

Digital Technologies: What does the research tell us about Innovative Classroom Practice and Student Outcomes?

Introduction

Throughout New Zealand and the world teachers (and students) are developing new education practices in response to the opportunities that digital technologies offer. There is, a growing body of evidence to support the view that digital technologies have the potential to improve student outcomes and to enrich, if not transform, the learning experience of children (Underwood, 2009). Furthermore, as the definition of student outcomes broadens to include non-academic outcomes there is increasing evidence of the positive impact of digital technologies in areas such as motivation, engagement, efficacy and interaction (Wright, 2010).

Commented [g1]: This is important I believe. Having measures of these domains provides data that is 'under' the data for literacy and numeracy.

Research supporting positive student outcomes

The following are examples of empirically sound studies that have used quantitative methodologies to show improved student outcomes in learning areas. We expect to see more such evidence, as education researchers find ways to measure student outcomes and validly attribute these outcomes within the complex and changing world of innovative teaching and learning practice.

1. The BECTA final report into the use of ICT in schools and its effect on teaching and learning in UK schools found that national test outcomes “improved beyond expectations” (Somekh, Underwood, Convery, Dillon, Jarvis, & Lewin, 2007, p. 6). This impact was greater in primary schools than secondary.
2. A study considering technology integration in secondary mathematics classrooms (Sheehan & Nillas, 2010) showed that when students were the primary users of technology, they were more engaged in learning and attained higher levels of mathematical understanding. The authors reported that technology use can help students to manipulate and link different representations and to focus on concepts rather than calculations. Technology was also found to help students to develop critical thinking skills.
3. A study considering the effects of technology immersion in middle schools (Shapley, Sheehan, Maloney, & Caranikas-Walker, 2011) found a positive effect on students’ technology proficiency and the frequency of their technology-based class activities. While they did not find any statistically significant effect for either reading or mathematics there were constantly positive effects across the study. This improvement was repeated across multiple cohorts.
4. A meta-analysis of reading performance in the middle grades (Moran, Ferdig, Pearson, Wardrop, & Blomeyer, 2008) found a positive effect on reading comprehension. The authors concluded that a wide range of digital technologies appear to enhance the reading performance of middle school students.
5. A review of ICT impacts in European schools found that the greatest impacts were in primary schools in the home language (e.g. English) and science.

There was also evidence for improvement in mathematics where the use of ICT was over a longer period than the other subject areas (Balanskat, Blamire, & Kefaia, 2006).

There is a more extensive body of qualitative studies. These tend to be small case study research projects; often in one class only and focused on one tool such as interactive whiteboards (IWBs), iPads, iPods or blogs. Many of these studies have a primary focus on outcomes other than academic, often with the understanding that these broader outcomes do strongly relate to future academic success. Some examples of such studies are listed below.

1. A pilot study regarding the use of an algebra application designed for an iPad instead of a textbook (Houghton Mifflin Harcourt, nd) found substantial positive effects on academic achievement. These results appear to be related to greater engagement and motivation.
2. A study considering the use of Personal Digital Assistants (PDAs) in eighth grade social studies (Clarke & Besnoy, 2010) classrooms found that students became more engaged and motivated. The authors found that the PDAs made the content come alive for the students and captured their attention in ways the traditional text book alone could not.
3. A study considering the influence of gaming technology on student learning (Jackson, 2009) found that students learn to set and manage goals; to problem solve and construct their own understandings as they go. Further, games provide instant feedback to students encouraging them to persist with an activity.
4. A New Zealand study (Falloon, 2010) considering the use of digital learning objects found that students became more independent, engaged and motivated. There was also evidence of greater interaction between teachers and students.

Teaching and learning practices

A recent BECTA report (Crook, Harrison, Farrington-Flint, Tomas, & Underwood, 2010) looked in detail at classroom practices in nine secondary schools. They argued that ICT had "*reconfigured classroom practice in the project schools in important ways*" (p.4). Similarly, examples of classrooms and schools where innovative practices are occurring were found in the evaluation of the National Education Network (NEN) Trial. This trial has supplied 102 New Zealand schools with fibre through the Kiwi Advanced Research and Education Network (KAREN). In these classes there was a focus on student access to technology; on connectivity and collaboration (Ward & Marentette, 2011). Reports from the NEN trial can be found at <http://www.vln.school.nz/groups/profile/55909/nen-trial>

However, while digital technologies are often present in classrooms they are not as evident in the learning practices of students within schools as they are in their lives outside school (Ward & Parr, 2011). As Halverson and Smith (2009) argue some technologies "thrive in schools" while others

“flourish outside schools and animate new learning environments” p51. There is no reason such learning cannot occur within the more formal setting of a school (Lee & Finger, 2010). There are a number of research and educational organizations producing reports which track the ‘migration’ of tools that children are using to access, share and create knowledge in their daily lives into the school-based learning experiences that are provided for them. Such reports detail the use of technology in schools and its potential to transform practice.

Two examples of these reports and the websites where they can be found are:

- **Project Tomorrow (2012). Mapping a Personalized Learning Journey – K-12 Students and Parents Connect the Dots with Digital Learning.**
Each year the Speak UP National Research Project polls k-12 students, parents and educators about the role of technology for learning in and out of school. The surveys include questions about the use of technology for learning, 21st century skills and schools of the future, as well as emerging technologies, science instruction and STEM career exploration. This report focuses on how today’s educators are personalizing the learning process for students. It and other reports are available from: http://www.tomorrow.org/speakup/speakup_reports.html
- **Grant, L. (2010). Connecting Digital Literacy between Home and School. Report for Future Lab.**
This report is the result of a seven-month research project into the connections and discontinuities between children’s digital literacy practices at home and in school. It aims to provide evidence of children’s current digital literacy practices, where there are opportunities for connections to be developed or established between home and school, and where there are disconnections that may need to be addressed. This report and others are available at: <http://futurelab.org.uk/resources>

The **Horizon** series of reports available at <http://wp.nmc.org/> are an excellent guide to the changing face of technology and what is available for schools both now and in the future. They also offer examples of what is happening in schools around the world.

At the **Cooney Center** site you can find a number of reports that aim to promote change by stimulating discussion around a range of topics including the children's interactive media landscape, mobile learning, and the debates over media multitasking. Their web site is <http://www.ioanganzcooneycenter.org/Reports.html>

In addition, have a look at the **Computers in New Zealand Schools** online repository of journal articles at: <http://education2x.otago.ac.nz/cinzs/> and the **Australasian Journal of Educational Technology** site at <http://www.ascilite.org.au/ajet/about/ajet-arcs-a.html>. The latter is often focussed on tertiary education but there are interesting school articles throughout the editions.

There is also a range of New Zealand research reports available on Education Counts <http://www.educationcounts.govt.nz>. For example, a recent report (Bolstad & Gilbert, 2012) discusses some emerging principles for future learning, how these are currently expressed in New Zealand educational thinking and practice and what they could look like in future practice.

Another challenge, and support, for New Zealand educators to think about our unique context for learning can be found in the thinking of Sarah-Jane and Hans Tiakiwai (2010): A Literature Review focused on Virtual Learning Environments (VLEs) and e-Learning in the Context of Te Reo Māori and Kaupapa Māori Education.

The Manaiakalani cluster work in Auckland provides useful insights into developments in collaborating schools <http://www.manaiakalani.org.nz>

Further, a number of publications to support eLearning capability can be found at: <http://elearning.tki.org.nz/Research-and-readings>.

Please note that the Network for Learning team will be tracking this exciting research space and will post new and relevant research. We would be delighted if via our email ufbis.schools@minedu.govt.nz you would help us to highlight new and robust sources of evidence and other sources that help us challenge ourselves as a community of practice.

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