Technology in Docklands Education:

Using Scenarios as Guides for Teaching and Research

Bertram C. Bruce
Graduate School of Library and Information Science
University of Illinois at Urbana-Champaign
Champaign, IL 61820, USA
chip@illinois.edu; 1-217-244-3576 (Corresponding author)

and

Abigail Reynolds
Centre for Research and Innovation in Learning and Teaching
National College of Ireland
Mayor Street
Dublin 1, Ireland
areynolds@ncirl.ie

Abstract

Educators today are concerned with how to effectively implement whole school e-learning strategies, encompassing technical support, digital resources, and professional development. This paper reports the findings of a project, *Technologies in Docklands Education (TIDE)*, in which we investigated the use of technology to support learning in 24 disadvantaged, primary and post-primary schools in the Dublin Docklands area schools. Using a mixed methodology of face-to-face interviews with principals and teachers, classroom observations, and an on-line questionnaire, we analyzed the current situation in these schools, focusing on the key needs identified by principals. We used scenario-based analysis initially as a method to further discussions with schools, and later as a way to organize our findings and recommendations. Scenarios also became a way to share good practice and to make practical recommendations to schools. The study confirmed previous research regarding the major factors contributing to the successful integration of technology in schools, such as the need for technical support and professional development. However, there were unexpected findings regarding the range of digital technologies in use and what leads to effective teaching with technology.

Keywords: cooperative/collaborative learning; improving classroom teaching; interdisciplinary projects; media in education; pedagogical issues; teaching/learning strategies

The need to integrate technology fully into all aspects of teaching and learning is no longer a matter of choice, but one of necessity. New technologies for learning have become especially relevant in schools today for many reasons, including concerns about jobs in the information economy, issues of equal opportunity and access, and the need for more innovative learning that engages today's students. Here, the term includes an array of new digital tools and media, including personal computers, databases, software, local-area networks, broadband, the worldwide web, digital cameras, projection devices, mobile technologies, and other information and communication technologies.

Apart from the obvious need to promote digital skills for a digital age, the introduction of new technologies also raises issues of equity. The expense of purchase, maintenance, and training inevitably makes them more available to higher-resourced communities. Social capital (knowledge of what's available and needed, expertise in use, personal connections) only compounds the inequities. And yet, new technologies are increasingly affordable and could potentially mitigate differences in wealth. Other tools enhance access for students with special needs in terms of physical capabilities, learning, and emotional needs.

One of the most exciting possibilities is that new technologies may address the need for more innovative learning, which will engage disaffected students and help all students to learn in deeper, more connected, and more meaningful ways. Tools such as multimedia, web resources, online databases, social networking, simulations, games, virtual reality, sensors, mobile computing, geographic information systems and more promise new kinds of learning that are more engaging for students and more relevant to the world they will be living in and creating.

Issues related to the information economy, educational equity, and innovative learning are just some of the reasons to look more closely at new technologies for learning. However, even casual observers soon realize that achieving meaningful integration of new technologies in schools is not a simple task. While the issue of funding for technology and student-to computer ratios is still relevant, the debate has moved on somewhat to identifying strategies for how schools can effectively implement a ‘whole school’ e-learning strategy, one that encompasses areas such as professional development, digital content, ICT infrastructure, broadband connectivity and technical support. How can they move from simple access to effective use (Gurstein, 2003).

Our key questions were these:

- What technologies and related resources exist already in the schools or community?
- How are these technologies now being used?
- What is working well? (scenarios of use)
- What are the most pressing problems?
- What could be done to improve the learning environment and practices? (scenarios of support)

Background: Context for the Study

We describe here both the local and the larger context for the study.

The Docklands Schools

Within our study, we examined the use of new technologies in schools in the Docklands area of Dublin. National College of Ireland (NCI) is based in this area and works with local school Principals, who identified the use of technology within their schools as an area of need. Our aim was to investigate the current use of technology in this group of schools and to make recommendations on what strategies schools could employ to improve their use of new technologies for learning and teaching.

New technologies could potentially have a very positive impact on schools in the Docklands, an area were the most technically-advanced financial services industries reside alongside areas with historically-high levels of poverty and social disadvantage. In fact:

> If you are a child or young person attending school in a disadvantaged area of Dublin, there is a 30 per cent chance that you will leave primary school with a serious literacy problem;1 only a 50:50 chance that you will sit your Leaving Certificate, and a 90 per cent probability that you will not go to college. In contrast, if you are a child or young person whose parents are from a professional background and you live in a prosperous part of Dublin, you have only a 10 per cent chance of leaving primary school with a serious literacy problem, you will almost certainly complete your Leaving Certificate and be part of the 86 per cent of young people in your area who go to college.*(Jesuit Centre for Faith and Justice, May 2007)*

This is evident in the Docklands area where many primary and post-primary schools struggle to provide for basic literacy and numeracy needs. In contrast, these same school children are often quite technologically advanced in terms of using social networking sites (*Bebo, MySpace, FaceBook*), mobile phones, and downloading music.

Our study sought to investigate how these schools were currently using technologies for learning, what barriers might be limiting their effective use and, most importantly, we sought to highlight and share good practice and identify possible steps forward. How could new technologies allow these students to connect with learning in innovative ways? Can it offer alternative methodologies to reach out to these students in a way that is more relevant to the world they are living in and creating?

Interpreting within the Larger Educational Context

A meaningful interpretation of good teaching with technology needs to consider the larger context of the education system. It is often the case that the structures and supports for using technology effectively are consistent with those needed for any teaching. Moreover, even though our study focused on the Docklands schools, the means of addressing identified needs may require systemic approaches, rather than a localized response.

A report from McKinsey & Company (2007) is a propos here, and connects to several of the issues raised by principals and teachers in this study. McKinsey looked at the qualities of the world's best performing schools in 2006 and 2007. They identified three key factors for success:

(1) getting the right people to become teachers, (2) supporting their professional development; and (3) ensuring that the system can deliver the best possible instruction for every child. The report includes a case study of Finland, which scores at the top in international literacy, numeracy, scientific and problem solving assessments.

The first major issue raised in the report is the need for well-prepared teachers. The case study found that Finland recruits its teachers from the top 10% of graduates. Applicants go through a two-round selection process, which includes tests for literacy, numeracy, and problem-solving skills, followed by tests of communication skills, willingness to learn, academic ability, and motivation for teaching. A rigorous selection process coupled with high initial salaries corresponds with a view of teaching as a high status profession. The result is a cohort of well-prepared teachers eager to learn more.

Even more importantly, there are mechanisms to support continuing professional development, a necessity for coping with rapidly-changing technologies.

> Finnish teachers work together, plan their lessons jointly, observe each others' lessons, and help each other improve. Most faculties of education manage their own training schools...Teachers are given one afternoon each week for joint planning and curriculum development. Schools are encouraged to work together and share materials so that best practice spreads quickly throughout the system

Some, but not all, of these practices exist in the Docklands schools. An implication from the McKinsey report is that additional support for continuing professional development is essential for effective use of new technologies. Yet, we suspect that few of the educators in the study would see the full Finnish model as a realistic option.

In addition,

> Finland has arguably one of the least prescriptive curricula of all systems. It emphasizes the need for teachers to adapt learning to the specific context in which they find themselves, while at the same time setting high expectations for what should ultimately be achieved. Finland has largely dispensed with national examinations.

These characteristics relate to the questions raised about how technology can be integrated into the curriculum. We observed good teachers adapting learning to the context and incorporating technology in creative ways. At the same time, we heard concerns about standardized examinations driving the curriculum and about an overloaded curriculum with little room for innovative teaching with new technologies. Having a national curriculum that promotes innovative and extensive technology use may be necessary for widespread adoption. But again, many educators see little realistic possibility for imminent curriculum reform.

Methodology

This study arose as a result of a meeting between National College of Ireland and the Docklands Schools Principals Forum in December 2007. At that meeting school Principals identified the effective use of technology within their schools as an area that could benefit from additional support. Two areas of need were highlighted: technical support and using technologies

for learning. NCI subsequently secured funding to undertake a study into the current use of technology in the 24 Docklands schools, called *Technologies in Docklands Education (TIDE)*. We worked with schools and other partners in the area over the period January to May 2008 and then produced a report with recommendations (Bruce & Reynolds, 2008).

The Schools in this Study

Currently 24 Docklands schools participate in the Docklands Schools Principals Forum. These schools are spread over a large geographical area comprising four postal districts. Of the 24 schools in this study, 16 are Infant, Junior or Primary schools (or a combination), seven are Post Primary schools and one school includes both levels. Of the 24 schools in this study, 22 have been classified by the Department of Education and Science as being disadvantaged schools and in need of additional educational support.

Data Collection

The research design included primarily face-to-face interviews with Principals and an online survey. In some cases, there was also the opportunity to interview teachers involved using technology in their classes and to observe classroom teaching.

The interviews were semi-structured. In each case, the two authors met first with the Principal, who in some cases would invite other staff to join in. In the beginning we reiterated the primary purpose of the study–to ascertain needs in the area of technical support and using technologies for learning. We also explained that we were interested in success stories, both so they could be shared and because they would help define the needs more clearly.

We had an initial set of questions focusing on school demographics, technical infrastructure, and overall characterization of technology use and needs. As the interviewed progressed, we would explore more deeply the history of the school, how and why computers were used, pressing problems, and unique aspects of the school. In a typical case, we would visit various classrooms or a computer lab, meet with someone holding a school IT post, or talk with students. In most cases there would be an exit interview as well.

The discussions were wide-ranging. As we would go from one school to the next, we would refine questions based on those experiences. For example, "another school told us that they found laptop carts to be useful; have you found that as well?" or "we've seen the use of claymation for digital storytelling; are your teachers doing anything along those lines?" This was in line with our plan to create collaborative scenarios, but would likely have occurred anyway, as most Principals were eager to learn more about what other schools were doing, and often pressed us for details.

We also created an online survey using PHP Surveyor. This essentially replicated the interview, but facilitated quantitative responses. It ensured that we hadn't left out crucial questions. In many cases, a teacher with special knowledge of the school's IT capabilities and needs would be the one to complete the survey.

All but two of the schools took part in face to face interviews and 19 of those completed the online survey. In addition, we communicated with every school via telephone and email. We

also hosted an open meeting for Principals and their staff to share initial findings and solicit further feedback. During the research, we also met several times with staff from other projects who are involved in supporting schools in this area of Dublin, as well as those working in similar Dublin inner-city contexts.

Use of Scenarios

We employed *scenario-based design* (Carroll, 1999; Carroll & Farooq, 2005) as one method to further discussions with Docklands community members and potential partners. Scenario-based methods yield descriptions of people using technology, which are essential for analyzing how to coordinate the technology with associated activities, e.g., to portray various ways that a particular tool might be used for classroom learning activities. Scenarios can be used at any stage of the process from design to evaluation.

> Scenarios are stories...about people and their activities...[which] highlight goals suggested by the appearance and behavior of the system, what people try to do with the system, what procedures are adopted, not adopted, carried out successfully or erroneously, and what interpretations people make of what happens to them...Representing the use of a system or application with a set of user interaction scenarios makes that use explicit...It can help designers and analysts to focus attention on the assumptions about people and their tasks that are implicit in systems and applications...Thus, scenarios can provide a framework for a design-based science of human-computer interaction. (Carroll, 1999, p. 2)

This means sharing visions of what might be and soliciting those from all the stakeholders. The exact form of the options will evolve following these discussions (and some entirely new options may emerge). Together with the Principals we produced multiple scenarios, each essentially a story of activities. These stories were then shared and refined in subsequent school visits. As the scenarios evolve, they can be linked to (a) where and when it's observed, (b) special resources needed, such as software, digital camera, special expertise, and (c) learning outcomes. They become a way to organize and present our key findings and recommendations.

Interview Principals and staff members on site to understand their situations, current practices, plans, and needs.
Solicit in particular, best practices and visions of improved practice.
Where possible, observe teachers and students using new technologies.
Conduct formal response to the scenarios through an online survey
Bring participants together to review the scenarios and provide feedback

Results: Scenarios

While each school presents a unique challenge, there were common themes. These included issues around technical support, types of technology, curriculum and instruction using technology, professional development, and connecting with community. As we interacted with the Principals and others in the schools, two types of scenarios evolved. The first describes an example of good classroom practice, such as how a particular software tool might be used for classroom learning in a particular subject. Because these practices are already underway, we

have good reason to believe that they would be immediately applicable and of educational value in similar settings. These are described as our *scenarios of use*.

The second kind of scenario describes a strategy for helping schools expand on the best practices that already exist (the exemplary uses) and to develop new ones for more classrooms or other areas of the curriculum. These are *scenarios of support*, which essentially became our recommendations from the study.

Scenarios of Use

A primary objective of the study was to identify and share good practice. During the course of our research we found many examples of successful ways that teachers are currently using technology in the classroom. These s*cenarios of use* are working examples, stories of what teachers are actually doing in the schools today, none of which use complex technologies or require extraordinary resources or skills. Thus, these are realistic classroom activities, even though they may not yet be widely adopted within these schools. We saw each of these scenarios at least once throughout the study; more often we observed closely related activities on several occasions. A contribution of this study was to share these good practices so that schools might consider adapting and adopting them as well.

Overall, we identified 16 scenarios of use of technology, each representing not just one classroom, but a type of project that we observed several times. These are based on real classroom experiences, but were anonymized for presentation. In some cases they represent a fusion of projects from two or more schools or have been generalized. The essential idea is to represent concretely a set of activities that help to create a successful environment for learning and can be realistically achieved. For example, digital storytelling emerged as a common and successful use of technology for learning, especially in primary schools.

Principals were eager for advice on the use of technology in the classroom; scenarios of use were one way to address this need. Within the Irish primary curriculum there is no specific area dedicated to technology skills. However, the National Council for Curriculum Assessment is in the process of developing an ICT framework, which states that technology use should be conceived in terms of supporting student and teacher inquiry, not simply as isolated skill development. This implies 21st-century literacy skills, such as asking good questions, finding and integrating information from multiple sources including media, validating, leveraging, communicating, collaborating, and reflecting. In accord with the framework, schools mentioned that using technology within specific projects such as English or Art was not only a successful way to teach new technology skills, but also an exciting way to engage students in class, allowing them more freedom to create and express themselves. In these instances teachers saw not only an increase in student competence levels but also higher levels of self esteem which in turn led to higher motivation and engagement in the class in general.

Digital Storytelling. Through digital storytelling, students develop their own stories or re-create stories they have read or seen. At various times they may use a song, a poem, or the children's own stories. Through these projects they learn using art, drama, technology, reading, writing, collaboration skills, and problem-solving.

As a specific case, consider a fourth-year class project in a boy's primary school in Dublin. During English, the boys have just read The Hundred-Mile-An-Hour Dog by Jeremy Strong. For this project, boys formed six groups, each of which chose a chapter of the book The aim of this activity was to create a 'digital story' of the chapter. To do this the boys first used storyboards to create their own stories based on chapters from the book. They then made clay figures to create characters from their story. Once the clay was set, the boys set up figures in 'scenes' which were based on their storyboards. They then took digital photos of each scene and transferred these to the computer. Then using Photostory, the boys put together a digital presentation, complete with photos, captions and music.

With the Teacher supervising, each group worked independently, undertaking each activity in turn and deciding among themselves which story or figure they would use. The activity combined art—sketches, coloring, clay figures, collage backdrops; group work—planning, sharing work, dispute resolution; technology—audio files and editing, digital photography, Photostory; as well as reading and writing. Participants said this about the activity:

> *Students* say, "it's easier to think in groups, you have more brains," "[when you have a question] you go back to the story," and "[when we disagree] we talk it out." [Do you like this activity?] "it's great, and not really schoolwork".
>
> *The Teacher* thinks that the project encouraged children to work and think independently and at the same time to work in groups to communicate and share responsibilities. It also involves everyone in the class; "Children become really engaged because it is something they enjoy. It's a digital age and children need to learn digital skills."
>
> *The Principal* says that activities like this—it's really a whole program—have totally changed teaching and learning in the school. It's boosted self-esteem and helped the school re-connect with the community. It has changed the culture of the school and she "can't imagine the school without it." The work develops multiple intelligences, fosters project work, leads to integrated learning, and addresses the standard curriculum goals in the process. Teachers learn from each other, and maybe from the children, too.

A few other scenarios of use are mentioned more briefly below:

Interactive whiteboards for whole class learning. Teachers use the whiteboard as a way to engage students in whole class instruction, with active and direct use of the technology by the students. For example, in a 3rd class, the teacher uses a slide show to flash sets of 10-15 dots up on the whiteboard with a numbered or colored background work sheet. Children look quickly at each set and write a number representing their best guess at its size. Through the activity, the students learn about estimation and about the relation of numbers to set size in an interactive and public way. They also develop teamwork and observation skills.

Multimedia centre near the school. A multimedia centre offers computers, broadband access, video production equipment, and display technologies. Post-primary students come to the centre for a week at a time to engage in challenging, collaborative, multimedia projects. Each small group adopts a social action multimedia campaign–visit your elderly relatives over the holidays, stop using drugs, give aid to Africa, and so on. They take a video camera into the

neighboring community to film objects, the neighborhood, and themselves, then edit the video. They do web-based research, then create a poster with text, images, and graphics. Later they produce a radio spot for the same campaign. At the end of the week, they make a web page integrating all of their work. College students assist in the centre, learning in the process. Students develop facility with digital video, video and audio editing, web search, graphics, design, web page construction, all in the service of and as an aid to learning about living responsibly in the world. In so doing, they also learn about working together and completing complex tasks.

Urban geography. Students take digital photos of their local area, learning about the history, geology, culture, and economy as they do that. They organize their photos into a PowerPoint presentation.

Research-based video production. Students study the solar system, using the Web to find information about planets, dinosaurs, and space travel. They create paper models of each planet which are hung from the ceiling. They produce a film documentary about the solar system, using music they find on the web and edit, their physical models, and text they write. The film becomes a way to integrate their learning and to communicate with parents.

Learning beyond the school walls. Schools engage parents more in their children's learning. An online plus print school newsletter informs parents about school events and student projects. At the same time, the production of the newsletter is a learning activity for students. A school website further connects teachers, parents, students, and the community. Providing laptops for parents helps them become more involved in their children's learning. Schools connect with local colleges and with centers such as Bridge to College (Suas Educational Development, 2008) and the nearby St. Andrews Resource Centre.

Scenarios of Support

We also used scenarios to describe how schools might bridge the gap from current realities to more and better uses of technology. This highlights the fact that specific support is needed to facilitate better use. Each of these scenarios reflects consideration of all of the stakeholders--Principals, teachers, parents, students, and external partners--in identifying needs, best practices, and new possibilities. In collaboration with the educators, we identified several future-oriented scenarios detailing ways that schools can promote the effective use of technology in the classroom. They tell stories about what might be in the schools, but is not always so today.

On-Site Curricular Support and Integration: A Technology Coach facilitates learning by doing through on-site curricular support and integration. He or she is a knowledgeable teacher, who understands how technology can be infused into all areas of the curriculum. They also demonstrate how technology can be used effectively in the classroom and assist teachers locate software, web resources, and other teaching materials. They could also assist in helping schools locate appropriate technical support. The Coach facilitates informal networking and may also advise on Internet safety and training. Perhaps, most importantly, the Coach helps teachers learn and empowers and encourages their use of technology. The Coach focuses on Docklands area-schools and builds a relationship with the Principals and teachers. He or she has special

knowledge of the challenges they face in terms of facilities, student population, or special needs, as well as the unique resources they have in areas of history, cultural heritage, art, music, and geography.

Technology Network/Forum: Principals and teachers participate in a network/forum to share good practice and information. This network/forum is informal and based primarily on face-to-face interactions, but could be supplemented by an online portal. This network serves as support for exemplary teachers who are using ICT in innovative ways. It develops initiatives that recognize teachers work and reward their achievements. Alumni of courses such as those in the professional development scenario participate in a network/community of educators who learn from one another and other organisations. This network includes community organizations and employers.

Coupled with this, there is more support for teachers who are using technology in innovative ways. There are programs to recognize teachers' work and reward their achievements. Some schools are fortunate in that they have very capable teachers who have taken on the IT post. These teachers provide technical support & advice and encourage other teachers to use technologies in the classroom. This scenario helps retain teachers and sustain good work when good staff leave.

Professional Development: Educators have the opportunity to participate in courses and workshops that address their specific needs in the Docklands schools. These courses might include technology training, but more importantly, how to use technologies effectively in teaching, especially with disadvantaged students. Professional development is structured, school-specific, and where possible on-site. It encourages teachers to explore new technologies and awards excellence in teaching practice as well as providing certification for individual professionals. This could lead to scholarship programmes that support teachers in post-graduate education. The courses help to link school-based learning with community resources, such as churches, libraries, museums, after-school activities, clubs, charitable organisations, arts, and sports groups, as well as to involve parents and families. Professional development programs include the development of skills related to leadership and the strategic use of technology.

This scenario recognizes that new technologies can augment good teaching, but not replace it. If anything, technologies place higher demands on teachers' knowledge and skills. The art of teaching is more important than ever before. We need to find the best teachers and support their continuing development. New pedagogies are required, not just using new tools to accomplish old objectives. Technology use needs to adapt to diverse learning styles and backgrounds of students today.

Budget for Technical Support: Keeping technology working is an issue: Deciding on appropriate technologies, updating, maintaining the technologies currently in place, fixing problems that arise, often at critical junctures for teaching, all are on-going concerns. In this future scenario, each school has a budget for in-house technical support. This helps Principals address technology needs which are not currently provided for in the general budget. There is now sufficient localized technical support to supplement that provided by on-going initiatives such as the National Centre for Technology in Education (NCTE) advisors or the DISC project.

In-house support means that there is expertise to advise when there is a need to turn to outside suppliers. Schools now know which provider to engage and what it should cost.

Service learning programme. A service learning programme is established in which third-level students receive course credit for work in the Docklands schools. This work might include technology support, teaching primary students how to use computers, or working with teachers to set up classroom activities. Their enthusiasm and presence becomes a tangible representation of what college can be, thus providing role models for younger students.

Multimedia Centre Accessible to the School: A multimedia centre has state-of-the-art computers, broadband access, video production equipment, and display technologies. It is also a site in which teachers can come to learn about the latest technologies. Students come to the centre for a week to engage in serious, challenging, collaborative, multimedia projects. They develop facility with digital video, video and audio editing, web search, graphics, design and web page construction. The centre becomes a way for the school to connect with parents and the larger community as well.

Discussion

Numerous previous studies (Bruce & Rubin, 1993; Comber, 2007; Frank, Zhao, & Boreman, 2004; Hsu, Kuan, & Yang, submitted; Reynolds, 2008; Russell & Schneiderheinze, 2005; Wasser, 1998; Wilson, et al., 2001) have addressed the issue of ICT integration in schools and sought to identify factors they consider necessary for the effective use of technology for learning in schools. These factors include:

- having a shared vision for ICT use within the school;
- updating the curriculum to accommodate and make good use of ICTs;
- planning the use of ICT to enhance learning and teaching;
- addressing issues of prior beliefs and values, and fitting with local circumstances;
- providing quality support and training activities for all staff in the use of ICT;
- successful collaboration and informal networking among teachers;
- extending opportunities for learning within and beyond the school;
- purchasing, deploying, and managing appropriate and well-designed equipment and technical support;
- demonstrating how students can make good progress in ICT capability; and
- demonstrating how the use of ICT improves their achievement in other subjects.

Wasser (1998) emphasizes the dialectic aspect of technology integration. She argues that it is not simply a process of lining up supportive elements, but that the introduction of technology creates tensions and possibilities for dynamic, systemic changes:

> technology infusion...[is] a systemic proposition. Changes in the classroom are closely related to changes occurring among teachers in the ways they think about teaching and about their relationships with colleagues. Tensions about technology force changes in school structure, leading to new policies and opportunities for leadership...if technology infusion is systemic, one should see changes occurring in four related dimensions:

educational practice, professional culture, technology leadership and management, and school-community involvement and family participation.

Wasser's four dimensions–educational practice, professional culture, leadership, and community/family–were recurring themes in our study. In general, we found evidence that each of these factors was important in this context as well. We also noted some other issues that have received less attention in technology integration studies.

Teachers' work experiences outside of the schools. We found that some of the most innovative approaches to using technology in the classroom could be attributed to teachers having work experiences outside of the schools. For example, one teacher with experience in marketing and graphics design was able to bring her specific skills into a sixth class for a media campaign project. Students used video, image and graphic editing, web search and other ICTs in creative and productive ways. Some of the digital storytelling classrooms were led by teachers with similar industry experience. It's ironic that while some teachers have questioned whether say, clay animation, was serious enough for academic work, those with beyond the school work experiences felt little hesitation in adopting it as academically and professionally valid.

Technologies beyond the computer. Principals noted, and we also saw repeatedly the value of digital cameras, even of the cell phone variety. Students used them for gardening projects to document plant growth, for studies of their families or the neighborhood, as part of arts projects, in mathematics, and other areas. This was an important reminder not to see the standard computer as the sole new technology for learning. There are many other digital technologies already being used or potentially available for use in schools. Various classes used video, Lego robotics, microelectronic sensors and output devices, mp3 players, mobile devices such as PDA, GIS/GPS, interactive whiteboards, and other digital tools. The use of these other technologies was less common in the Docklands schools, although their effective use has been demonstrated elsewhere.

Slow learning. Many people would say that new technologies speed up life, indicated by terms such as “fast forward” or “multitasking.” The same people might add that because young people live in a fast-paced, digitally-enhanced world, we need to change schooling accordingly. If we don’t use technologies to match their pace, we’ll lose them. Moreover, there is so much more to learn today. We need to use podcasts, mobile technologies, video, on-demand resources, blogs, SMS, and other tools to speed up learning for the millennial generation.

However, the most thoughtful uses of new technologies we observed often showed the contrary: Learning seems stretched out or slowed down. For example, *The Hundred-Mile-An-Hour Dog* scenario took many class sessions and involved discussions about the story, choices in design and presentation, and referring to the text for details. Certainly the new technologies (digital camera, computer) made it easier to carry out aspects of the project. But the overall effect was to engage the students in a deeper, more critical form of reading and response. During this time, they didn’t read as many stories as they might have, or write as many words. One might say that their learning slowed down. But it had become more substantive and meaningful. The organization of smaller group work may have initially taken more time to set up, but it encouraged children to work as a team and to engage in communication, sharing, and

collaboration. In contrast, their usual activities are sometimes rushed and unreflective. Perhaps one benefit of the new technologies is not that they accommodate the fast pace of modern life, but rather, that they slow it down.

Conclusion

Many young people today are disillusioned with the world of school; they find a more stimulating and media-rich environment outside. In schools, the use of new technologies is often ad-hoc and patchy, with an emphasis on skills associated with particular software packages, rather than on communicative and creative outcomes. We need to employ technology to facilitate greater student engagement and connection between everyday encounters with digital media and what is taught in schools.

In the Docklands schools, Principals are working to develop coordinated strategies for planning, support, and training which address their school technology needs. One thing that could help them achieve this is a vision of what is both desirable and possible in their current contexts. This vision could be expressed in many ways, but one of the most practical and accessible is a set of stories about successful classroom learning and teaching practices. We found scenarios as a useful way to present success stories that are already taking place and allow activities to be shared more easily among schools. Scenarios also offered us a way of making meaningful and achievable recommendations to schools on how they could move towards using technology to enrich their learning and teaching practices.

An ever-present assumption in this work is that new technologies not only represent new forms of learning for young people, but they also imply the need for continual learning on the part of everyone involved in the education process. As John Cotton Dana reminds us, "Who dares to teach must never cease to learn" (inscription over a building originally of the Newark Normal School).

Acknowledgements

Our special thanks go to the Principals and teachers who participated so freely and helpfully in the study. We would also like to thank Leo Casey, Paul Mooney, Kate Lacey, Keith Maycock, Lisa Kilmartin, and others at the National College of Ireland for their help with the project. We are grateful for support from the Dublin Docklands Development Authority and the Fulbright Scholar Program through the National College of Ireland. Any opinions, findings, and conclusions or recommendations expressed in this article are those of the author(s) and do not necessarily reflect the views of these agencies.

References

Bruce, Bertram C., and Abigail Reynolds. 2008, May. *Using technology to support learning: Getting IT right in Docklands schools*. Dublin: Centre for Research and Innovation in Learning and Teaching, National College of Ireland.

Bruce, Bertram C., and Ann D. Rubin. 1993. *Electronic Quills: A situated evaluation of using computers for writing in classrooms*. Hillsdale, NJ: Lawrence Erlbaum.

Carroll, John M. 1999. Five reasons for scenario-based design. In *Proceedings of the 32nd Hawaii International Conference on System Sciences*, ed. Ralph H. Sprague, Jr. Los Alamitos, CA: IEEE Press.

Carroll, John M., & Farooq, Umer. 2005. Community-based learning: Design patterns and frameworks. In *Proceedings of the 9th European Conference on Computer-Supported Cooperative Work*, ed. H. Glllersen, K. Schmidt, M. Beaudouin-Lafon, & W. Mackay, 307-324. Dordrecht, The Netherlands: Springer.

Comber, Chris. 2007. SLICT: How to integrate ICT in your school. *Teaching Expertise.* http://www.teachingexpertise.com/articles/slict-how-to-integrate-ict-in-your-school-2495 [Accessed 6 September, 2008]

Frank, Kenneth A., Yong Zhao, and Kathryn Borman. 2004. Social capital and the implementation of computers in schools. *Sociology of Education,* 77, no. 2, 148-171.

Gurstein, Michael 2003, December. Effective use: A community informatics strategy beyond the digital divide. *First Monday,* 8, no. 12. http://firstmonday.org/issues/issue8_12/gurstein/index.html

Hsu, Shihkuam, Ping-Yin Kuan, and Cheng-Hong Yang. submitted. Improvement in ICT integration proficiency: Access, training, and support for grades 1-9 teachers in Taiwan. Submitted to *Computers and Education*.

Jesuit Centre for Faith and Justice. 2007, November. *Educational Disadvantage*. Available from http://www.cfj.ie/images/stories/pdf/May07_WN/education.pd [Accessed 03 March 2007]

McKinsey & Company. 2007. *How the world's best-performing school systems come out on top.* http://www.mckinsey.com/clientservice/socialsector/resources/pdf/Worlds_School_Systems_Final.pdf

Reynolds, David. 2008. *Schools learning from their best: The Within School Variation (WSV) project*. Nottingham: National College for School Leadership.

Russell, Donna L., and Art Schneiderheinze. 2005. Understanding innovation in education using activity theory. *Journal of Educational Technology & Society,* 8, no. 1, 38-53.

Suas Educational Development. 2008. *The Bridge to College*. http://www.suas.ie/b2c.html [Accessed 6 September, 2008]

Wasser, Judy D. 1998, February. Technology infusion: A systemic proposition: Learning from the Hanau Model Schools Partnership. Hanau Model Schools Partnership Research Report Number 3. http://modelschools.terc.edu/TEMPLATE/Publications/pdf/techinf-systemicprop.pdf [Accessed 6 September, 2008]

Wilson, Brent, Lorraine Sherry, Jackie Dobrovolny, Mike Batty, and Martin Ryder. 2001. Adoption of learning technologies in schools and universities. In *Handbook of information technologies for education & training,* ed. Heimo H. Adelsberger, Betty Collis, and Jan Martin Pawlowski, 293-307. New York: Springer-Verlag.