E-learning, outcomes and pedagogy

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Abstract
A growing number of education systems are exploring the potential of e-learning to improve outcomes for students. There is also a great deal of hype about this; at times it seems as if e-learning tools are perceived to be an educational silver bullet. While a number of studies report on the success of using particular tools such as interactive whiteboards (IWBs) or report on how to create digital products like podcasts for educational purposes, few make explicit links to learning outcomes. When they do, the links appear to be tenuous. A stronger theme in research papers associated with this topic is the effects on teachers’ pedagogical practices. This paper outlines key themes from a synthesis of research published over the last five years that principally link e-learning, outcomes and pedagogy in school settings. The aim of this article is to demonstrate a relationship between pedagogy, technological tools and the role of teachers.

Key words: e-learning, outcomes, pedagogy

Introduction
This paper is synthesised from a New Zealand Ministry of Education commissioned literature review centred on schools, learning outcomes, and research and government policy documents published in the last five years in places such as The United States, Australia, Singapore, The United Kingdom, Canada and Scandinavian countries. The Ministry of Education in New Zealand has a best evidence synthesis programme in place (for example, Alton-Lee, 2003) with educational outcomes as a key focus, which meant that this literature review included defining what was meant by ‘outcomes’ and e-learning. The following lists synthesise outcomes information from two best evidence synthesis reports plus New Zealand national policy documents. Outcomes for students in relation to e-learning incorporated:

- Learning how to learn/metacognition
- Engagement/positive attitudes to learning
- Concentration on, and completion of tasks
- Taking learning outside the classroom
- Developing social skills – discussion, co-operation, task completion, inclusion, sensitivity to difference and diversity, building effective relationships
- Articulating opinions on and about their learning
- Improving basic skills of literacy and numeracy leading to improved products of learning such as written reports, visual or oral presentations
- Improving quantitatively in common tests.

And incorporated for teachers:

- Improved confidence with, and knowledge about, e-learning practices and tools
- Improved understanding and consistent use of appropriate pedagogies that support learning
- Improved relationships with students including an appreciation of their prior knowledge, diverse backgrounds, and capacity to learn
- Seeking regular feedback from students about their learning in order to improve practices and relationships
- Greater satisfaction and engagement in designing and implementing effective pedagogical
The most commonly reported student outcomes in e-learning studies were motivation, engagement and concentration (for example, Moos & Azevedo, 2009). A few documented progress in academic outcomes (Burt, 2007; Lewin et al, 2008) and others reported better relationships between students and teachers or alterations to pedagogy (Alexander, 2008; Ballantyne, 2004; Mitchell, 2007).

The terms e-learning and ICT eventually settled on the New Zealand Ministry of Education’s (2006, p. 2) e-Learning Action Plan definitions as ‘Learning and teaching that is facilitated by or supported through the smart use of information and communication technologies [ICTs]’, which include tools such as interactive whiteboards (IWBs), handheld devices like cell phones, digital cameras, voice recorders, or PDAs (personal digital assistants), plus computers, specific software applications, online contexts like LMSs (learning management systems), and Web 2.0 tools. The central word in ICT is ‘communication’ – the ability to receive, create and transmit information and/or new knowledge using a mediating technological tool of some kind. ‘Smart use’ in the above definition implies practices that are strategic, nimble, just-in-time, and pedagogically appropriate. And, as Earl and Forbes (2008) argued, the word ‘communication’ ‘emphasises the purpose behind using a wide range of technologies in educational contexts... the central focus should be…. on how [these technologies can] enable connections between people’ (p. 195). These connections imply interaction and a flow of information.

This paper examines student outcomes and pedagogy in classrooms where e-learning features.

Methods

Once definitions of key words were addressed, specific methods were used in the review, which concentrated on texts in the 2004-2009 range including theses, journal articles, conference presentations, policy documents and reports relating to e-learning and the compulsory schooling sector, particularly as they might relate to the New Zealand context, thus eliminating most texts about higher education. Finding evidence of e-learning and student outcomes, and texts which linked e-learning to teachers’ dispositions and pedagogy as factors in positive and deliberate classroom practices were also priorities.

In searching for reports, journal articles, theses and various texts (such as conference presentations), key words (such as e-learning, ICT, outcomes, engagement..) were systematically used to identify texts, and select and summarise concepts, ideas, methods and findings. Various electronic databases were searched including Proquest, ERIC, A+ and NZCER’s thesis database.

Given that schools and classrooms are complex, relatively unpredictable and fluid places, finding empirical studies that purport to establish causal links between these phenomena is difficult. While some argue that ‘reliable and valid objective measures are necessary if we are ever to achieve true integration of information technology in education’ (Maddux & Johnson, 2009, p. 1), studies in education are rarely objective. Qualitative research methods developed precisely because such objectivity was shown to be almost impossible to achieve in sociological settings like education. Richardson (1997) argued this in a seminal work on methodological objectivity and interpretive social science. This review did not discount qualitative studies.

While many articles about ICT/e-learning examined for this review were richly descriptive of what happened and how, generally, they were thin on examining impact or outcomes. Other studies demonstrating effect sizes of interventions sought to explain what happened in objective ways and sometimes made larger claims than could reasonably be expected from the size of the study. Most studies concentrated on specific classrooms and teachers. Contextual impediments, like how people felt on the day, what they already knew, or even what impact the environment might have had on the study context were seldom addressed. The potential influence of the Hawthorne Effect (explored shortly), was mostly excluded in discussions regarding the effect of e-learning/ICT interventions. The methodological basis for many of the studies’ conclusions examined for this review (whether qualitative or quantitative) are not necessarily applicable to contexts beyond the studies themselves, but the ideas cumulatively, have credence.
The nature of the evidence

Reports from Australia, Great Britain, Canada, USA, Singapore and Scandinavian countries such as Norway and Finland were searched in order to understand policy contexts around e-learning/ICT. Most reports outlining national e-learning policies also link it to educational outcomes. They assert that e-learning is beneficial. However, in Bourdieu’s terms, it is essentially doxa (Grenfell, 2007), a term referring to that which is considered to be a given, that needs no explaining, and is perceived as fact, when it is it is not. This international doxa about e-learning’s inherent benefits to learners masks a relatively small amount of actual evidence about its relationship to improved educational and life chances for students. While ‘outcomes’ is a term referred to consistently in governmental policy documents vis a vis learning, what it practically means is not always clear. Policy documents assert aspirational e-learning benefits for learners and expect teachers to embrace it but can ignore what this embrace might mean. Providing the tools is insufficient if people do not understand how to use it purposefully.

For example, the British ESRC’s Teaching and Learning Programme outlined key findings of a classroom-focused inquiry based on a survey of 250 teachers auditing IT structures across primary and secondary schools. The findings ‘confounded expectations’ because ‘while IT is now a well-established element of classroom practice, teachers made little use of electronic networks to develop their own professional practice, even when they were part of networks designed to help them do so’ (Learning how to learn- in classrooms, schools and networks, 2006, p. 3). Perhaps this also hints at what teachers need in order to engage in understanding how to get the best out of such networks: time, spaces, places, opportunity, and intellectual energy.

However, the UK’s BECTA final report into the use of ICT in schools and its effect on teaching and learning found that as technology embedded into the fabric of schooling, schools’ national test outcomes ‘improved beyond expectations’ (Somekh et al., 2007, p. 6). It suggested that gains were greater for primary-aged students, and that the regular use of ICT tools improved the quality of interactions between teachers and students, leading to greater learner-initiated choices. Through more personalised learning (ie working in smaller groups; identifying individual learning goals), students grappled with content and concepts in classrooms focused on their needs (Somekh et al., 2007). This ability to develop and consistently feature learner-centred pedagogical practices is significant in maintaining both student motivation and effective classroom relationships everywhere (Bishop & Berryman, 2006).

The point about embedding technological tools into the fabric of schooling is important, iterating the need to integrate, authenticate and develop purposeful learning, which is the role of the teacher. In terms of the differing results for primary and secondary schools, Somekh et al. (2007) highlighting the ability of primary classrooms to flexibly respond to students’ engagement in cross-curricular project work. Timetables are more flexible, allowing for greater time and concentration on specific tasks, rather than being at the mercy of a secondary school’s timetable bell.

In the BECTA report, students in classrooms containing technologies such as IWBs and other capture/display tools (digital cameras, for instance) could more easily ‘see’ or visualise material that was otherwise relatively abstract or difficult to access in other formats. Video formats were especially useful for students with disabilities. For example, their learning behaviours could be filmed for their own critique as means for improvement. The same technologies were useful for developing a broader range of students’ acting and other performance-type capabilities, as well as recording field trips, science experiments, or sports movements. In other words, this BECTA report noted a wide range of positive outcomes when ICT use was embedded into the fabric of a school’s learning opportunities.

As noted earlier, there are some issues with the rhetoric and the reality regarding e-learning and
outcomes. While there is evidence of a positive influence of using interactive whiteboards (IWBs) in classrooms on teachers’ pedagogies in UK research (Lewin, Somekh, & Steadman, 2008), and evidence of a relationship between regular ICT use (especially of digital media tools) and improved literacy and numeracy scores (Burt, 2007), the influence of internal contextual factors cannot be discounted. These include the:

- knowledge and confidence of the teachers,
- ready access students and teachers have to ICT tools (such as IWBs),
- prevailing pedagogical thinking in the school,
- leadership and technical support,
- social cohesion of the classroom, and
- the extent to which students have an audience for their work.

In exploring some details from the above list, podcasting and television productions from New Zealand’s Pt England School, for example, demonstrate the effects of both an authentic audience for students’ work, and a prevailing ethos about the social and pedagogical frameworks important to learning (Burt, 2007). It illustrates e-learning studies in primary school settings and suggests the need for comparable investigations into e-learning uptake and related pedagogical practices in secondary school settings.

In terms of access to tools, the research literature is currently dominated by work on interactive whiteboards (IWBs) in classrooms (see Lewin, Somekh, & Steadman, 2008). Perhaps the easily observable presence and use of IWBs, or their price has made IWBs so prominent. However, racking the educational uses of Web 2.0 affordances and gaming may soon supersede it: and there is a developing body of evidence of trials using mobile digital tools and gaming technologies for learning (see Stansbury, 2009).

One longitudinal study (Lewin et al., 2008) on the relationship between IWBs and learning concluded that IWBs were an ideal resource for those students whose motor skills prevent them from handwriting easily. The authors argued that for “those students whose attainment scores progressed over the two years” of the study (implying that not all students’ scores progressed), the key factor was the skilled teaching of concepts and numeracy and literacy skills to small groups of students, mediated by the IWB. Students were able to use drag and drop functions to quickly access new learning, rather than poor motor skills and handwriting getting in the way. At the same time, when teachers used the IWB regularly and deliberately, they greatly increased both the quality and the number of interactions with students. And, as IWBs became embedded in these teachers’ practices, changes occurred. The authors noted that small group interactions with the IWB over extended periods of time, were most valuable to these students’ learning. Time and regular use are important factors.

In other studies, the excitement of reporting what happened with students when e-learning tools were introduced into classrooms, masked potential effects of the Hawthorne Effect. This Effect refers essentially to what occurs in a given context when any explicit scrutiny or measurement takes place. Positive (or negative) effects can occur through the introduction of something to an environment, but without certainty of any lasting change beyond the intervention, measurement, or observation period. The Hawthorne Effect showed that the very act of observing, questioning or evaluating something can alter it; scrutiny can heighten awareness and thus practices (see for example, De Amici, Klersy, Ramajoli, Brustia, & Politi, 2000).

Convery (2009) unmask the broad lack of evidence for claims about the learning effects of specific technologies while Mitchell, Bailey and Monroe (2007) acutely observe that ‘Initial student excitement, if any, at an innovative technological approach may quickly fade when technology is the expected “normal use” from [the students’] perspective’ (p. 78). These ideas suggest that the
excitement of the newness of incorporating ICT tools may create a level of student engagement not obvious before, but, as these practices and tools become normalised, the Hawthorne Effect may wear off, and engagement levels or improvement levels may restabilise, unless different practices accompany the change. This points to how important it is for teachers to consider the long-term effects of incorporating ICT in classrooms, and find ways to use such tools for authentic purposes and in engaging ways. It also suggests that examining use over time is key to more accurately attesting to these tools’ educational value (Lewin et al, 2007). It is important to remember that if different technological tools simply replace old ones (such as presentation software instead of overhead transparencies) with little else changing, then the engagement and interest of the learners will quickly wane.

Pedagogical practices and e-learning

In any classroom, teachers have an impact on students’ learning dispositions (Bishop & Berryman, 2007). Hardré and Sullivan (2009) suggested that ‘Teachers’ classroom motivating practice includes both their design of the classroom learning environment, and their direct, interpersonal relationships with individual students’ (p. 2). This is important to consider when the ‘emphasis today is on active construction of knowledge by the learner’ (Chism, 2006, p. 2.4). This implies educationally productive levels of interactivity and are practices that support diverse cultures and positive e-learning outcomes. If that is the case, then they should be widely adopted and used in contexts such as:

- **Expository instruction**, where digital devices transmit knowledge, much as f2f lectures do.
- **Active learning**, where learners manipulate digital artifacts (online drills, simulations, games, or microworlds).
- **Interactive learning**, where learners build knowledge through inquiry-based collaborative interaction with others and where teachers can co-learn and facilitate (Means et al, 2009, p. 3).

Effective learning does not happen without deliberate pedagogical design. Deliberate design creates spaces for learning interactions, collaboration and critical thinking so that students can actively construct knowledge and enhance their achievement. These active learning processes must be learned. Teachers' careful structuring/scaffolding of learning is critical if students are to apply prior knowledge and skills to new concepts and create new understanding. Chism (2006) argues that students learn when their senses are stimulated, when exchanging information is encouraged, and where rehearsal, feedback, application, and transfer opportunities exist. e-Learning contexts appear to encourage this, while decontextualised, abstracted and passive learning is counter-intuitive to what is considered to be 21st century learning: ie collaborative, active, contextual and social.

For example, Reid (2009), in examining why few girls entered ICT tertiary studies, looked to secondary schools for answers. In noticing a downward trend in participation in these school subjects, she argued that courses about learning software packages, rather than learning them through authentic, contextualised scenarios (such as within other subjects and fit for purpose), was putting students off. Such scenarios use a range of tools, knowledge and skills with other people, demonstrating how well we remember new learning (Dale, 1969). Integrating e-learning tools is an answer. Because the studies under investigation here suggest that 21st century students desire to learn collaboratively and socially, mirroring their social networking experiences in classrooms seems sensible.

**Conclusion**

In socially oriented and authentic classroom environments, students are likely to be at the centre of the learning experience, and in e-learning classrooms, the evidence is mounting. In 21st century technology-rich classrooms, the teacher must facilitate learning using relevant pedagogical processes and e-learning affordances that support deep and critical engagement. Such classrooms appear to be satisfying and rewarding for both teachers and students. Common student effects reported in a range of studies used words like ‘engagement’, ‘collaboration’, ‘co-operation’, and ‘concentration’. Separately and together, they are desirable and necessary attributes or outcomes in learning contexts, but they are not sufficient for academic success: deliberate pedagogical action is also required. The deliberate
development of both critical thinking and sophisticated subject content knowledge within student-centred pedagogical frameworks, over time should underpin educational outcomes. The role of teachers in facilitating effective learning is as important as it ever was.

Lastly, any e-learning tools should be fit for purpose, support developing specific academic skills, concepts and content needs, and develop students’ metacognition and knowledge through engaging, contextual learning.

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