of technology is that it has the potential to create efficiencies in school management processes⁵⁰, allowing teachers to generate productivity gains in their work by automating record-keeping about students.

As part of their Specialist School status, all 18 subject departments are required to ensure that they identify ways and create policies to implement the whole school 'Assessment for Learning' policy. Teachers do this by setting academic targets for students whose work is examined, and reviewing

50 British Educational Communications and Technology Agency (BECTA). (2003). *What the research says about ICT and motivation*. London

Figure 20: Degree of influence of technologies to monitor and track students

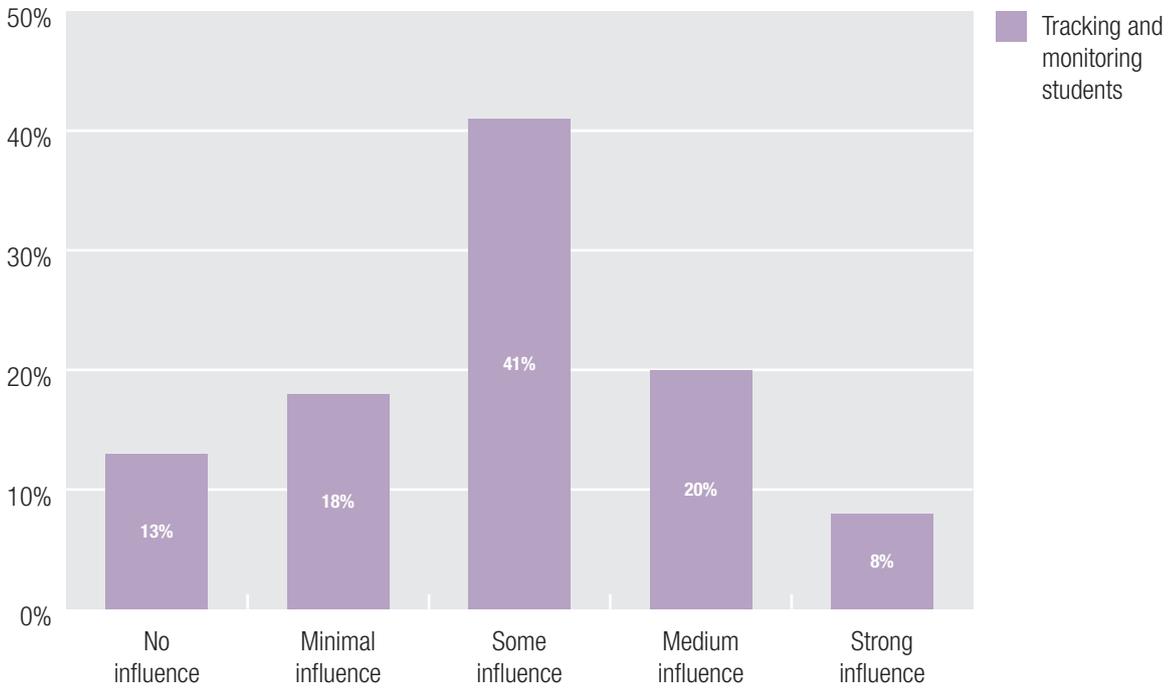
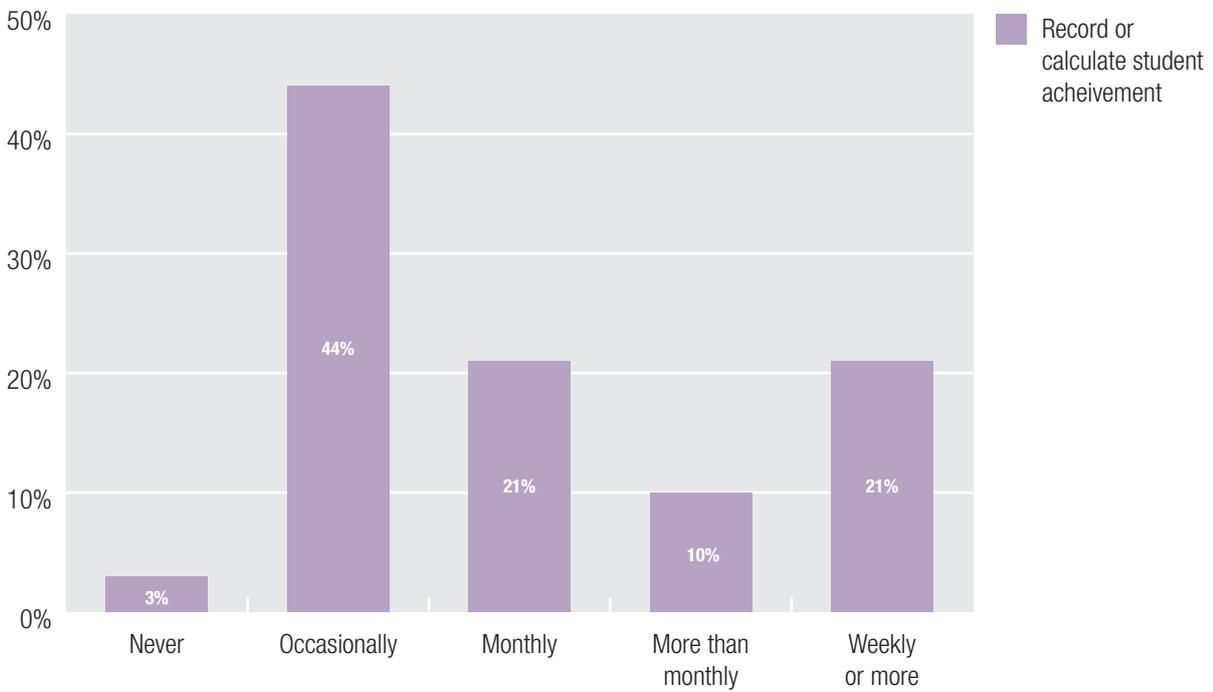


Figure 21: Using technologies to record student achievements



the progress of all students as a matter of routine. The teachers generate indicators of student performance using national sets of benchmarking data including MidYIS (Middle Years Information System); YELLIS (Year 11 Information System) and ALIS (Advanced Level Information System)⁵¹.

They have also streamlined the use of reporting facilities within Studywiz to create a more detailed impression of a student's attainment. Target setting sets out minimum acceptable targets for students to attain. The teachers report formally to the parents twice in an academic year, but this is not yet being done online.

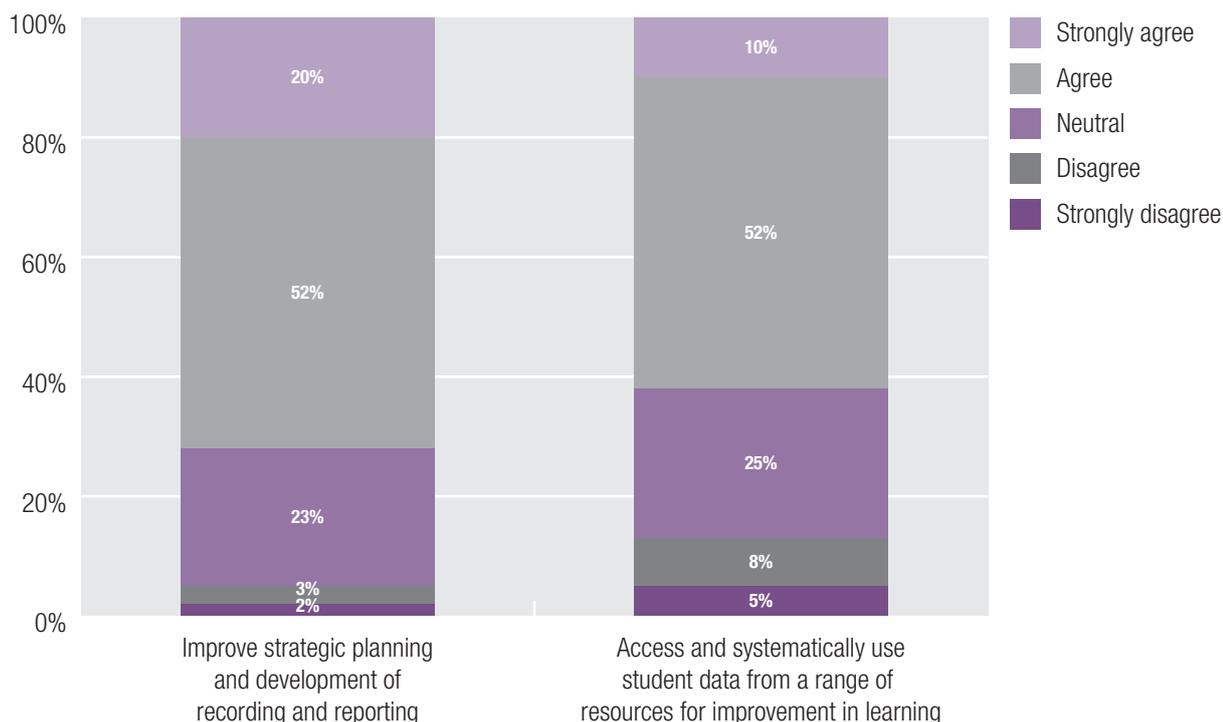
Some 28% of respondents to the survey indicated that technologies influence their ability to track and monitor students to a medium or strong degree, as Figure 20 illustrates. Although 59% of respondents indicated some or a minimal influence of technology in this regard, 13% reported no influence at all.

Similarly, Figure 21 suggests that technologies enable staff regularly to calculate and report students' achievements.

Consistent with Figures 19, 20 and 21, Figure 22 below demonstrates that 10% and 20% of respondents respectively strongly agreed that technologies enabled them to access and systematically use student data from a range of resources for improvement in learning, and improved the strategic planning and development of recording and reporting.

Some 62% of respondents agreed or strongly agreed that access to and systematic use of student data from a range of resources contributed to improvements in student learning. For example, the school has cooperated with three other Specialist Schools to create a web-based test in ICT knowledge and skills for use with students on transfer from primary school to create a baseline on which teaching of ICT can be planned in Year 8.

Figure 22: Extent to which respondents agree that technologies improve strategic planning and access to and use of data



51 Adaptive and predictive computer-based testing systems <http://www.cemcentre.org>

In summary, the value of technologies for recording, monitoring, tracking and reporting on students' achievements is in its relatively early stages. While teachers generally perceive the benefits of using technologies for achieving efficiencies in their work and those of their students, and for improving their performance, the practice is common with only a minority of teachers.

Some of the early benefits have been transactional, making the teachers' record-keeping more efficient. The school has arguably more to do to improve on the potential transformational gains associated with achieving positive organisational change and enabling high quality teaching and learning.

Investment in infrastructure by the school has created enormous potential for increased efficiencies and for improved effectiveness in information benefits such as the quality, quantity and availability of information, including research findings available to those who require them.

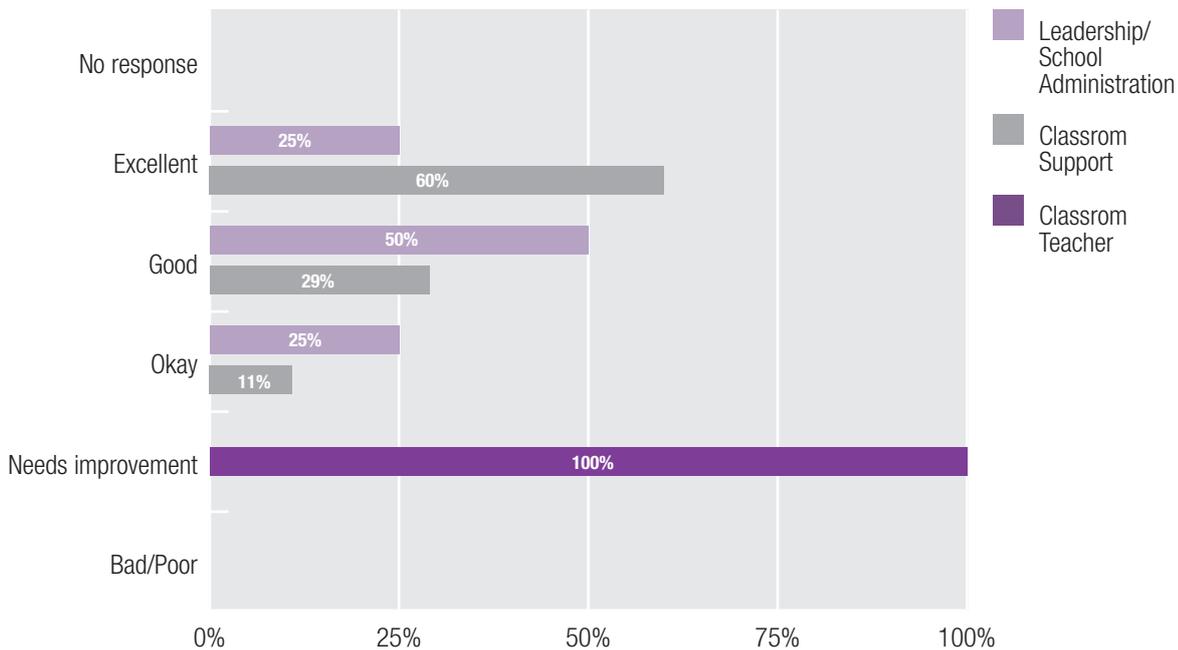
There is a commitment to bring about whole school improvement with the use of data available in the school to analyse how and where improvement is needed in the school's Specialist ICT plan, which is the area for growth within the school.

Developing communication channels

Improving interaction within the school and between the school and home is a priority for future development within Northtown High. The capacity to network computers enables the school and its community to connect to the Internet in a safe and protected, fire-walled environment. In addition, it allows the school's network access to JANET, the academic community network and its international partner networks, as well as to the network of all of the public libraries in Northern Ireland.

As Figure 23 illustrates, teachers in the survey indicated that one of the primary purposes for which they use technologies is to communicate. Importantly, all of the classroom teachers, the leaders and the school administrators say that they can rely on the email system, with 90% describing it as good or excellent.

Figure 23: The teachers' description of the quality of the email system.



It can be seen in Figure 24 that the use of email or messaging tools was almost universally popular with 97% reporting frequent use either weekly or more. However, only 10% of the teachers communicate weekly or more often with their peers in online communities, while 85% report that they never or only occasionally engage in this way.

The teachers report that they are now making more consistent use of the technologies to share resources with each other, including past examination papers, policy documents and minutes of departmental meetings. They also say that they discuss and assess shared teaching resources.

However, when it come to communication with parents, and the importance of communicating with parents and students online, it can be seen from Figures 26 and 27 that there is a dissonance between the belief that such communication is important, and the actual practice. While 72% agree that online communication should increase openness and improve feedback to parents and students, 51% believe it is having no influence and 28% only a minimal influence. There were only a small proportion of the respondents (22%) who see it as currently having an influence varying from 'some' to 'strong'.

The school is presently engaged in addressing this situation, having procured an Etech learning platform solution in order to create a PPPP (Portal for Parents, Pupils and Partners) which will contain e-learning and e-assessment materials. The stated aim of the portal is to reflect the evolving dynamics of the school's interaction with stakeholders, and to reflect the high-quality of learning and teaching which takes place within the school. The portal will provide the students with integrated access to their resources, work-files, web-based Outlook, the school library system and their timetables. It will also provide an e-portfolio for each student and access to synchronous and asynchronous communications.

This practice can be seen, for example, in Home Economics, where the Studywiz platform enables the students to access their work from home. Students can also access study resources compiled by the teachers who have developed multi-media resources and assessment activities for the students. The students are able to record their subject specific work using the e-portfolio features of the environment.

Parents will be able to see, through the PPPP dashboard, data about their child, including attendance and assessment grades.

Figure 24: Frequency of technologies of teachers communicating with others

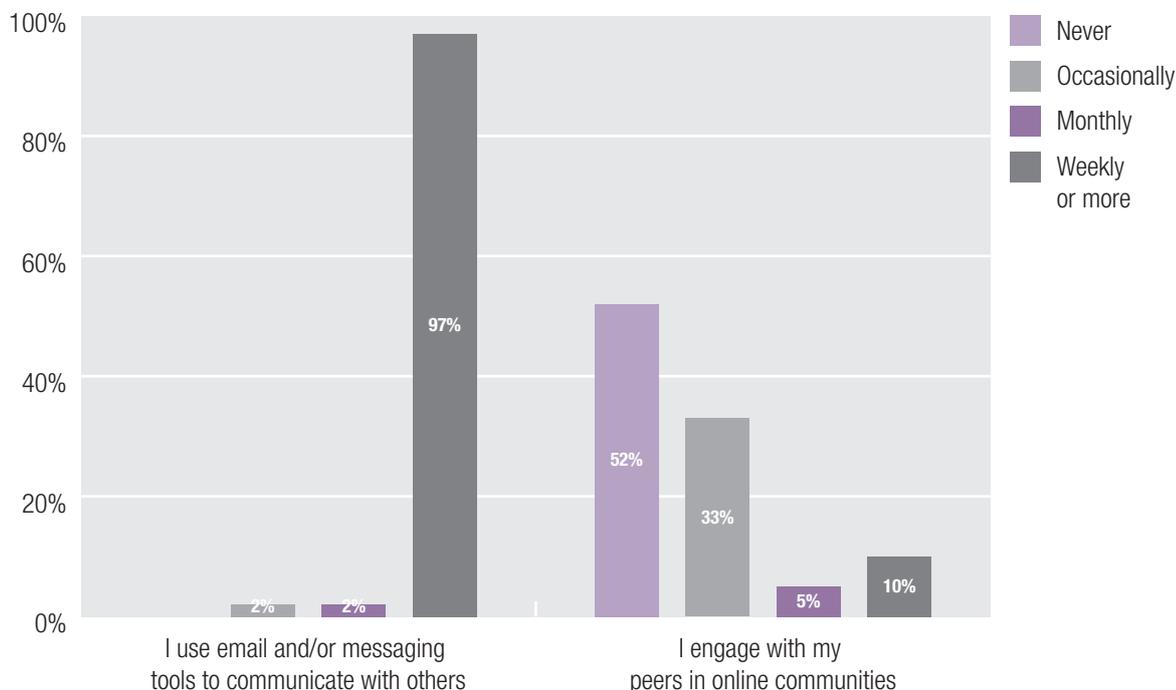


Figure 25: The importance of email for teachers to do tasks easily

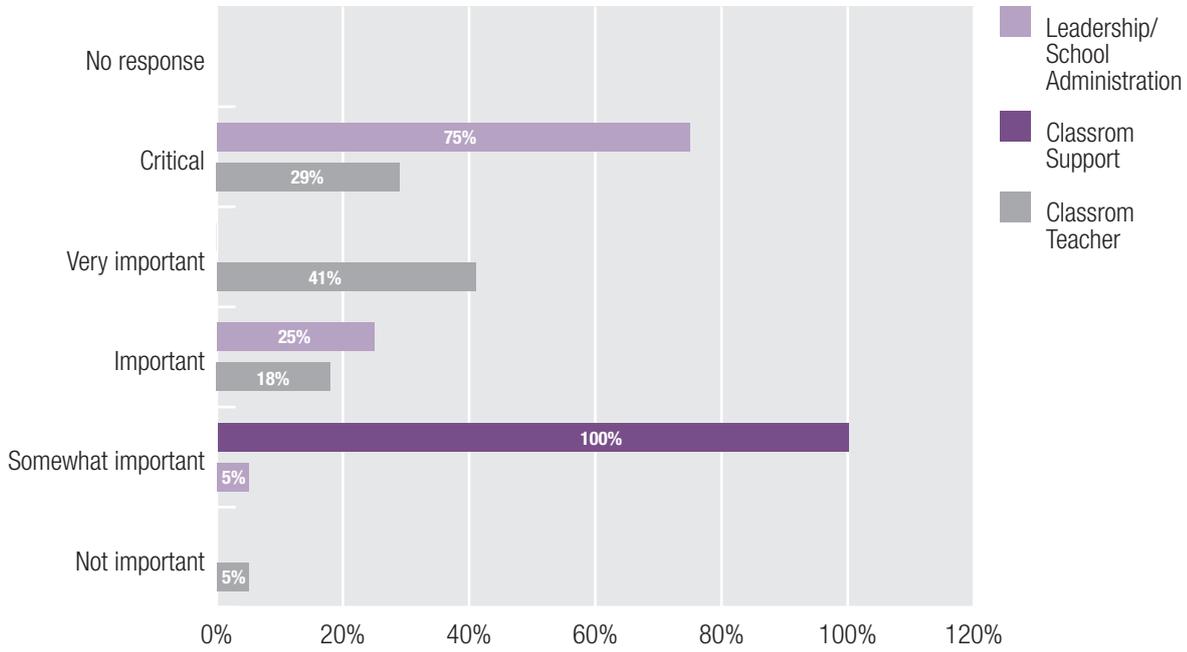


Figure 26: Degree of influence of technologies on teachers communicating with parents

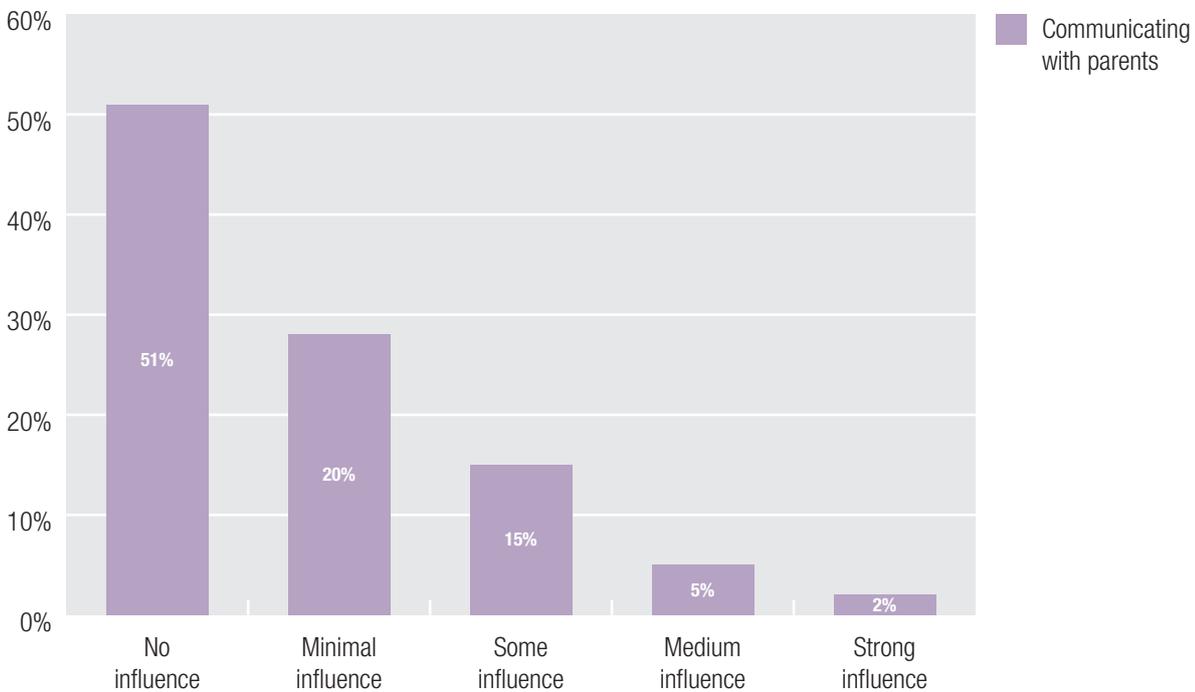
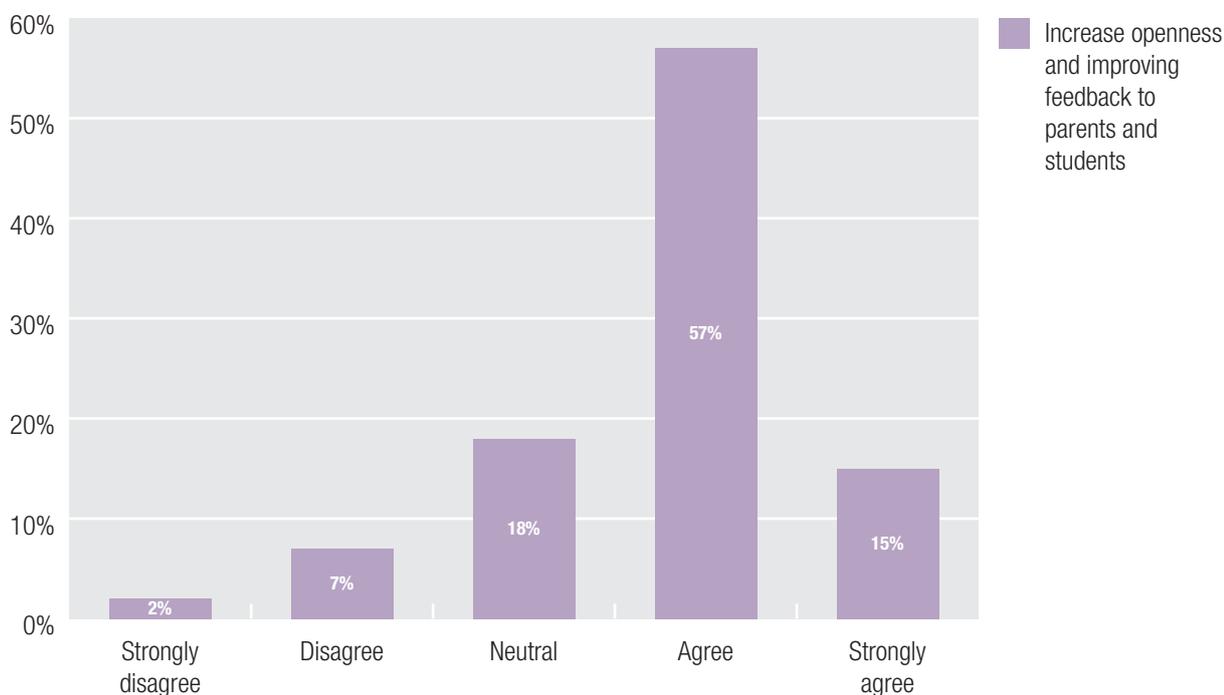


Figure 27: Improving communication with parents and students



It will provide access to all the school's published documents, showcase students' work, provide for communications with staff and enable the school to conduct surveys of parental opinions. Similar integration tools will be available for all staff as well as the ability to track and monitor student progress.

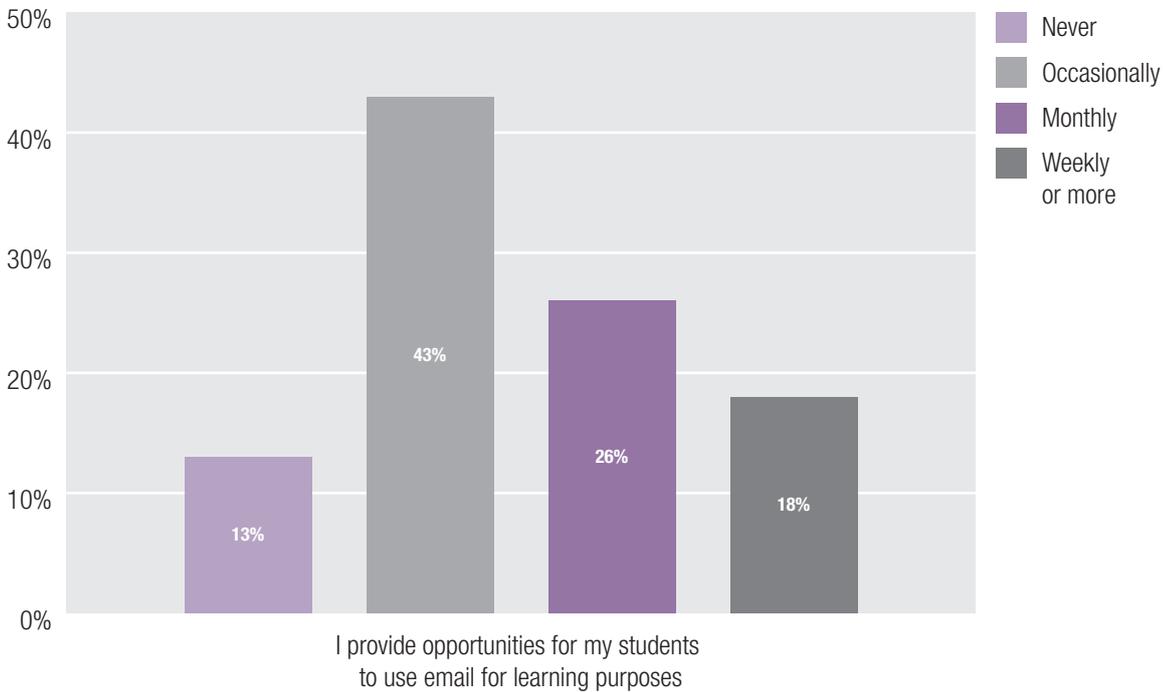
Other stakeholders, such as business and school partners, will be able to publish small websites and access the online courses being developed within the school. Indicative of the school's work with the local community is the appointment of a web designer to create a Specialist Town website as a showcase for local businesses and to complement the Northtown Chamber of Trade website which was originally developed by school students.

Beyond the local community the school has established an e-twinning partnership with a school in Poland to complement the work of a Polish language assistant.

Some 44% of the teachers indicated that they provide opportunities for their students to use email for learning purposes at least monthly or more often, but 43% do so only occasionally. Students indicated that they believe that technologies have helped them to communicate with teachers and that they feel more connected with teachers and other students. As one student stated 'we can send emails to anyone in the school including teachers. This is useful if you were off sick or your printer was broken.'

Furthermore, students indicated that technologies made them feel more connected with one another and with staff. One student felt much better about submitting coursework since 'my handwriting is very bad (and) word processing helps this'. Frequent use was made of home computers and laptops to keep in touch with one another to do 'research on school work', ask friends about different topics being studied, and write emails or 'type up coursework' among other things.

Figure 28: Frequency of opportunities provided to students to use email for learning purposes



In summary, the use of technologies for communication is an important area for growth in Northtown. It is a priority for improvement to secure better overall value of technologies by opening up communications not only within the school, but also with parents, students and other stakeholders.

To promote and share learning with colleagues about the work in the school, a wide range of educational articles are regularly prepared and published in professional journals and magazines, including a variety of case studies of the school produced in government and national agency publications⁵². The promotion and sharing of experiences of the school in articles provides a 'branding' strategy for Northtown High.

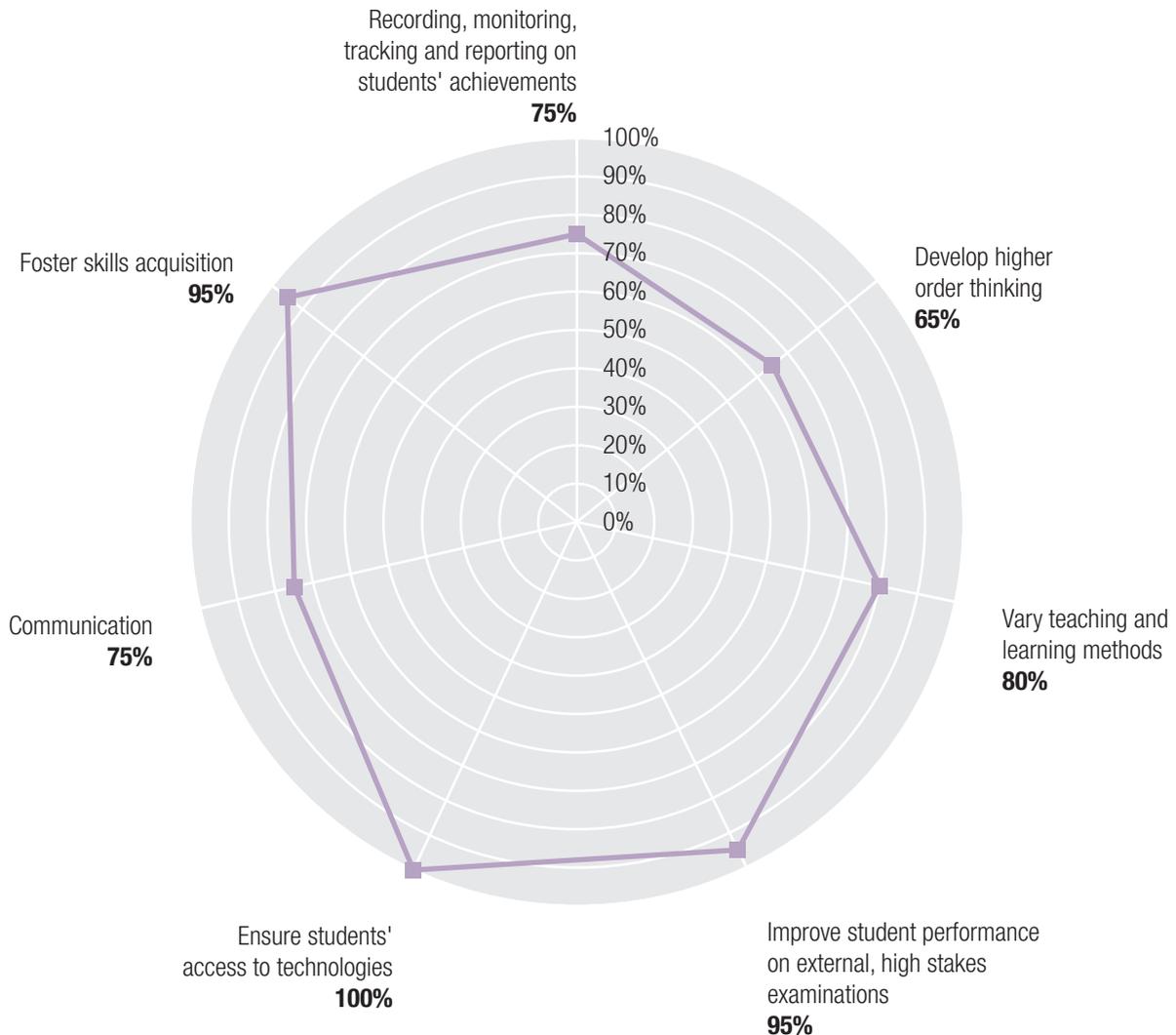
Teachers already see the benefits of such improvements and the school has made the investment in the technologies which are

necessary for a transformation in practice over the next period. Both teachers and students report that communication strategies are important to the quality of their work. 61% of respondents to the survey agreed that technologies improved their communication with parents, and 49% of respondents indicated they use email on a daily basis. These approaches are consistent with the respective strategic plans of the school: effective links have been established with a range of key partners and the school has ensured that there are effective structures and personnel to support this work both in the community and in the school itself.

The opportunity to extend and strengthen the connection of the school to its global partners to share the very best practice is a significant potential to ensure that the school's name is known throughout the world.

⁵² www.futurelab.org.uk/resources/.../web.../Web-Article1033, www.northgate-managedservices.com/.../ballyclare-high-school/, www.northgate-managedservices.com/case-studies/www.ballyclarehigh.co.uk/news/ictmarkaward07.htm, <http://www.ballyclarehigh.co.uk/news/bectaawardnov06.htm>, www.delni.gov.uk/.../nta07-ballyclare-high-school.htm, www.leadermagazine.co.uk/article.php?id=1284, www.tes.co.uk/article.aspx?storycode=362210, http://partners.becta.org.uk/upload-dir/downloads/page_documents/research/VLE_report.pdf

Figure 29: Value of technologies for teaching and learning goals of Northtown High



Overall the high importance attached to the use of technologies in teaching and learning at Northtown can be illustrated in a spider diagram as in Figure 29.

In this diagram, it is clear that, relatively speaking, the teachers attach less importance to the role of technology in developing higher order thinking, monitoring progress, communicating or varying the methods of teaching and learning than they do to its roles in improving student performance in high stakes tests, ensuring they have access to appropriate technologies and fostering skill acquisition.

Linking Learning with Intangible Assets: Measuring the Value of Human, Organisation and Information Capital

Intangible assets enable the value of technologies for students to be realised. Identifying the intangible assets of human, organisation and information capital enables the recognition of what strategic capabilities are contributing to students' achievements with technologies and where there are gaps in the strategic readiness of a school. Recognising the value associated with the various types of 'capital' can be accomplished with a five-dimension frame, namely:

- **Pedagogical benefits** such as:
 - fostering ICT capabilities that can be applied across the range of subjects and content standards;
 - the development of higher order thinking skills;
 - the ability to apply ICT capabilities to a range of different problems and contexts.
- **Information benefits** such as:
 - the quality, quantity and availability of information including research findings available to those who require it.
- **Strategic benefits** such as:
 - creating advantages and gaining alignments between the overall goals of the school and the technology goals.
- **Transactional benefits** such as:
 - those that enable efficiencies in teachers' and students' work.
- **Transformational benefits** associated with:
 - achieving positive organisational change;
 - enabling high quality teaching and learning.

The following sections set out the details of the human, organisation and information capital in place at Northtown High that are contributing to students' learning with technologies.

Human capital

The phrase 'human capital' refers to the competencies and commitment of the people within an organisation such as a school. That is, human capital refers to the skills, knowledge, experience, capabilities and capacities of people. The concept of human capital as an intangible asset captures all the people-oriented capabilities required for a school to be successful. People are only an asset within the education context however, insofar as they invest their capabilities into the school and school education board area for the benefit of the students. That is, people are critical assets for schools to meet their obligations in relation to students successfully achieving the learning outcomes required of them.

Learning with technologies and the staffing profile of the school are inextricably linked. The staffing profile reflects what it is the school is seeking to achieve.

Teachers are fundamental to students' learning, and they represent a significant investment in the future. The salaries for

staff across Northtown High represent some 84% of their total budget. The value of the human capital can also be seen in the leadership and in the staff capabilities within the school. There is also a strong alignment between the human and organisation capital available within the school.

Leadership

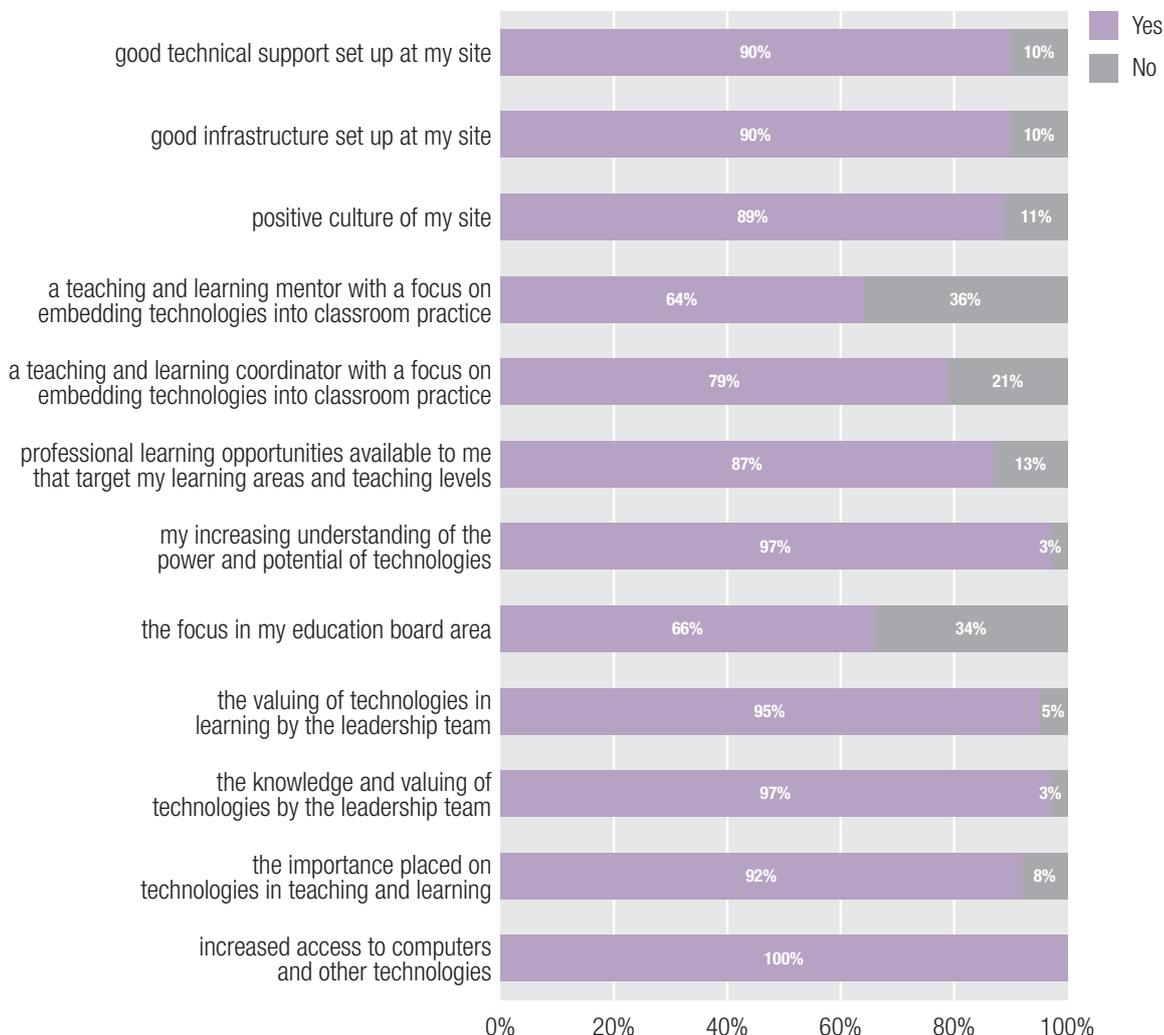
To integrate technologies meaningfully into teaching and learning requires the school leadership and teachers to have a clear strategic focus on learning, teaching and organisational improvement. Northtown's principal describes the approach to the leadership and management of education technologies as horizontal in structure and distributed in nature. The involvement of a broad representation of staff in managing change is considered the best way to utilise the breadth of vision which the school has about the fundamental role of ICT in teaching and learning.

The school manages its investment strategically, through an education technology strategy group. This group has delegated responsibility from the school principal to research and set policy for ICT procurement and practice. This education technology team comprises the vice-principal/bursar, the Specialist School coordinator, the head of ICT and the head of technology support, and it takes the driving role with active support from and direct access to the school principal. The group is well able to articulate their aspirations as endpoints, including what sort of learning and learners they are trying to develop and what organisational structures will support their development.

The principal talks about the development of vision and strategy in the school as a fifteen year journey during which time the school has moved from a focus on procurement to a focus on pedagogy. The principal encourages the school to become involved in national awards schemes, competitions and assessment exercises, including the current study to measure the value of education technology, as a means of interrogating and challenging the judgement of the staff and of promoting dialogue and learning across the school.

The school is an important member of the emerging Northtown Learning Community. It works closely with the non-selective Northtown Secondary School to provide a post-16 entitlement curriculum choice to all students in the community, and has appointed a primary liaison teacher to work directly with 19 of its contributory primary schools. In both cases, the use of ICT is central to providing access to online courses of study with the local non-selective secondary school and to build the capacity of

Figure 30: Staff perceptions of leadership



the primary students to make effective use of ICT. Asked about the knowledge and valuing of technologies by the leadership within Northtown High, 97% of the teachers indicated that they found their support useful (see Figure 30).

Leadership for the inclusion of technologies throughout the school is characterised by a distributed and inclusive model. This involves key members of staff being responsible and accountable for leadership within his or her area, where that leadership is a property of a group of people. Distributed and inclusive leadership brings together the human capital of

individual leadership capabilities and leverages these individual capabilities with organisational approaches to leadership.

Staff capabilities

The knowledge, skills and capabilities of the staff of Northtown High contribute to their value or capital. The value of the human capital (or the staff of the school) requires they stay up-to-date with and understand emerging pedagogical developments. If education technologies are to be included in teaching and learning strategies, particularly in innovative and varied ways, then the

capabilities of the staff are fundamental to achieving such an aim. Figure 31 below indicates that 48% of the respondents to the online survey indicated they enjoy using technologies, and that this is correspondingly beneficial to their work. 62% of the respondents indicated that technologies are integral to their working practices in the classroom, they find technologies motivating, and that others recognise their expertise. This level of self-efficacy amongst the staff toward including technologies in their work is necessary so that no-one believes that technology is irrelevant to their role, and there is complete confidence about the directions being taken in the school.

These are 'teacher-leaders' who are actively reflecting on their teaching and learning strategies to include technologies in their classroom activities in effective ways. This group of teacher-leaders represents a critical mass of motivated staff willing to change and learn. The education technology team actively supports all of the teacher-leaders. 79% of the teachers report that the coordination role offers useful support.

Knowledge

Staff capabilities with technologies, in part, are related to the regularity with which they use particular technologies, and their ability to remain up-to-date with technologies appropriate for

their specific purposes. Knowledge of developments concerning teaching and learning with education technologies also assist staff in change processes.

After fifteen years of investment in capacity building, the school is very largely self-sufficient in ICT professional development and offers peer support, on a rotational basis, which is tailored to the individual needs of the teachers. In addition, each teacher, including newly appointed staff, is paired with mentor (a 'buddy'), organised on an inter-departmental basis. In response, 64% of teachers say that the mentor role provides useful support. A choice of support packages and 'drop-in' sessions, at different levels, is available to all staff. 75% of the staff hold the European Computer Driving Licence⁵³ and 70% have completed a commercial training qualification in the use of interactive whiteboards.

In this study, when asked about the way in which they stay up to date with technologies appropriate to their learning contexts, 80% of respondents indicated that they basically or strongly agreed that they stay up-to-date with new versions of relevant technologies; 87% regularly learn new technologies which are relevant to their roles. Figure 32 illustrates these findings.

Figure 31: General self-assessed confidence in technology capabilities

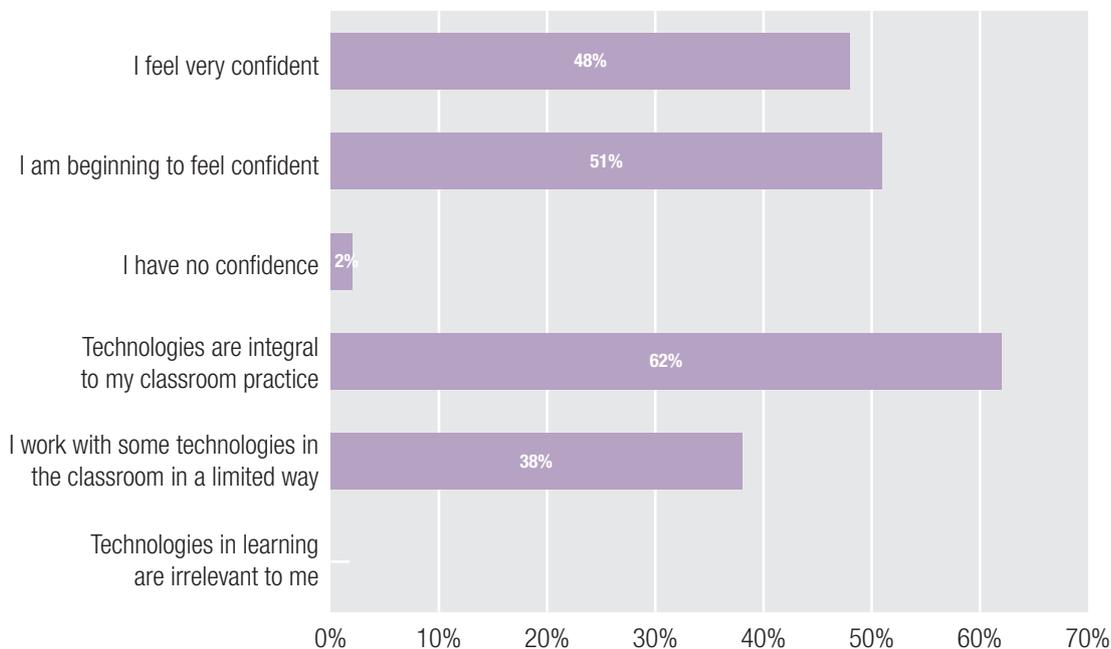
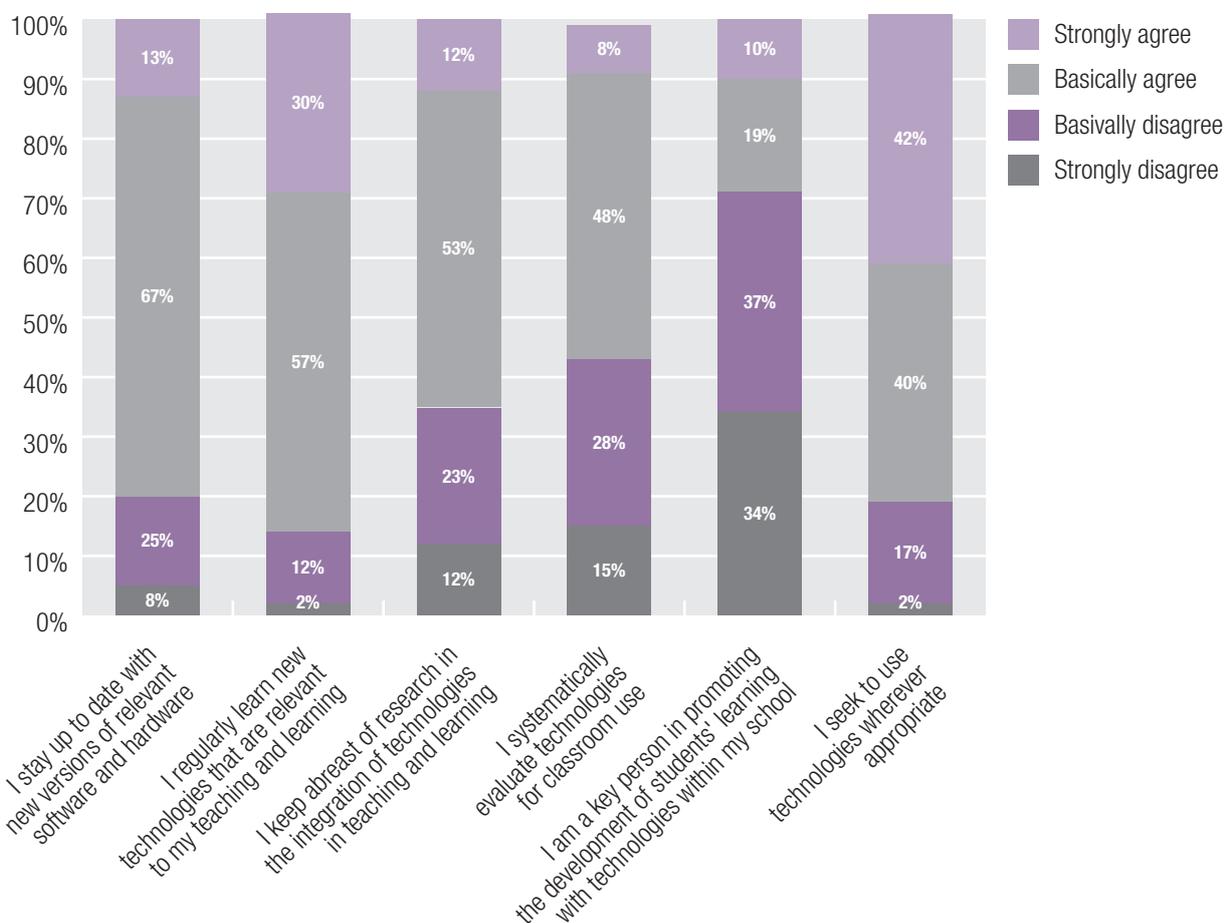


Figure 32: Staying up-to-date about learning with technologies



Skills and capabilities

Staff skills and capabilities in accessing and using technologies in the planning and preparation of their work, and in the promotion of student work, are indicators of the ways in which teachers include technologies in their day to day work, and are a reflection of the value of technologies to teachers. It can be seen in Figure 33 below that 30% of respondents to the online survey indicated that they use technologies on a daily basis and a further 28% on a weekly basis to prepare their own resources and lesson plans for use with their students.

While 24% of respondents indicated that they use technologies to post their students' work, ideas and resources for electronic access by other teachers on a monthly or weekly basis, 36% of respondents indicated that they never did so. It is interesting

to note though that 18% of respondents indicated that they did share information and files with other teachers on a daily basis, thereby highlighting the value to teachers of some of the communication functions of technologies that are available to them.

Furthermore, it can be seen in Figure 34 that all respondents consider they have 'some skill', are 'competent' or are an 'expert' in locating electronic resources. When asked to rate themselves in identifying electronic resources from authoritative sources, 11% of respondents indicated that they are novices in this area. Overall, the degree of competence expressed by the respondents is highly valuable to the school, as it represents a core group of capable teachers who can create a critical mass of motivated staff willing to change and learn.

53 <http://www.ecdl-courses.co.uk/>

Figure 33: Frequency with which teachers use technologies in their work

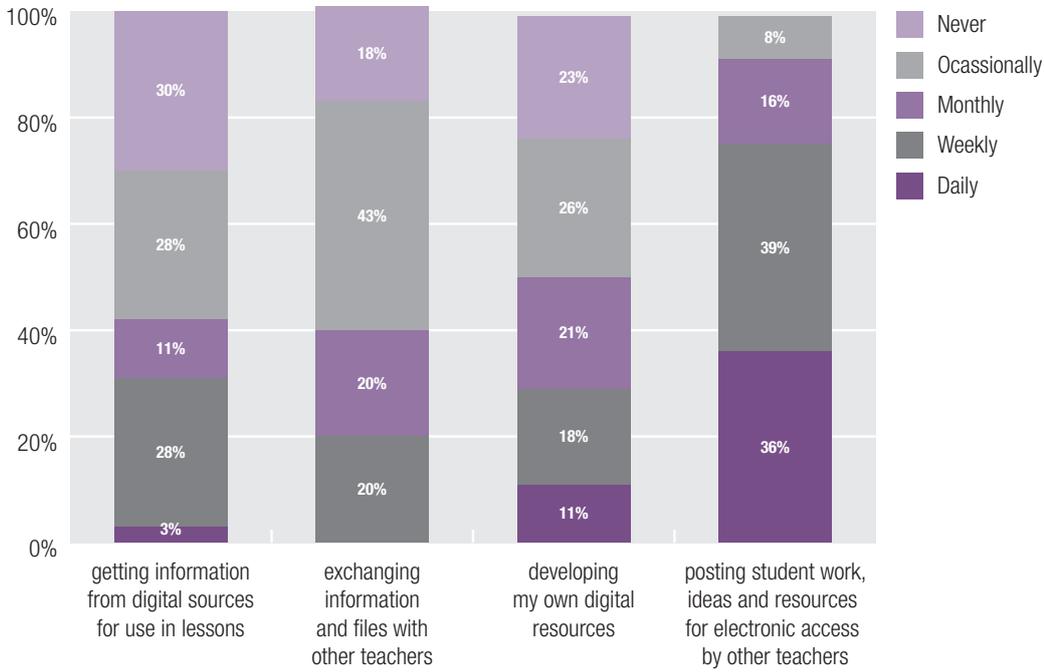
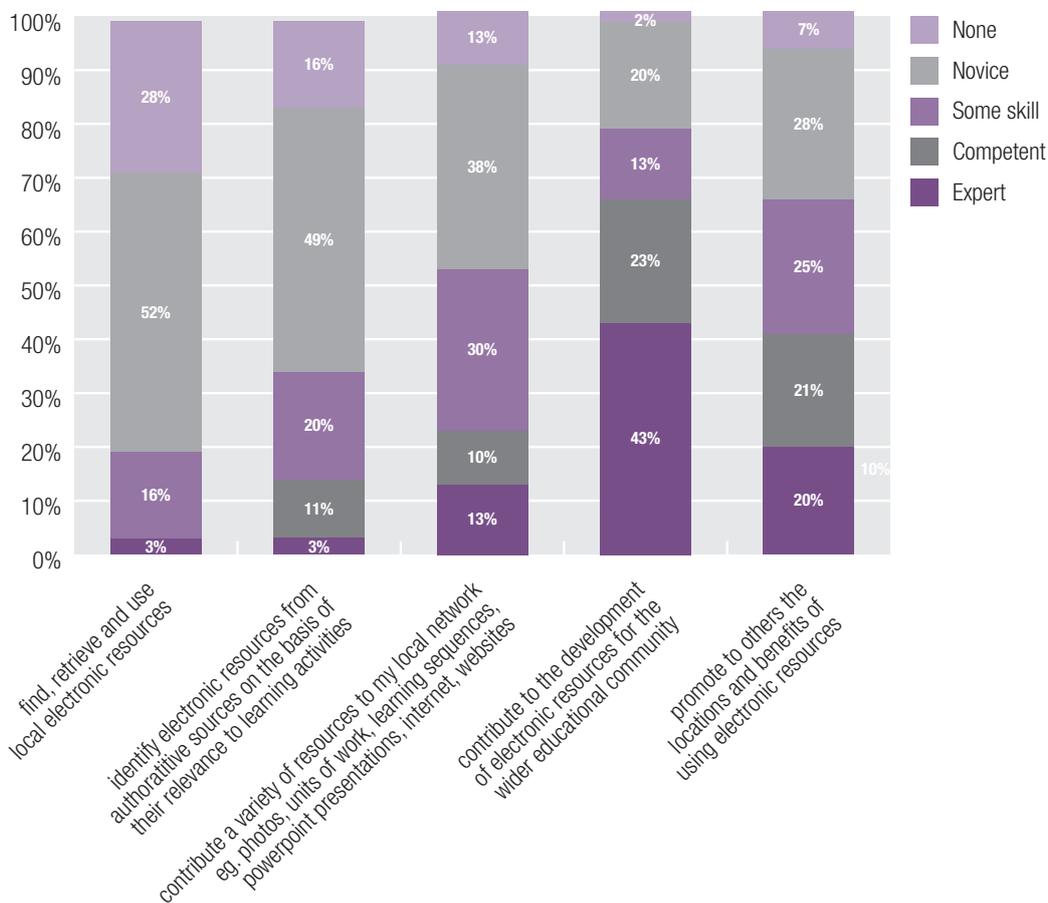


Figure 34: Teachers' self-assessed competence with education technologies



Frequency of use of technologies

The frequency with which teachers use technologies with students is indicative of teachers comfort and capability with technologies in teaching and learning, and many of the respondents indicated they consider themselves as ‘competent’ with using technologies. More than 48% of the respondents also indicated that they either incorporate or seek to incorporate on-line activities into their teaching on a monthly or weekly basis at least. Figure 35 illustrates the extent to which technologies are integrated in various approaches.

Figure 35 also shows that on either a weekly or monthly basis 42% of the respondents use learning objects for student learning. It would seem though that the online resources which they use in class are from third party providers. That is, 52% of the respondents indicated that they never author their own online resources for use in class.

The value of the human capital in terms of indications of its benefit to the school is summarised in Table 10.

Figure 35: Frequency of teachers' use of technologies with students

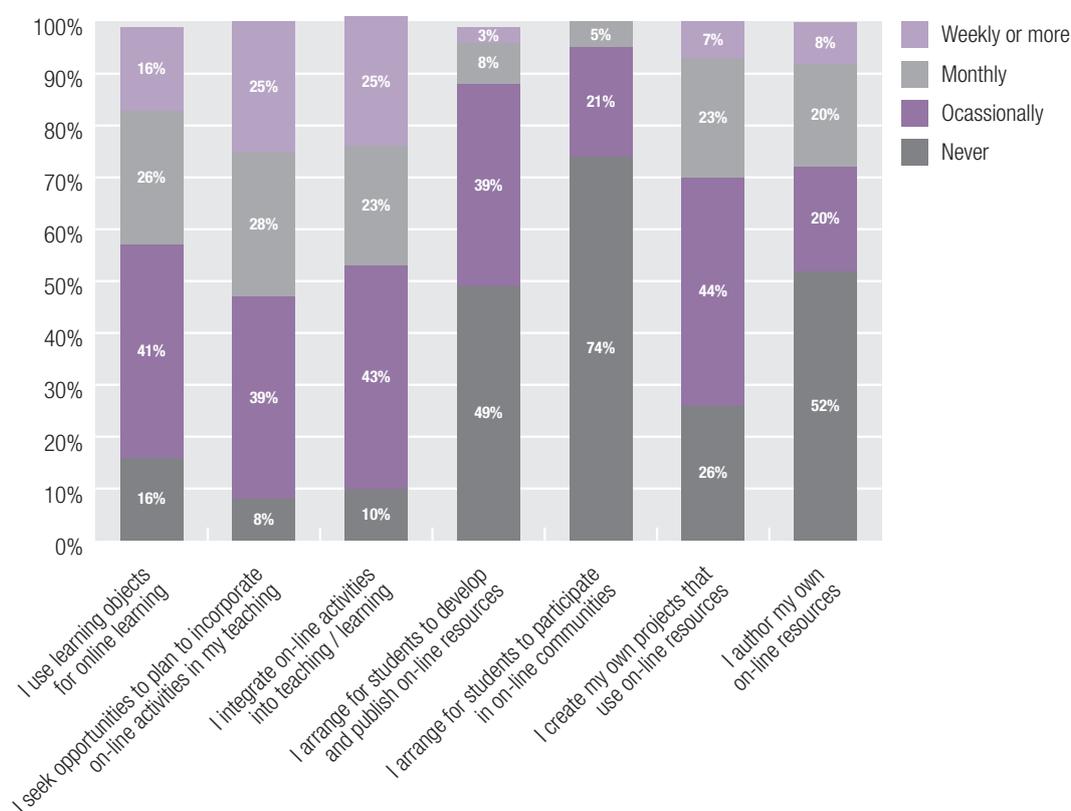


Table 10: Indicators of the benefits of human capital in Northtown High

Pedagogical benefits	Information benefits	Strategic benefits	Transactional benefits	Transformational benefits
There is a strong focus on developing ICT skills that support the pedagogic use of ICT to improve learning		There is evidence of effective leadership of the strategic development of ICT across the school and the alignment of investment to learning outcomes	Strategic benefits are in turn underpinned by the development of staff capabilities and knowledge, skills and capabilities, and a high level of use of technologies	There are useful frameworks for subject departments to build on and extend their known strengths

Organisation capital

Organisation capital can be characterised by leadership strategies; alignment of strategic plans and actions; teamwork; and the culture of the school. Organisation capital also sits in the degree of alignment between organisational strategic goals and organisational practices. Professional learning is positioned at the intersection of human and organisation capital because professional learning builds the capabilities of teachers and also builds the organisation capital of a school.

Organisation capital influences the work of teachers and leaders within Northtown High. It is seen in important intangible assets for achieving high quality outcomes with their students and is evidenced in:

- the culture of the school;
- distributed leadership and management structures;
- policies, plans and decision-making approaches; and
- professional learning.

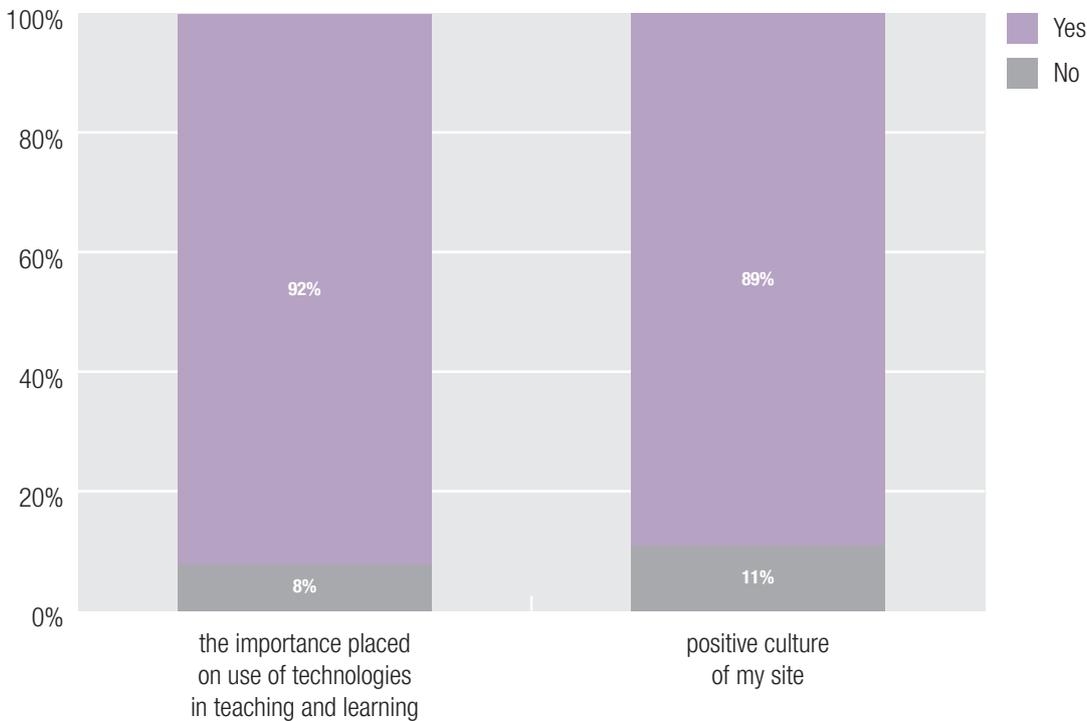
Figure 36 below shows that respondents to the online survey indicated that they consider there is a positive culture at the school, and organisational importance is placed on the role of technologies in teaching and learning.

These characteristics of the school set its tone in relation to the use of education technologies.

Culture

The school context and school culture are inextricably linked. The culture of the school can be considered to be the assumptions, expectations, norms and values that underpin the work of the school. The school climate forms part of the school culture. A school climate can be broadly defined as its internal features that exert an influence on those at the school and distinguish it from other schools. The school climate is influenced by individuals and groups, often involved in symbiotic relationships. These characteristics of a school culture and climate are reflected in symbols and practices such as a common language, shared concepts, defined organisational boundaries, the selection processes for staff at the school, methods of allocating authority, power, status, allocated resources, norms for handling interpersonal relationships, and the ways of coping with unpredictable events. A shared culture can help to create meaning and inspire commitment and productivity within the school.

Figure 36: Staff views of organisational matters influencing their use of education technologies



A school culture requires leaders who see technologies as integrated with, not separated from the curriculum. At Northtown High there is a strong sense of purpose around the integration of education technologies into teaching and learning.

Distributed Leadership

Bringing about organisational improvement, including the integration of technologies, into classroom practices requires effective leadership. Individual leadership capabilities can be considered human capital while a distributed style of leadership represents organisation capital. At Northtown High both types of leadership approaches are used to achieve their required outcomes. As is described under Human Capital above, the school principal describes the approach to the leadership and management of education technologies at Northtown High development as horizontal in structure and distributed in nature. The school therefore involves a broad representation of staff in managing change as the best way to represent the breadth of vision which the school has about the fundamental role of ICT in teaching and learning. Figure 37 below reflects some insights into the knowledge of staff of key technology-usage policies. It can be seen that greatest awareness among the staff related to policies concerning the Internet (90%), filtering (82%), viruses

and network security (77%), and licensing (75%). Overall the respondents were less well-informed about other specific policies with significant proportions, responding 'don't know' in relation to internet etiquette (38%), plagiarism (36%) and privacy (34%).

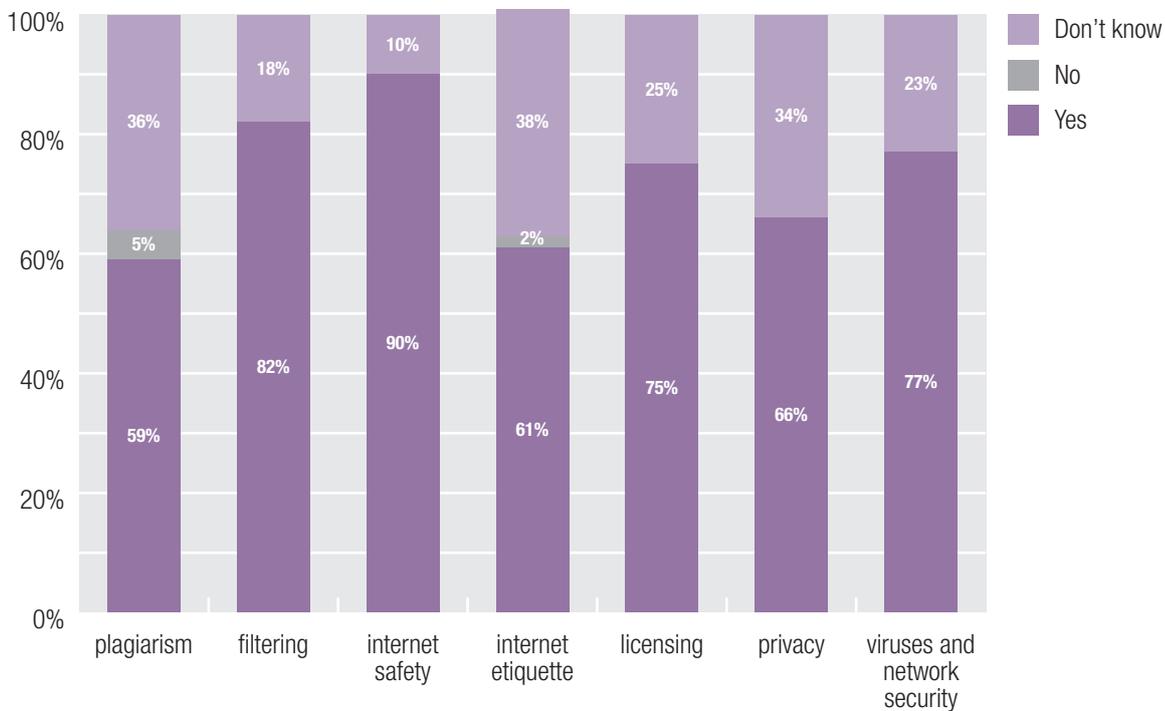
The range of policies and strategic plans available within Northtown High provide documented directions about the aspirations and approaches being used to include technologies in classroom practices including, for example, professional learning.

Professional learning

The value of professional learning for both human and organisational purposes is that it provides the pathway for enabling transformation through educating and motivating people. Professional learning also enables alignments to be developed between strategic plans and the capabilities of staff.

At Northtown High the pedagogic capability of teachers to employ the appropriate active learning and assessment for learning methods, which are supported through the use of ICT, is central to the programme of professional learning in the school. Through a programme of Performance Review and Staff Development (PRSD), each teacher is obliged to select one of the five key

Figure 37: Staff knowledge of policies pertaining to the use of technologies

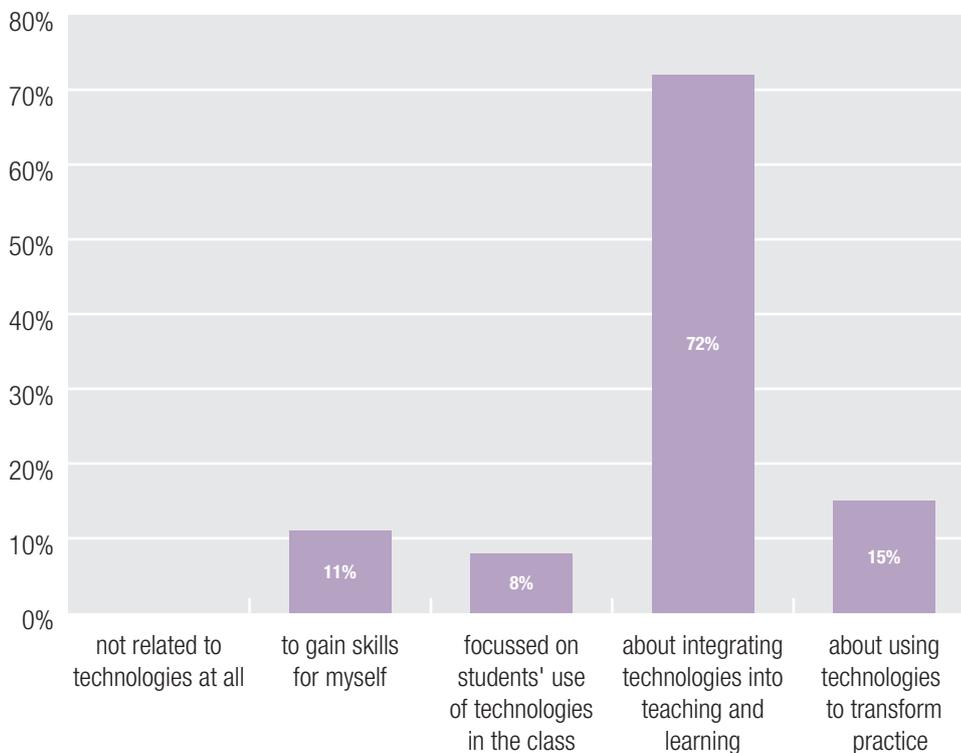


characteristics of high quality learning and teaching with ICT⁵⁴ as a personal annual objective. These are: 'autonomy, creativity, capability, scope or quality', and the teacher is required to develop the selected characteristic through their teaching. A lesson or a number of lessons are then observed and critically reviewed by a peer, to demonstrate their developing capability. Overall progress is audited annually through a staff development e-survey.

A small group of the teachers in Northtown High are engaged in a pedagogical training programme to help them to develop the capability for the creation and implementation of online courses in Learning NI⁵⁵ in order to build progress in e-learning.

Asked about the nature of the professional development they undertake, 72% of the respondents to the survey indicated that they are interested in professional learning activities relating to integrating technologies into teaching and learning (see Figure 38).

Figure 38: Nature of professional development undertaken



⁵⁴ From the NAACE definition for e-maturity; NAACE is a professional association for those concerned with advancing education through the appropriate use of information and communications technology at www.naace.org

⁵⁵ www.c2kni.org.uk/

The survey also asked about preferred methods of undertaking professional development and the answers revealed several preferred learning styles (see Figure 39), with the most popular variant being formal development activities at school (39%). One of the ways a school can foster an environment of ongoing learning is to build the relationships between peers in order to

provide support and guidance. Figure 40 below illustrates that various degrees of self-sufficiency and capacity to support others were expressed by up to 59% of the respondents, while the largest single group (37%) considered themselves able to use the technology but still needing some support from others.

Figure 39: Preferred methods of undertaking professional development about learning with technologies

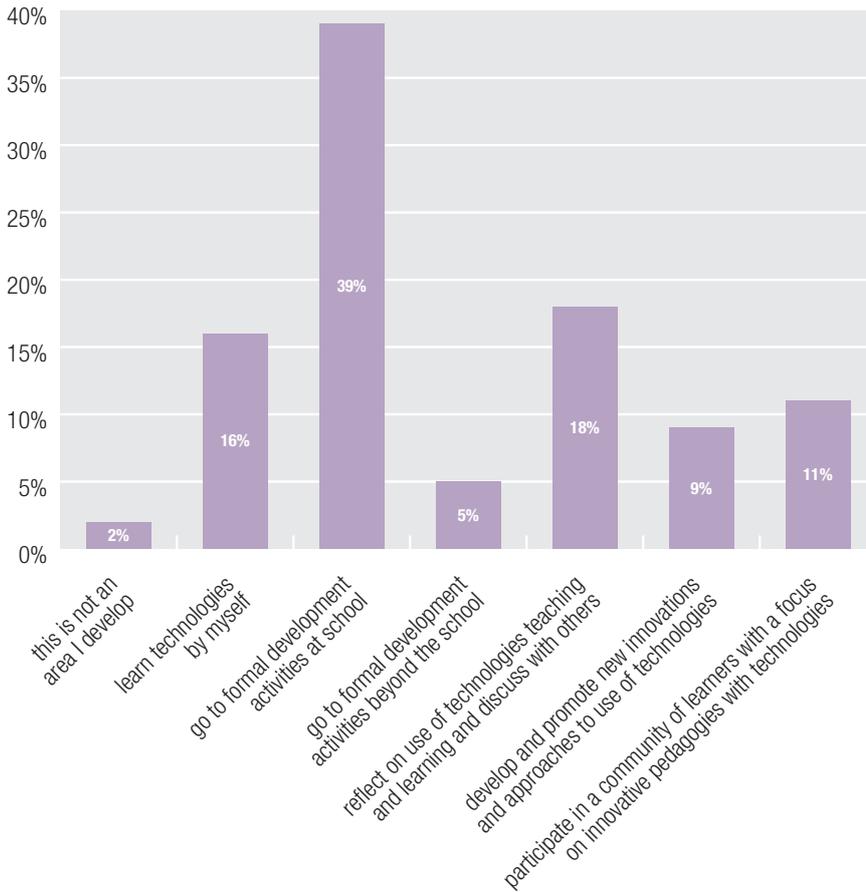
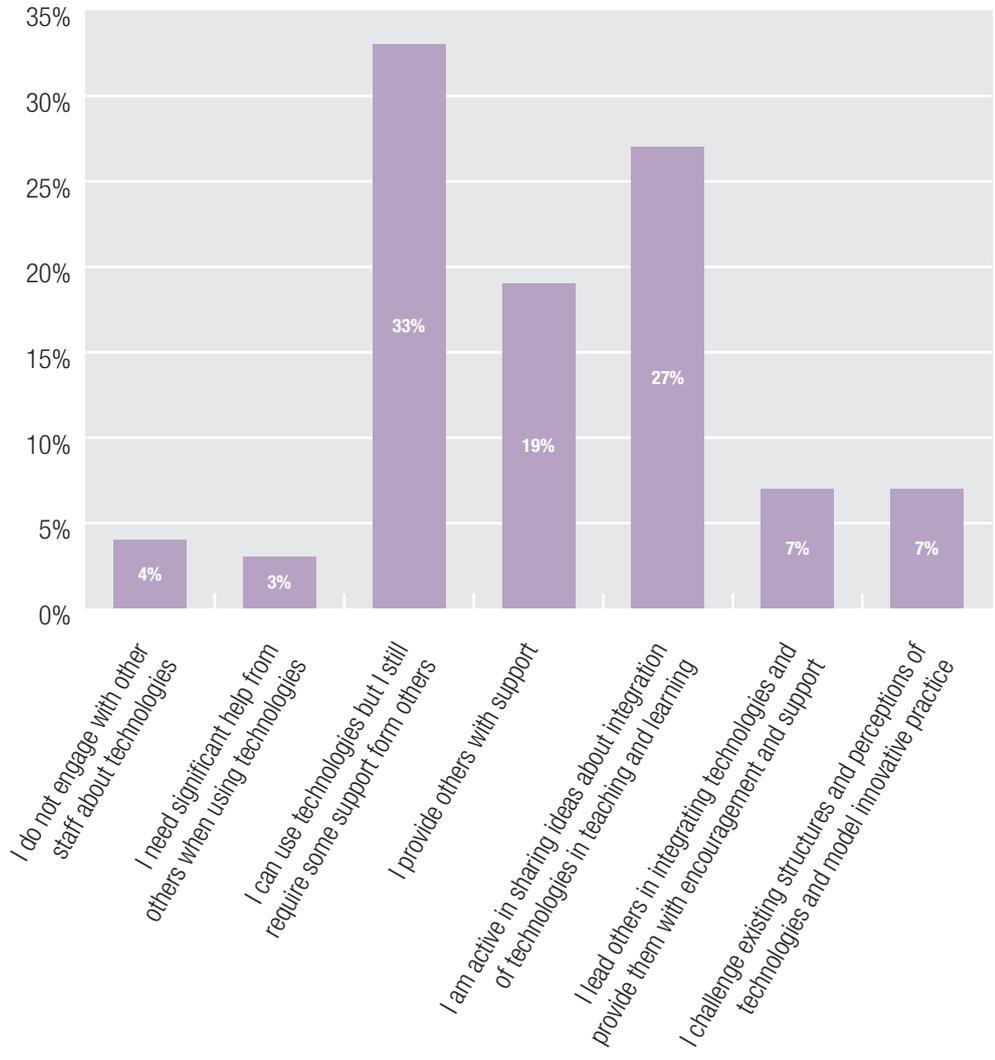


Figure 40: Relationships with peers about teaching and learning with technologies



The value of the organisation capital which is evidenced by the culture of the school, the distributed leadership, the documented strategies for embedding ICT and the integral approach to professional learning are summarised in Table 11:

Information capital

Information capital includes the ICT infrastructure and the information carried over that infrastructure. The infrastructure can include networks, databases and telecommunications. Information capital underpins both human and organisation capital. The value of information capital in school education, for example, underpins organisational change. Technologies enable ‘back of office’ productivity improvements as well as a broadening of the skills and capabilities of teachers as they incorporate technologies into their teaching and learning. This makes information capital in school education a highly valuable intangible asset.

Information capital underpins the work of both people and the school. Evidence of information capital being created and used can be seen in the following aspects of Northtown’s activities:

- Strategic planning;
- Investment and planning of the ICT infrastructure;

- Significant investments to complement government provided services;
- The embedded use of ICT in school administration and management;
- The growing use of technology for assessment, monitoring and reporting on student progress.

Intersections and alignments exist between the school's information capital, organisation and human capital. The Specialist School plan and the School Development Plan include central roles for technologies through the following initiatives:

- Whole school improvement;
- Improvement of specialist courses and provision in ICT;
- Collaborative support for contributory primary schools;
- Collaborative work with other post-primary schools as part of the Northtown Learning Community.

Information capital is also evident in the information flows between ICT, curriculum, assessment and reporting of students’ achievements. Information capital and the place of the school in the community are also inextricably linked.

Table 11: Indicators of the benefits of organisation capital in Northtown High

Pedagogical Benefits	Information Benefits	Strategic Benefits	Transactional Benefits	Transformational Benefits
ICT is an area of clear curricular strength, which has good levels of attainment.	Pedagogic benefits are underpinned by an effective and evolving culture of monitoring and self-evaluation through an exemplary action plan, based on recognised ICT research and inspection findings, with realistic targets.	There is a strong sense of purpose around the inclusion of education technologies into teaching and learning.	The school has given a high priority to the development of ICT within and across subject areas with a continuing emphasis on the pedagogic capability of teachers to employ the appropriate active learning and assessment for learning methods, which are supported through the use of ICT.	The range of policies and strategic plans available within school provide documented directions about the aspirations and approaches being used to include technologies in classroom practices.

Technology infrastructure

The school's education technology team is responsible to the board of governors and to the principal for the provision of the ICT infrastructure across the school. Northtown High gains support for the upgrade and maintenance of the ICT managed service infrastructure of the school from C2k, the government's central ICT school service provider. As described, the school adds considerably to the resources provided centrally as the core service by C2k in behalf of government. It funds this from a significant commitment in its own delegated budget, together with contributions from the North Eastern Education and Library Board.

In addition the school has attracted £588,000 over a four year period as a consequence of the award by government of ICT Specialist School status. This has enabled its investment in some significant enhancements to the online learning services provided centrally by C2k. The technology system is refreshed on a regular basis, keeping it up to date with new developments on a 3 to 5 year cycle. At no cost to themselves, grant-aided schools receive, based on student numbers, a core entitlement comprising⁵⁶:

- an infrastructure of 500 networked computers which, linked to schools' existing hardware brings the computer/student ratio in Northtown High to 1: 2.44 which can be compared with a central provision of 1:4 in post-primary schools and 1:5 in primary schools;

- access to a wide range of content and services to support the Northern Ireland Curriculum – including 250 centrally-licensed curriculum software titles;
- an integrated suite of services for school administration and management;
- broadband connection of schools' networks into a single wide-area education network and the Internet, connected directly to all of the public libraries in the province, to the UK's higher and further education network (JANET and to HEAnet in the Republic of Ireland) and the National Education Network (NEN) across the UK;
- e-learning tools in an online learning environment service to facilitate the development of online teaching and learning – including online curriculum content;
- first line support through a central help desk
- online learning environment serviced and maintained by the private sector.

In addition, the school licenses Studywiz⁵⁷ as its main learning environment and has invested in the Etech platform⁵⁸ to enable it to provide personalised portals for various target groups.

⁵⁶ Current details of the C2k service are available on www.c2kni.org.uk

⁵⁷ www.europe.studywiz.com/?page_id=1156

⁵⁸ www.etechnology.com/

Figure 41: Summary of types of technologies available at the school

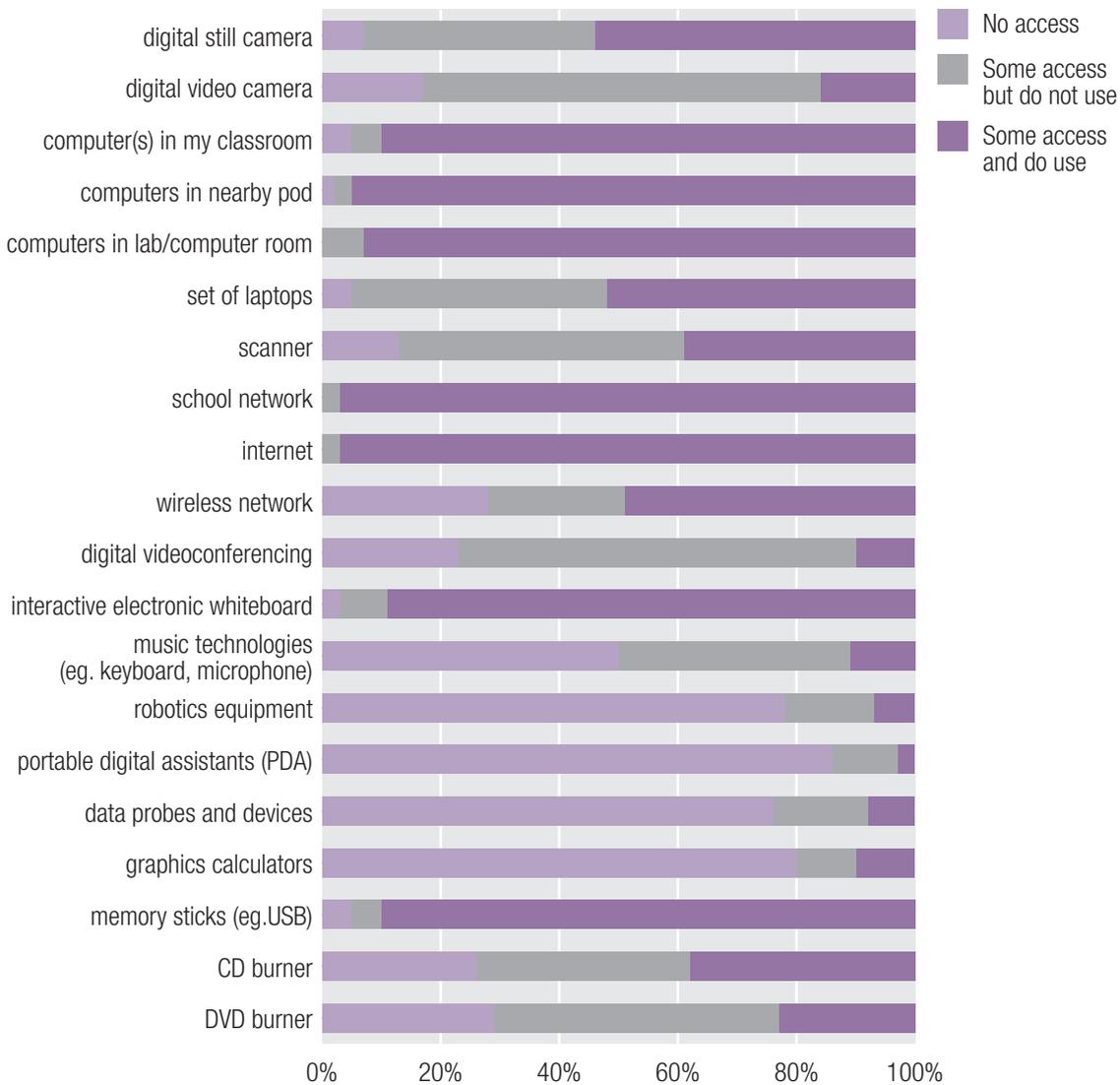


Figure 41 below provides a summary of the different types of technologies available at and the degree of access and use made of them by teachers at the school. It can be seen that the networked infrastructure, together with interactive whiteboards, are the most used resources.

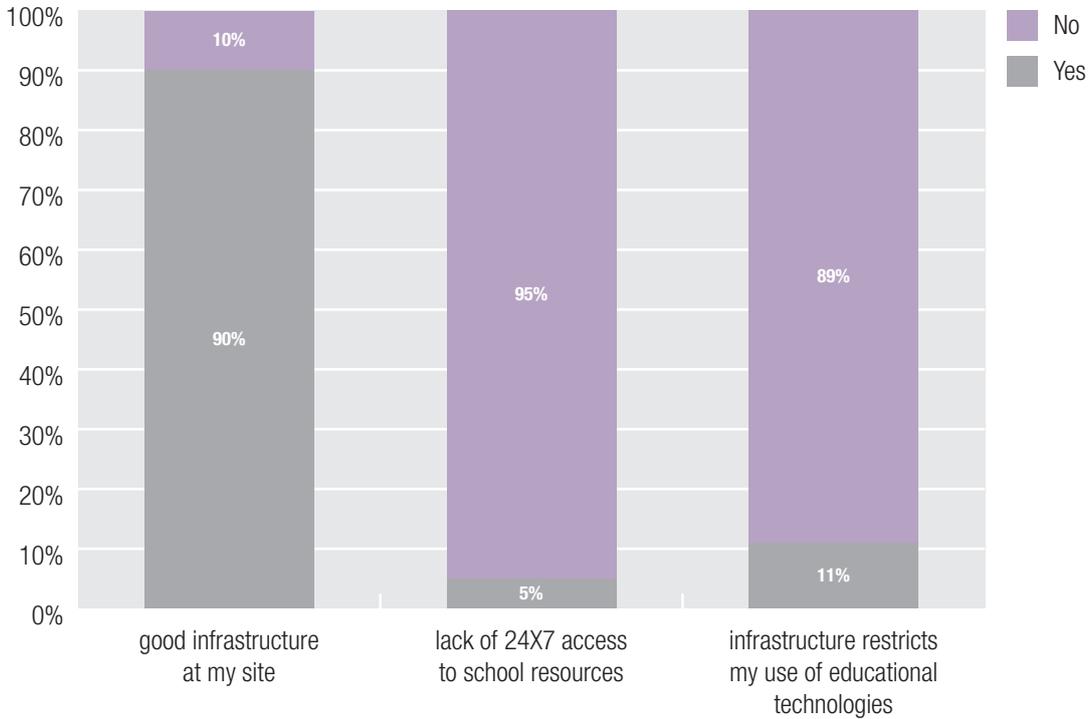
Quality of the infrastructure

It is the nature of the access and use of the technologies that determines what value is extracted from the technologies. For example, the robustness of the infrastructure influences the perceptions of the value of the technologies for teaching and

learning purposes – if it is unreliable teachers and students will shy away from it. There is a very good range of reliable technologies available at Northtown High, and as a consequence 90% of the teachers believe that the technology facilitates and promotes their use of it for teaching and learning purposes (Figure 42 below).

Furthermore, as Figure 4 (see page 33) shows, 77% of the students believe that the technology is good enough not to need improvement.

Figure 42: Quality of the ICT infrastructure



The value of the information capital in terms of indications of its benefit to the school is summarised in Table 12:

Table 12: Indicators of the benefits of information capital in Northtown High

Pedagogical benefits	Information benefits	Strategic benefits	Transactional benefits	Transformational benefits
The ability of the school to complete successfully as an ICT Specialist School	High levels of investment in ICT resources by the school to the benefit of both the staff and the students	Documented change management strategies outlined Specialist School and School Development Plans.	The high levels of confidence and the growing levels of use by teachers and students.	The high levels of attainment achieved by the students in external specialist examinations.
	An increasingly robust, extensive and reliable IT infrastructure	The increased availability of infrastructure to partners outside the school		
	The investment in innovative additions to move beyond core practices			

Closing Comments

Cost or Value?

The work underpinning the case-notes presented in the above two studies sits within a larger international effort to increase understanding and use of the concept of *value* within technology and education decision making – from the school to the system level. It confirms that the notion of value is nothing like as self-evident as it may seem, but demonstrates that there is considerable promise evident when we move the concept from its original business-world meaning to a more school and education aware usage. Many of the key business assumptions around total cost of ownership simply do not stand up in the worlds of schooling and education decision making. For instance, there is little that standard baseline indicators and growth models can tell us about the reality of technology access and usage in school settings. Some of this we knew, or at least suspected, before engaging with the schools. On the other hand, the cases presented above offer powerful insights into the multi-layered nature of the *value propositions* and particularly more intangible aspects of meaningful usage.

The decision to work with two schools in Ireland – one north, one south – which are emblematic rather than representative, but each at the leading edge in how they use and integrate technology into the student experience, proved to be a good one. It grounded what we tried to do in two very different, but valid, realities. Equally, the decision to test the frames and concerns of the wider Measuring Value of Educational Technologies project in the Ireland settings was useful. We established a number of common issues and concerns and also some which were unique to the individual schools studied and to their jurisdiction.

The most powerful lessons from the study concern the degree to which teaching and learning technologies have penetrated the lives of the schools, the degrees of systemic thinking that underpin this, and the utility of value proposition modelling in the leadership and management of technology-rich, education settings. Through its methodical application of the value proposition model to the work of the schools surveyed, MVET Ireland has helped increase our technical and policy level understandings of meaningfully technologising the student experience. Much, of course, remains to be done, but the key learning points of the project may be summarised as follows:

Pedagogical benefits

Value was added to the student experience at each site by both subject and cross-cutting usages of ICT. The shared emphasis

was on embedding technology into the teaching and learning activities of the schools, with a focus in the southern school more on mobile application and usage, and in the northern setting on maximising the value available through C2K resources and the school's own well-developed ICT capability. The degree of teacher engagement we observed around *how* and *why* to use technology was most impressive. There was a marked culture of practical, classroom-level, decision-making evident at both schools. The affordances of the various available technologies were weighed carefully when decisions were made about usage. The overall result was sensible and well-informed integration of ICT into the learning experience.

The underlying education mission of the schools differed considerably. But both teaching staff and management at each were, in our view, highly successful in identifying the pedagogical benefits of the technology available to them, and leveraging this to effect *through the teachers and support staff working at the school*. We believe this evidenced a high degree of deliberation and reflection concerning the practices of teaching and learning and the ways in which a technology-rich environment can be used to support the school's mission.

Information benefits

In corporate settings, technology is frequently seen as a catalyst to enhance information flow within the organisation and as a means of monitoring and adjusting workflows and performance at various levels. Schools, we believe, are different in the sense that the requirements for information and the nature of the information generated differ significantly from a business or corporate setting. Consequently, our work on value under this heading tended to focus mostly on how the teachers set about personalising or making more meaningful the individual student's use of technology within the learning setting.

In this area, we noted some interesting usage of technology to generate and explicate records of learning, attendance and participation. In each setting we observed simple but effective information management on the part of class teachers and school managers to feed into the direction of future students both at an individual and group level. Relatively sophisticated observation and monitoring tools are built into the learning management systems used by the schools. We were impressed to see how in each case teachers used these *in conjunction with their students* to set or redefine goals and schedule activities for various teaching groups. The utility of such management information for teaching and learning is still in its early stages.

It was, however, in their utilisation of technology to supply pedagogical content, and the information architectures that allow the drawing-down of teaching materials on demand and in repurposable formats, that the schools most evidently benefitted in terms of information flow. Each school operated different methods of identifying, preparing and deploying teaching and learning resources within the teaching and learning setting, but both have developed learning management systems that support very high levels of in-class access to content and materials. This allows the teachers to make a much wider range of pedagogical decisions that would be conventional. The value proposition here was evident in most of the practice at each site.

Strategic benefits

When we considered this aspect of the research frame, we focused primarily on how the schools set about creating advantages for themselves by leveraging their technology-rich situations, and how they went about gaining alignments between their overall goals and those of their respective Education Departments and curriculum bodies. In each case, there was a sophisticated grasp of this in evidence. Both schools have put in place detailed development plans which factor-in their technical and human resources and seek to set these against intimately local, and more system-level, policy requirements. In other words, each seeks to meet strategically the specific needs of its immediate community – its students, parents, staff and broader neighbourhood – as well as those of its regulatory and funding authorities. It would be our view that they are largely successful in this.

However, this is the value area in which the schools also proved most divergent. The explanation we offer for this is to do with the education technology policy contexts within which each operates. The northern school enjoys the certainties of a well-elaborated, longstanding national vision for education, with ICT – and education technologies more generally – situated within established fiscal and teacher professional development arrangements. The school is a recognised centre of academic and technological excellence: its utilisation of education technology reflects and builds on this. The southern school, in contrast, operates within a much lighter policy context and draws its funding and guiding principles from a unique, multi-agency, pro-social initiative with its own local funding streams and underpinning rationale. The iterative nature of the initiative has allowed the school to carve out a singular value proposition where education technology is utilised to significantly impact what the school sees as its core mission – the enhancement of academic opportunity and life-chances for its students and the counteraction

of social disadvantage through proactive educative intervention based around information society skills.

Transactional benefits

We considered transactional benefits to be those that enable increased engagement in teachers' and students' work and so benefit the student experience. Both school settings offered numerous examples of this in operation. Each used education technology in ways that address the four classic concerns of transactional benefit:

Education is by its nature a *knowledge intensive* activity and both schools have successfully developed patterns and practices of knowledge work that would not be possible in less technologised contexts. These are predominantly to do with task-based activities and problem solving, and frequently involve access to real world problems and information facilitated by the schools' learning management systems and internet access. *Desegmentation of effort* and more effective *aggregation of information* are other hallmarks of the work made possible by the technology rich contexts of the schools. Each provides marked opportunities for collaborative learning and the co-construction of understanding across the curricular range and seamlessly within the activities of the typical classroom activity. Finally, there are indications from both schools that the learning process / knowledge acquisition is increasingly demystified, and that the students are displaying increased confidence in relation to handling information and manipulating data – both individually and in groups. Each school works on encouraging innovative thinking and what may be termed a 21st century skills approach to problem solving – where contemporary technologies are simply resources to help solve the challenge at hand.

We believe that this is an interesting and not insignificant shared development. It points to an issue that our education systems – north and south – will most likely need to confront sooner rather than later. Their existing policy models for education technology are based essentially on transactional '*cost*' modelling. What we are seeing in the schools suggests that transactional '*benefit modelling*' may be a better guide to the possibilities of schools engaging with radical realignment around emergent understandings of 21st century skills and the technology that schools need to deliver on these. For now, this remains a tentative assertion. It will need to be tested more widely to see if it retains its resilience.

Transformational benefits

Transformational benefits are principally associated in our context

with achieving positive organisational change and enhancing the quality of teaching and learning on offer. Technology, especially Information Technology, is widely acknowledged for its catalytic and positively disruptive qualities and effects across almost every aspect of contemporary society. What puzzles many is why the introduction of ICT into our schools and colleges over the past twenty years or so has not had a similar effect.

Our contention would be that the vast majority of schools worldwide are still not at a sufficient level of technology saturation coupled with an appropriate level of technological and pedagogical cultural expertise to make that move. Nor indeed are those who govern and regulate education confident enough of the value propositions involved to force the issue. At least for now. The initial and early stages of technology adoption are almost inevitably marked by displacement rather than deeper changes in the practice and culture of the institution. We continue to do what we have previously done but bolt the new technology onto this – letters become emails, faxes become attachments to those emails, and so on. It is only with time, and *if* the new practice build to some sort of critical mass, that deeper change becomes a possibility. Confidence grows; an openness to experiment results; small but significant possibilities start to emerge and deeper patterns of practice start to take root.

We see both schools in the MVET Ireland project as being well into this second stage. As such, they are differently, but significantly, engaged in the process of transformation, and illustrative – even at this early point – of some of the major benefits education technology brings to the process.

As a result, the schools may provide some useful insights into getting to this point and the challenge ahead. There are two in particular we would draw attention to here:

- In different ways, emergent, technology-enhanced learning practices at each school present a challenge to the pedagogical models they currently nest within – teachers in both have begun to explore the edges of their practice in ways that can only be seen as innovative and potentially disruptive of many of the conventions that sustain ‘ordinary’ school activity. For instance, the extensive use of computer pods and laptops in the northern school, coupled with high-speed broadband, is changing the way the students approach the learning act. Similarly in the southern school, pervasive/ ready at hand technology and unrestricted access to the HEAnet 100 Mbit/s ‘super-pipe’ is driving up, substantively, levels of student engagement and attendance across the school. What is most interesting about this, from our perspective, is that

the shifting practice is already starting to come up against some of the fundamental *taken-for-granted*s of our school systems – the subject-based nature of secondary education, the edges of the school day, the period framework, and the essentialising role of the teacher within current practice. The question is: will these deep-set changes in the way students and teachers *can* interact lead inexorably to changes in how they *do*? We have a strong sense that they may, and would see such uses of education technology as the catalyst for changes that many policy makers and educationalists on the island of Ireland have long argued are necessary within our essentially conservative systems.

- The second point concerns leadership. It has long been acknowledged that leadership plays a defining role in the life of a school – both as an organisation and a community. And the MVET Ireland project would certainly confirm the truth of this where the case study schools are concerned; both are led by visionary actors, who in each case have been central figures in driving forward the technologising agenda. But we also found compelling indications at each site of the impact of a powerful and influential ‘*core group*’ of teachers who have operationalised the integration of education technology within the life and work of the school. In the case of the southern school they are called precisely that – the core group and they work closely with the county-funded ‘ICT champion’. Their mission is to lead, model and encourage - which they do in an impressive manner. In the northern school, the equivalent is the *education technology team* which comprises the vice-principal, the Specialist School coordinator, the head of ICT and the head of technology support. They have been equally effective in driving forward their technology project. Both groups exercise driving roles with active support from, and direct access to, the school principals. Two things struck us about these arrangements – the distributed nature of leadership involved (with all the powerful arguments that can be made for this in terms of ownership of change, validation of the teacher voice, empowerment of participants and so on) as well as the voice that this arrangement allows to the wider school community. This we feel is particularly important because it holds out real hope for the emergence of a genuine community of practice – one enabled and empowered by its use of education technology to radically reimagine and reconfigure the student experience in each school.

The primary purpose of the case studies reported above was to pilot an innovative method of assessing the idea of *value* in the acquisition and usage of education technology. We set out to identify as best we could the ‘real’ cost of the use of technology

in schools, including not just the cost of the technology and its necessary renewal, but also the extent of less immediately evident additional costs such as staffing and professional development. The most important aspect of the case studies was, perhaps, our attempt to focus in on the concepts of the *tangible* and *intangible* relating to technology ownership and usage. Tangible assets proved difficult enough to identify and catalogue. Other costs relate to peoples' time (technical support to classroom processes, teachers trying out software, creating materials and so on) but they were to a large extent compassable. Intangible assets include such things as staff expertise in using the technologies and the impact of technology usage on school processes and on student outcomes. These proved inordinately difficult to identify, but once identified proved open to a satisfying degree to an analysis drawing on the value proposition model we developed.

Much remains to be done of course. This short report is an initial step in a new direction. We plan to continue to investigate the affordances of the MVET model and to elaborate it further. Nevertheless, the case studies reported above and the analysis we offer represent, we believe, a small but significant contribution to the growing literature on education policy and practice on the island of Ireland.

Appendix 1: Documentary Sources for the Case Studies

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