

E-learning: increasing the uptake of digital technologies in teaching and learning

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Executive Summary

School leaders have a most important role to play in ensuring students develop 21st century skills. A school vision and strategic plan needs to be grounded in pedagogy, developed by the community and supported by a sustainable organisational structure. Self-review instruments assist schools to identify current capability and help shape their development.

Leadership teams selected firstly for their pedagogical knowledge and secondly their technical capability will be most effective if they are distributed within each learning area, connected to other key people such as senior managers, technical and library staff, and who are able to present a compelling argument in a memorable way to their colleagues.

Teachers are more likely to be “ready, willing and able” if they share the school’s vision, are motivated to achieve it, are able to explore knowledge (knowing that) and knowing (knowing how), belong to a professional learning community that shares their vision, and have opportunity for experience and reflective practice. To provide teachers with tools is insufficient if they don’t know how to use them purposefully – that is, for authentic purposes and in engaging ways, rather than new ways of doing the old.

21st century skills go much deeper than just the technical “knowing how” in a digital world. Students will also need to:

- manage an overabundance of disorganised information;
- think about and create meaning and new knowledge;

- share their knowledge for others to access;
- collaborate with others online;
- solve or negotiate agreement on problems of varying complexity;
- work across diverse cultures and democracies; and
- manage their own work along with their own digital footprint.

“Digital natives” are unlikely to have all these skills. Teachers can further challenge ICT-savvy students by raising the level of complexity in the activity.

Students need authentic tasks that not only challenge their cognitive and technical abilities, but also confront their attitudes and feelings – the affective attributes of dilemmas and their resolutions. Deliberate pedagogical action is required to provide activities, structure and scaffold learning, and stretch students to the limits of their personal repertoire of learning strategies. Students also need authentic situations with multiple perspectives to enable transfer of knowledge and skills. While students appear to be experts at social networking online, collaborating about a work task is a most challenging skill for them.

Socio-cultural constructs of learning are most suited to integrating ICT and progressing 21st century skills. Teaching and learning is a joint process in which teachers and students learn together. The role of the teacher is to moderate and manage the learning process, develop the activity and provide the technical facilities. The role of the students is to take more responsibility in knowledge acquisition and self-directed learning. To maximise these roles, activities need to have:

- authenticity (utilises student knowledge and expertise; and provides a situated context with multiple perspectives);
- social interaction (causes collaboration, reflection and revision of prior knowledge and assumptions); and
- negotiation (participants independently contribute multiple opinions and experiences; and requires agreement or compromised solutions).

Change happens when people are expected to do things differently. People will do things differently if they share the vision with inspiring colleagues who encourage and assist their participation. Organisational culture (the way we do things here) follows behaviour (the actions of its members) but requires a clear direction and tolerant persistence from leaders for the school to progress towards it.

Introduction

The rapid development and personal uptake of digital technologies has placed increasing pressure on schools to adopt applications in teaching and learning to ensure students utilise and learn 21st century skills and can operate as global citizens.

School leaders continue to discuss ways in which teachers can be encouraged and supported to adopt applications in their teaching, often focusing on early adopters to lead the way.

Teachers value the need to ensure any applications in teaching are embedded in pedagogy, enhance student engagement, improve learning outcomes, are easy to access, and with which they are reasonably familiar.

Primary schools are increasingly moving to digital applications and personal notebooks. Students entering secondary school arrive with prior knowledge and abilities to both draw from and build on in a national qualifications environment.

This report considers three aspects of ICT in schools:

- Review of literature relating to teachers' learning with digital technologies, and application in teaching;
- Identify school leadership and professional development models, and their application in schools to support the uptake of digital applications; and
- Explore e-learning in practice, along with its links to pedagogy and student learning outcomes, across primary and secondary schools.

Findings are grouped under three headings:

- Leadership (page 4)
 - Principals
 - Creating a vision for technology
 - Self-review
 - Leadership teams
 - Professional development
- Teaching and Learning (page 8)
 - 21st century skills
 - Improving learning outcomes
 - The socio-cultural learning classroom
- Applications in teaching and learning (page 13)

Leadership

Principals

Our people model their engagement on the messages (intended or otherwise) that their leaders convey. In the past, the Principal may have been able to delegate development of ICT in school to the innovators and early adopters. Continuing a distanced approach will send messages that ICT is not important in this school. As David Kinane (Interface 2010) writes, the need for the Principal to adopt and use applications for both social and business purposes, and to ensure embedded and continuing application in school despite staff movements, is now more important than ever. The interest and involvement of the Principal is paramount in creating productive 21st century schools.

In his paper to ACEC2010, *School Leadership is Critical to Maximising the Impact of ICT on Learning*, Paul Newhouse identifies six inter-connected organisational conditions as necessary for supporting teaching and learning with ICT:

1. Vision – reduce the chance of techno-centric thinking by enunciating a clear vision grounded in pedagogical understanding;
2. Strategic plan – short and long term, to give school-wide effect to the vision;
3. School culture – foster a sense of teacher-ownership of initiatives, then support implementation;
4. Whole school approach – involve everyone in developing the vision and strategic plan; provide school-based PD including presentations from colleagues; enable communities of practice to become established across the school;
5. School infrastructure – provision is critical to implementation and is the responsibility of the leader;
6. Organisation structures – sustainable structures ensure the maintenance of adequate infrastructure and the ongoing capability of staff in response to development, turnover and ICT innovations.

Creating a vision for technology

Becta (2008) advises the school's vision focus on "improving learning", addressing multiple elements that draw together to support this outcome. Elements such as a flexible learning environment, supporting staff with professional development and tools, and providing reliable and secure communications, are essential to achieving the vision.

The Australian Ministerial Council on Education, Employment, Training and Youth Affairs, through its suite of papers *Learning in an On-line World: contemporary learning; leadership strategy; and pedagogy strategy* (MCEETYA, 2005), also promotes the imperative for leaders to develop vision and strategic plans that support teachers to focus on student

learning with ICT applications. The framework goes some way toward establishing clear understanding of ICT embedded in pedagogy to improve learning outcomes and adds weight to the transformative shift required in moving people from “learning-to-use” to “using-to-learn”. The Council reports in its pedagogy strategy paper:

“making technologies available does not of itself result in changed teaching methods or in the level of learning outcomes. Effective use of ICT in education requires appropriate pedagogies.”

In establishing a vision and strategic plan, Newhouse (2010) identifies and elaborates on six principles including:

1. a learner focus – interactive, experiential, needs-based, knowledge creation, communication, critical and ethical understandings;
2. educational soundness – adds value, protects integrity of the learning area, inclusive of all students, scaffolds learning, appraises the application of ICT;
3. professional learning – with and from colleagues and students, in teaching and management, appraises pedagogies made possible by ICT, evaluate, create and share learning resources;
4. diversity – connect prior learning and desired goals, cultural diversity, support students whose learning is at risk, provide a range of learning experience at varying levels of complexity;
5. alignment – connect learning with assessment and reporting, meet diverse needs of students and their families, share across schools and education systems, draw from the world beyond school;
6. collaboration – utilise student expertise, collaborative projects, access and interact with local and global communities.

McIntosh (2007) claims that leaders need to sell their vision by knowing who best amongst staff and students to do the talking, participating in the action, supporting risk-takers, spreading the word and establishing sustainable learning communities. If messages from the top are to be effective, the best approach is to keep it simple using pragmatic and achievable language that our people can relate to and understand. They need to be clear about the school’s direction and their role in making it happen. Using concrete ideas that are credible, linked at an emotional level by telling a story about the future, will go a long way to avoiding an unexpected interpretation that creates misunderstanding and confusion.

The central challenge and core problem of all improvement initiatives lies in changing people’s behaviour – addressing what people do and creating the need for significant shifts (DuFour, in *21st Century Skills*, 2010). Schools need a cultural shift from the traditional

knowledge-based model to a co-constructive professional learning community. In any change, culture comes last and follows from changed behaviour. Successful change agents focus on what people must actually do, using for example SMART goals, then leveraging through reward, structures, coaching and resources, and confronting those who don't.

Andy Hargreaves (in *21st Century Skills*, 2010) presents four ways of leadership, being (1) Venus: the social welfare state; (2) Mars: the market economy; (3) Mercury: the knowledge society; and (4) Earth: the push for sustainability and success in our world and or work. Fourth Way teaching and learning starts from an inspiring and inclusive vision, is deep and mindful, is reflective and ruminative, sets short term targets for long term commitments, is owned and developed within and with the community, and collaborates to balance strengths and weaknesses and ensure succession.

Self review

There are several tools available that describe the progression steps towards a fully integrated status where IT provision is sufficient and ICT is embedded in pedagogy. This report does not purport to identify them all, nor promote any particular tool. The tools mentioned are research-based and have a high level of complexity and ability to be repeated over time that makes them worthy of consideration.

The school self-review rubric framework promulgated by BECTA (2008) provides a self-evaluation of current school-wide understanding of ICT across five levels of progression in each of six elements:

- leadership and management;
- curriculum;
- teaching and learning;
- assessment;
- professional development; and
- resources.

Pre- and post-applications of the tool provide benchmark and progression information as a basis for planning improvements.

The Victorian e-Potential ICT Capabilities Continuum also provides a progression framework <http://epotential.education.vic.gov.au/continuum> with four achievement levels in each of sixteen categories of development.

Schools will have developed their own self-review tools over recent years in an attempt to find out what teachers and students know and can do, and what they would like to do if they

could. Rather than find out what staff can and want to do, using a capability rubric shifts the expectation of progression from the stage of “*can and want to do*” to “*can but need to do*”.

Leadership teams

Many Principals write in their sabbatical reports of the value gained from focusing their attention on the early adopters (described as “the ready, willing and able”) and creating lead teachers and specialists who teach the students as well as the teachers. Building capability in key people enables networks for distributing ideas, knowledge and experience, whole of staff and opt-in workshops, just-in-time and just-in-case peer tutoring, inclusion of staff who are new to teaching or new to the school, and create a “me too” environment for the late adopters.

This idea is supported by DuFour, (in *21st Century Skills*, 2010) who proposes that successful professional learning communities require resilience, tenacity, persistence, problem solving, and conflict resolution. The “*tipping point*” comes from having a few highly regarded and connected people to present a compelling argument in a memorable way. Others will want to follow their lead.

Paul Newhouse, Centre for Schooling and Learning Technologies at Edith Cowan University, reported at ACEC2010 that international research has consistently found the organisation and leadership of a school are critical factors and require a leadership team including the Principal, a Curriculum leader, and Technical support. The most powerful strategy comes from creating a curriculum leadership role through which a person with, firstly, pedagogical understanding and, secondly, an early adopter in the use of ICT can facilitate a strong connection between ICT and curriculum. Moyle (2006) expands the curriculum leadership role to include multiple people, for example, from all subjects, library, professional development, technical staff and senior managers. Without the curriculum leadership role being established in the school, there is little prospect of teachers realising the potential of applications in teaching and learning. Also, without a connection to the senior leadership and technical people in the school, the curriculum leadership role is rendered ineffective. Claire Amos of Epsom Girls’ Grammar (www.core-ed.org) reports a similar structure for her role as ICT curriculum leader that includes one ICT focused teacher in each learning area.

Professional Learning

Tony Fisher, et al, in their Report for Futurelab (2006) explores research and projects relating to teachers learning with digital technologies. Their Report 14

www.archive.futurelab.org.uk) is well worth reading to understand the concepts underpinning teachers being “ready, willing and able”.

Conventional conceptions of teaching and learning claim that knowledge exists in the mind of an individual and can be transferred without problem to another. Socio-cultural conceptions of teaching and learning draw from theories of distributed and situated cognition with transfer occurring through communities of practice, claiming that knowing and thinking cannot be separated from the social context in which they occur, and hence that “knowing” is a social process.

Both “knowledge” and “knowing” are required if teachers are to be effective in their own and others learning. With regard to developing teachers’ knowledge [knowing that], there is an important role for conceptual inputs, but such inputs are subjected to a range of complex influences and interplay of individual characteristics, hence, are resistant to standardisation. With regard to teachers’ knowing [knowing how], learning is best in activity systems containing elements such as personal experience, reflection, construction and take into account the situated complexity relating to individual and social factors. Social factors are described as being “ready, willing and able”, in which, according to Schulman (in Fisher, et al; 2006), teachers need a shared vision (ready), motivation to achieve it (willing), knowledge and knowing (able), experience (reflection), and belonging (professional community). With such conditions, learning will occur whether or not it was the intended goal of the activity.

Fisher, et al (2006) draw their research together by discussing three models of teacher learning. The teacher’s personal construct is placed at the centre, surrounded by three levels of influence – individual factors, professional community and school policies. In practice, the importance of the personal construct (or being ready, willing and able) means that similar conditions for change do not yield similar outcomes and small input shifts can cause large and unpredictable differences in outcomes. Greatest progress is most likely to come from a systemic approach to the activity encompassing a common vision amongst teachers, motivation that will sustain their persistence, and access to professional learning, practice and reflection.

We are at risk of assuming that provision of ICT tools plus professional development for teachers will modify pedagogy. For some teachers it will, while for others it is most likely to deliver a different and more expensive way of doing more of the same. As Hattie (2009) found, doing more of the same will have little effect on improving learning outcomes. This view concurs with the evidence Wright (ACEC2010) found in her analysis of global research – *“providing [the ICT] tools [for teachers] is insufficient if people don’t know how to use them*

purposefully. “Purposefully” is explained as “*finding new ways to use the tools for authentic purposes and in engaging ways; not new ways of doing the old*”. In Alan November’s contribution to “*21st Century Skills*” (Ch12) he claims there is little worse than “*visiting laptop schools to find every student taking notes with what amounts to a \$2,000 pencil*”.

Teaching and Learning

21st Century Skills

This is a phrase so often quoted but shortened to the extent that it gives little indication of what it might actually mean. It seems a relevant place to start thinking about and planning for e-learning – what are the skills purported to be necessary for the 21st century?

A well-recommended read is the fifth book in the Leading Edge™ series, *21st Century Skills: rethinking how students learn* (Bellanca and Brandt, editors, 2010). Ken Gray in his foreword claims that: “*with 21st century skills, students will be able to think, learn, work, solve problems, communicate, collaborate, and contribute effectively throughout their lives*”. One could well claim that the New Zealand Curriculum expects this already of our learners, so let’s search more deeply into what these 21st Century authors say.

Linda Darling-Hammond (Ch2) talks about the need for students to design, evaluate and manage their own work; to frame, investigate and solve problems; to find, analyse and use information; and to collaborate and communicate to share knowledge. Effective teachers apply both basic skills and thinking skills in their teaching - *both/and, not either/or*.

Chris Dede (Ch3) reinforces the importance of collaboration and communication with the shift to Web 2.0 technologies and neo-millennial learning styles of sharing, thinking and co-creating. Technology is now less about static presentation of material and more about active co-construction of resources by communities of contributors – applicable to both teachers and students.

Johnson and Johnson (Ch9) set the scene for the future as having four challenges – (1) an increasing global interdependence, diversity and pluralism, and conflict, (2) an increasing number of democracies within groups, communities, and across nations creating the need for citizenship within and across political communities, (3) the need for creative entrepreneurs to contribute to the economic health of the country in an environment of global mobility, and (4) the importance of interpersonal relationships, increasingly on-line, that affect the development of personal identity. The tools required to meet these challenges include co-operative learning in each of formal, informal, short-term, and long-term groups;

constructive controversy in which agreement can be reached within a group where members have opposing views; and integrative problem-solving to negotiate conflicts of interest.

Cheryl Lemke (Ch11) proposes that young people will need critical thinking, collaboration and information literacy – adaptive expertise. Her “FLOW” model invites teachers to balance complexity of task with each student’s current repertoire of learning strategies. Poorly balanced complexity/skill leads to either frustrated or bored learners. Skill is measured as an efficiency of learning, while complexity is the degree of creativity and innovation required of the task.

Alan November (Ch12) proposes three big picture trends – an over-abundance of information, global communication, and job market flow. In response to these trends, students will need to know how to make meaning from the wealth of information, how to work with people around the world, and how to be a self-directed, interdependent and life-long learner.

Will Richardson (Ch13) talks about a tectonic shift that will see groups of people come together to accomplish something without belonging to an organisation. Learning is already no longer restricted to a particular place or time, rather being ubiquitous, cross-cultural, creative, and with new knowledge created and shared online for others to access. The new skill-set is “*network literacy: managing the potential and pitfalls of sharing our work and ourselves on-line*”.

Cope and Kalantzis in *Ubiquitous Learning* (2009) also refer to the paradigm shift caused by our evolving knowledge creation occurring in the public domain as we increasingly use Web technology to make sense of the world. The process of learning is rapidly merging into ubiquitous knowledge engagement. The skills of the future lie in information and communication – sourcing, creating and sharing.

Our writers are united in their thinking that students will need to manage an overabundance of disorganised information, think about and create meaning and new knowledge, share their knowledge for others to access, collaborate with others on-line, solve or negotiate agreement on problems of varying complexity, work across diverse cultures and democracies, and manage their own work along with their own digital footprint.

Alongside this discussion, there are numerous rubrics epitomising the digital literacy skills people need. Parkes, et al, (ACEC2010) presented survey results identifying perceived competencies considered essential. The most challenging for students include the ability to

critique and evaluate material found on the internet, technical expertise in using Learning Management Systems and maximising their own learning within it, and, while social constructivism is considered the theory of choice for informing e-learning practice, students found collaborating and interacting with others about their work online challenging. While students are highly interested in social networking, they consider an assignment as “work” no matter how it is presented, and find transfer from one context to another challenging. It is not surprising they may not see the similarity between social networking and collaborating for work (Wielicki & Olguin, 2011).

If we are to think deeply about the 21st century skills proposed above, we will need to take students far beyond the list of functional skills and place our emphasis on the socio-cultural design of learning activities where the digital learning is not the intended goal of the activity. We assume students to be digital natives, but their capability may be restricted to “knowing how” in a range of applications. It is this talent that teachers should draw from in the classroom to apply to the learning activity designed by the teacher to challenge students’ 21st century skills.

Improving learning outcomes

A challenge for all schools, as David Hodge (2010) found, is the ability to define the impact of ICT on learning outcomes. Access and uptake of ICT is relatively easy to measure in terms of costs, time, assets, professional learning opportunities, staff participation, applications, and apparent student engagement. At the hard end, is measuring and attributing improved student learning outcomes to ICT applications. Students can appear to be more engaged when given new technology to work with but there is a significant difference between being fascinated with the technology and using it to improve learning outcomes (Wright, 2010).

Further, Wright explains that studies in education are rarely objective because of the sociological setting. Research describes what and how but is thin on examining the impact on outcomes. Indeed, much of the literature is unclear on what outcomes we should be seeking from e-learning. In Becta’s final report into the use of ICT in schools, national test outcomes lifted beyond expectation for primary students where ICT tools improved the quality of teacher/student interactions and provided greater learner-initiated choices.

Student engagement is often cited as an improved outcome from ICT in learning and, certainly, any such gains bode well for gains in student achievement. But, as Wright has found, the Hawthorne effect can place initial gains at risk over the long term as the novelty of the application wears off and the researchers are no longer observing, after which the

learners risk considering this as the “new norm”. Teachers need to use the tools for authentic purposes and in engaging and challenging ways.

Knowing what, how and why – the technical attributes of ICT – are desirable and necessary for learners, but they are not sufficient as learning outcomes for the 21st century. Students need tasks that not only challenge their cognitive and technical abilities but also confront their attitudes and feelings – caring about why: the affective attributes of dilemmas and their resolutions (Magenheim, 2003). Deliberate pedagogical action is required to cause students to think about and create meaning and new knowledge, share their knowledge for others to access, collaborate with others on-line to solve or negotiate agreement on complex problems, work across diverse cultures and democracies, and manage their own work along with their own digital footprint. E-learning contexts are important and the teachers’ role is as important as ever in achieving these outcomes.

The socio-cultural learning classroom

The socio-cultural conception of teaching and learning is a familiar theme throughout the readings on inquiry teaching and uptake of ICT in learning. Hill and Sewell (SET 3, 2010) expand on the ideas of Fisher, et al (2006), and deem everyone in the classroom to be learners. Teaching and learning is more than just learners being active together in the classroom where the teacher maintains the role of expert. Rather, it is an environment in which teachers and students participate together as a learning community. The socio-cultural classroom practice is also upheld as essential if teachers are to successfully integrate ICT and progress 21st century skills. When teachers and students are both learning from and teaching each other, the greatest synergy can be found.

The way learners handle knowledge needs to be a focus for teachers. Nunes and McPherson (2003) elaborate on the work of Laurillard (1993) and propose that knowledge has a contextualised character and cannot be separated from situations in which it is used. Knowledge learned in isolation remains inert – available but with no recognition of when it is relevant. A learner’s understanding of a subject is embedded in their experience making acquisition of concepts of no use if the learner cannot transfer and apply. They propose that learning occurs through interaction with rich learning environments and engaging in authentic activities that require social interaction and negotiation.

Socio-cultural teaching and learning requires three elements:

1. Authentic activities:

- learning has internal (understanding) and external (contexts) associations;
- the usability of a concept will depend on the external associations, which require both

- situated learning that is embedded in realistic and relevant contexts, and
 - multiple perspectives to acquire a comprehensive and therefore transferable view
2. Social interaction, which requires both:
- private activity – the cognitive restructuring that occurs as learners revise their ways of thinking to find a better fit with new information, and
 - social activity – collaboration and negotiation that occurs with teachers and peers, face-to-face and on-line
3. Social negotiation:
- consider situations from many perspectives (experience, perception and knowledge) to create new knowledge and understandings
 - negotiating equally on each other's ideas
 - joint problem solving to find agreed (or compromised) solutions

The roles of the teacher and the learner need to be clarified (Magenheim, 2003). Teachers are moderators and managers of the learning process, responsible for the learning activities and technical facilities, while students are required to take more responsibility in knowledge acquisition and self-directed learning. It is through the teacher's planning of learning activities that learners will have the opportunity to interact, have more choice and control over their learning and engage more deeply. The nature and complexity of the learning activity will enable appropriate ICT applications and students to develop 21st century skills. As Alan November claims (in 21st Century Skills), the test for any learning activity is when the teacher returns to class after a 20 minute absence and finds the students still working without having noticed the teacher's absence.

If change happens by first addressing what people do, Kellie McRobert (Nayland Primary School) has done just that. To ensure ICT is integrated in learning activities she developed a "tablemat planner" for teachers to overlay their pedagogical planning to check for both key competencies and e-competencies. In this case, the e-competencies adopted include five digital literacies – citizenship, digital, media, informational, and technological. Such tools assist the vision to become reality.

Applications

Descriptions that follow are not intended to critique the socio-cultural aspects of pedagogical design, nor display links to student learning outcomes or 21st century skills, merely to observe examples of current practice.

Advertisement Project: [Business class: Year 10] students are required to identify a product at the canteen and create a 30 second marketing advertisement using a video camera. The

advertisement is published on the school's intranet and invites feedback from the school community.

Blog: [Year 8 class] established a blog page accessed through the school's log-on web site. Both students and teacher contributed to the content with units of learning, photos, artwork, articles and writing. One student's experience of the difference between having work on the classroom wall compared to publication on the blog page was the difference in feedback – with the former she could see who was looking at her work and gain some feedback from their body language; with the latter, she had no idea who was looking and would often be surprised by an unexpected comment from a classmate.

Classroom presentations: [Year 8 class] students were asked to select a famous New Zealander, search for information, use *garage band* and create a static presentation they could use to support their speech to the class. One student developed her digital dream home, showing details of the architecture, floor plan and perspectives, to present to her class.

Collaboration: [Year 12 History class] students were given choices of topic within the unit of learning along with criteria for their assessments. Teams were required to do a Google Power Point presentation to the class. Through *Moodle* and *Google Apps*, students collaborate on-line from home as they work on their research, writing and developing their presentation for the class. The teacher is able to observe their discussions, answer questions and give feedback where appropriate. Again, using *Google Apps* the teacher puts up the calendar of dates for team presentations for the class allowing 3 per lesson over a set number of weeks. Each team is required to decide and book their preferred time slot. Teacher can see bookings and who will do theirs first – usually the least preferred slot as the first presentation sets the standard for teams that follow. The teacher has noted that they tend to learn from each other and adjust their presentations over the following days.

Digital Camera: [Year 7 class] photographed a sequence of shots of their “archaeological dig” showing the various layers and discoveries as the dig proceeded. Later in class, the students converted their selection of photos, animating it into a *QuickTime* movie.

Digital Response Systems: [all ages] in response to a question and without any conversation, all students are required to select their answer to feed into the accumulated class response. The class outcome is published showing the proportion of responses for each option given. Students are then asked to discuss their responses with those around them taking responsibility for convincing others that theirs is the correct response. A second

“straw-poll” is taken to ascertain the change. The teacher can identify where the correct/incorrect responses are sitting in the class and can initiate partnerships for student conversations. The tool is useful for a quick assessment, understanding of a complex issue, and peer tutoring.

Digital Storytelling: [Year 8 student] created a digital story of her family’s migration from China. She took new photos, scanned older photos, created artwork, mapped the story board, wrote the script, narrated the story, created titles and credits, and produced the sound track of background music to match the mood of the story as it progressed. She sought feedback from her family, teacher and peers. She posted her work on the internet to contribute to the knowledge base of the history of that time.

Documentary: [Year 8 class] as a social studies project, the class was required to identify the different aspects and elements of their school community and how they interrelate and work together to function as a whole. Students worked in co-operative groups of 3-4 to collate personal responses from community members. The class used *Inspiration* to brainstorm and organise the groups to be interviewed; *Word* to develop and publish questionnaires; *Email* to organise and confirm interviews; *Video camera* to film the interview; *iMovie* to edit their documentary segment; and *Keynote* to create group presentations summarising what they had learned. The teacher thought the planning session would be the most challenging for students, but the students found filming required the most concentration. In their view, the need for successful editing and production outcomes required them to get the filming just right, while plans could be adjusted as they progressed the project.

e-Portfolios: [whole school] students use the interactive tool for recording weekly reflections and goals, organising information and work plans, feed-back, feed-forward, and next steps in formative assessment from teachers, constructive comment from peers and others, and show-casing achievements – all evidence of their progress in learning with the end result as a portfolio of work to produce for one or more subjects or to validate qualifications and experience in future years. E-portfolios contain text, photos, voice, video, artwork. Students invite others to view their e-portfolio including parents and friends, and have access to their work 24/7. Students own and have control over their e-portfolio, including who gets invited to share their work.

Field Trip: [Year 7 class] students visited the wind turbine farm and recorded the mechanics of turbines in operation on video. When students returned to class, they used the video to reflect on what they had learned and to assist them explain how the wind turbines work.

iPods: [Year 4 class] one iPod with a headphone splitter allows one iPod to be shared between five students. Videos and podcasts free from the *iTunes* store form the basis of student activities such as comprehension, visualising, following instructions on a “how-to” video, skills to practice, and other instructional and interactive applications. Students can also create their own videos and podcasts and share with others.

Journal Writing: [Year 3-6] interest was waning in the weekly requirement to write – students lost their journal, wrote little, and delayed the teacher’s ability to collect all books for marking. Teachers chose *blogging* as the medium because of its simplicity in setting up and its user-friendly features. Students were motivated by the opportunity to express a reflective thought or opinion. ICT-savvy students enjoyed the on-line environment because of the additional features it offered for their journal entry and the opportunity for many others in class to read it. Some students still preferred to write in a journal and had the choice to do so.

Laptops: [Year 8 class] in a 1-to-1 laptop class, students agree their work plan for the day which establishes a timetable, a time when they can ask the teacher for assistance, lists of “must do” and “can do” activities, and online maths tutorial tasks at www.khanacademy.org for those students who wish to take up greater challenges.

Learning focus: [Year 7 class] every Monday morning the class creates a podcast in which students interview the teacher and classmates about what they are learning this week.

Lesson notes: [secondary] one or more students are assigned the task of creating the day’s lesson notes for the class on a laptop. At the end of the lesson the notes are displayed through the data projector and the teacher spends a few minutes going over the notes to check their accuracy with the whole class. The student then publishes them for the class to access anytime. The teacher and students can be assured they all go home with quality notes.

Mentoring: [Early Childhood] one young student was not progressing well. Following a conversation with her parents it was suggested that she was really missing her grandmother who had not been able to migrate with the family. Daily *Skype* contact (at a most inconvenient time for the grandmother) fixed the problem.

Mobile phone: [Year 9 class] were asked to video each other’s physical activity performance to provide feedback to improve their skill. To supplement the short supply of cameras, students used the camera on their mobile phones. This application is not restricted to

performing arts, rather available for any learning situation involving presentation – visual feedback is a powerful tutor.

Peer mentoring: [Year 8 class] in a class of 1:1 projects, the teacher can find the diversity challenging to manage. Students are directed to have regular conversations about each other's processes, progress, and rules to be followed. They are expected to help each other. When students encounter problems of a technical nature, they are directed back to student mentors to seek advice.

Podcast: [Year 12 class] the teacher creates a *podcast* introducing a new unit of learning or concept, makes it available online and expects students to listen to it before attending class, and as often as they wish to after that. Students claim it is easier to understand and engage in the discussion in class and to read about the concept in the textbook after listening to the Podcast.

Publishing Team: [Year 8 class] students were required to establish a team charged with publishing the school magazine. Individuals wrote articles and presented photos to support them. The student team learned how to edit, cross-reference material for accuracy, and the technical skills of creating a publication for print. They found it took a while to learn what was required of them but eventually became more efficient.

School-home: [Year 8 class] students were given an assignment in which they drew one from eight countries at random and were asked to research life expectancy. Using *Etherpad*, students needed to brainstorm, research, discuss their assignment at home, rank all their countries then choose how best to present their work to create maximum awareness – speech, poster, brochure, podcast, or animation/film.

Science Field Trip: [Year 7-8] students investigating the effect of natural processes of rivers on rocks, used a variety of ICTs to assist the interpretive processes in science inquiry – digital camera, video, voice recording and reviewing of their ideas, *IWB* discussion, digital microscopes to systematically view samples collected, *Google Earth* maps for aerial and spatial views of the land formation and comparisons with other similar areas, and animations of the natural processes at work at this site.

Sharing new knowledge: [Year 9 class] students research an aspect of their own community's history and present their work for assessment. Once the assessment is completed and the grade given, the written work done in class tends to come to a natural end. However, these students have their work published on the internet, enabling the

completed assignment to take on a new life after it is assessed, leave a legacy for others, and add value to the world's knowledge. Students found themselves having to justify their claims in response to on-line readers; or to review their understanding in light of new or more complex information.

Student Choice: [Year 8 class] students were able to select their science research topic from a range of options then select how best to present their research to the class. Topic examples included a bird study, a natural disaster, any country, or any capital city other than in New Zealand. Students could work as a team or as an individual, had to manage their timetabled access to computers for research, write their story and create its presentation mode. Presentations varied across print, power point, painting, animation, movie, and speaking. Students found the two weeks allocated to the project presented a challenge to get finished in time, especially as the presentation needed to follow the research report.

Talking: students learn by talking to either themselves or a friend. Wherever there is an opportunity, get students to talk about what they know. Attach a microphone (uni-directional) to a computer. Through talking, students suddenly realise what they are saying so progress quickly to identify their own problem/solution. Working in pairs, students can coach each other through critical listening.

Talking Book: [Year 8 student] wrote a piece of creative writing situated within her cultural community reflecting the culture and dialects of her family and friends. It was selected as an entry for the NZ School Journal, and was published as a "talking book". On reflection, she was extremely satisfied with the published story and with the illustrations given by the artist, but felt the talking book could have a more realistic selection of dialects to represent each of the people in her family's story. She would like to have been consulted on this aspect of the project.

Technical Teams: [Year 7-8] students are invited to apply for membership of the school's technical team. Examples of their responsibilities include operating the sound and lighting booth in the assembly venue, acting as the cross-school ICT crew to set up equipment and trouble-shoot to ensure it is operational for the event or classroom.

Television newsroom: [Year 7-8 class] two weeks are allocated for the class to develop its news story, which must be based on a researched issue or topic. The class works in various teams covering director, producer, presenters, researchers, writers, video editors selecting clips from *YouTube* to support the story, stage set, costume, camera crew, technical crew,

sound and lighting crew. The production goes live to air across the school's internal television channel to all classrooms at a set time each day. The documentary is published.

Tutorials: [Year 7 student] the class was given a choice of doing maths homework sums or creating a tutorial to assist other students' understanding of the particular concept the class was working on. One student elected to do the latter, publishing a voice-over video of her whiteboard explanation of the maths concept along with two worked examples. When asked why she chose 2 hours homework over 10 mins – “it would help other people not just me – and that's important”.

In another [Year 5 class], a group of students was asked to create a video tutorial to teach their peers about the good habits that can be adopted to prevent myopia. Their production would be used in teaching Year 5 health education classes. Students were taught the technical skills of filming, uploading, managing the software, and editing video clips. Students were given basic information and resources to develop their script. Teachers facilitated the production and subsequently developed health lessons based on the tutorial.

Video: [Year 8 student] was asked to produce a documentary on the behaviour of a species of mammal. She chose the social interaction of humans, writing her documentary from prior knowledge, research and new knowledge. Her final publication included voice over a time-lapsed video of students' movement patterns in the playground at lunchtime over consecutive days. Her work was presented on the school's television network and published on *YouTube*.

Voice: [Year 8] planned their documentary about solar heating using *Etherpad* as a story board template that asked them to brainstorm and document their existing knowledge and assumptions, research and collaborate as a class using post-it notes on the template to verify and document new knowledge, write their story then record it. Their documentary structure included an introduction, what they knew and thought they knew before researching, what they found out that confirmed or changed their existing knowledge, and what new learning they gained. The completed documentary was published on *RadioMe* and broadcast over the school's radio station, which has sufficient bandwidth for parents to tune into while waiting at the gate after school.

Conclusion

Start with a shared school vision, add a leadership structure that is widely distributed and predicated on teachers with strong pedagogical skills and an enthusiastic interest in ICT applications, develop socio-cultural approaches to planning learning, and select the ICT

application that is considered to add most value to the planned learning. Examples abound, and one of the best sources of “what could be” comes from exploring students’ prior experience.

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