Educational Technology Research in New Zealand: A Literature Review

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ABSTRACT

In this paper the authors examine a broad range of literature relating to research into educational technology in New Zealand published since 1996. The literature ranged from conference presentations to journal articles and from collaborative international research to "show and tell". We saw positive signs in terms of the quantity of research being produced in New Zealand, however, the critical questions for our study related to the quality of that work. The study looks at the relationship between the researcher's choice of methodology and their pedagogical framework, concluding that whilst much of the literature in this field is comparatively light methodologically this can be justified by a constructivist approach to teaching and learning. New Zealand research appears to be maturing but questions must be asked about a climate that encourages research purely for the sake of the research output and where funding is limited. Perhaps because of the lack of funding opportunities, we are grounded in praxis, more interested in looking at what we do than exploring the theoretical possibilities that technology could offer. Although we tend to ignore the lessons of history, our findings show that government policy is a concern for a number of researchers. This is primarily in terms of the policy makers not being able keep pace with the rapid changes that we have seen but also important issues such as funding and training for staff are discussed.

KEYWORDS

Educational technology, instructional design, New Zealand, research methods, pedagogy

1. INTRODUCTION

In this paper the authors will examine a broad range of literature relating to research into educational technology in New Zealand with the aim of determining the quality and maturity of this sector of academic research. Specifically, that is research related to the use of Information and Communications Technology (ICT) in an educational setting that has been conducted in New Zealand, by a New Zealand-based researcher or to which a New Zealand-based researcher has made a significant contribution. In

preparing this report, the authors selected literature from a range of sources, including the Internet, databases, conference proceedings and journals. As Hodges (2001, p.3) recommended, we have organised our literature into “discreet categories”, noting, however, that there is overlap. We reviewed each paper, looking for key phrases or definitions as well as for references to earlier studies and literature that supported the philosophical stance of the researcher.

We reviewed 46 papers, all published after 1996. Of these, 37 originate from refereed journals or conference proceedings and the remainder from academic websites or Government departments. Nineteen of the papers were published or presented overseas (ten in Australia), with the remainder published in New Zealand. In particular, we drew material from the conferences of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE) and from the National Advisory Committee for Computing Qualifications (NACCQ). We will critique the research in terms of its method and methodology and then categorise and discuss the research in the context of its pedagogical framework, educational level, historical place, the development of educational policy and what technologies are being used. We will then draw together the findings of our research by way of a conclusion.

2. RESEARCH METHODS

Research can be described as an investigation that will examine, develop or contribute to existing knowledge. Cresswell (1998) refers to the process of research as starting with the selection of a research paradigm and a format for pursuing the methodology within the chosen paradigm. In this section we will identify and observe the research paradigms and methodologies used in the literature. Figure 1 shows a trend towards qualitative research, either in a pure sense or when a triangulation of quantitative and qualitative methods is used (Cresswell 1998).

We observed that quantitative researchers tended to be more definite about their research methods and the majority of researchers only briefly touched on the methods and methodologies used. Methods included case studies, focus groups, observations, questionnaires, surveys, documentation analysis, interviews, discussion groups and personal reflections on praxis. Methodologies, where defined, included grounded theory, ethnography and experiential approaches. This section presents a critical analysis of articles and journal papers from the perspective of the method and methodology.

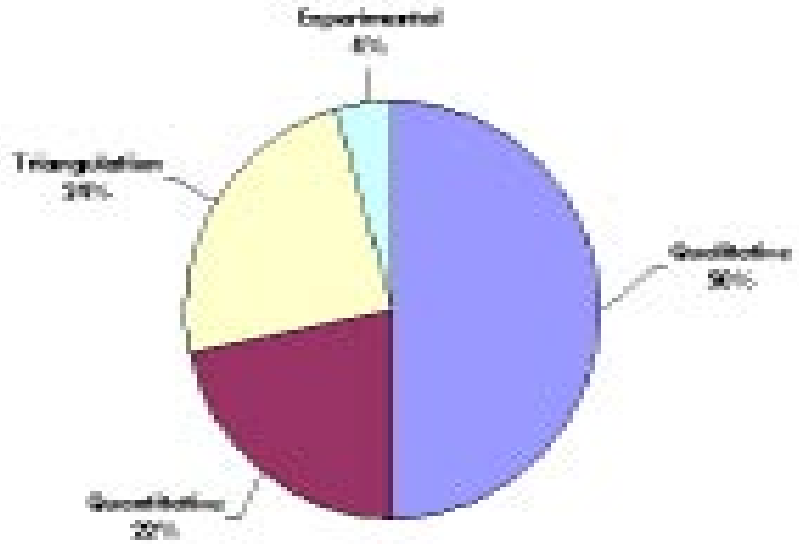

Figure 1

Breakdown of research methods

Questionnaires and surveys were prominent, used by both qualitative and quantitative researchers. Patek, Kinshuk and Russell (2000) took a quantitative approach to describe how learning resources are categorised to match them to different phases of skills acquisition. Goodwill (2000) used questionnaires and surveys when collecting data to analyse students' perceptions. Although this data was used to formulate strategies to improve course delivery, a qualitative approach, the results of the questionnaire were used quantitatively to analyse documentation such as enrolment data and pass rates. Document analysis, such as test results, enrolment details and data collection from questionnaires and surveys were the commonly used methods. Kwok-Wing (2000) presented a quantitative review of computer usage, ergonomic factors and awareness when conducting a study into the extent of awareness of health risks associated with computer use in schools. Kwok-Wing touched on the reasons for the reticence of many teachers to embrace ICT in the classroom but purely as an aside and this was not integral to the main study.

Bhandari (2000) used a case study to observe the use of computers in a classroom setting for tertiary level classes. For Ryba, Selby and Kruger (2000), case studies and participant observation were used to study how ICT can be instrumental in creating socially interactive and reflective learning communities. Being focused on creating viable online communities of professional practice, the writers are not immersed in their study at a participatory level, remaining as aloof observers. Experiential qualitative research was minimally evident. Gerbic (2000) described a post-graduate course taught online at AUT and how this course used asynchronous conferencing, learning activities, assessment and journal spaces for students. Mason (1996) took an experiential perspective to her ethnographic research into an article written on classroom practice in primary schools. The author is immersed in the focus of her research, more than just observing student behaviour in teaching and learning situations, Mason reflects the way she interacted with her students and interprets their responses to her. Many of those using focus groups, interviews or discussion groups did so after gathering the outcomes from questionnaires and surveys. Using a triangulated approach, Selby, Young and Fisher (1997) combined questionnaires and interviews to identify conditions that contribute towards the low number of women in tertiary computing courses. Other cases of triangulation of quantitative and qualitative methods using comparative analysis were observed.

The research focus was reasonably well explained and conclusions generally thorough, more so where the research was quantitative. However, qualitative research on many occasions lacked the methodological assumption, failing to clearly describe the process of research as it related to the focus of the study. As reviewers, we were often left wondering about the format of the overall design of the research, forced to analyse the researcher's approach to the study and often left to read between the lines. It was wondered if this is a phenomena particular to educational technology and related to the researcher's pedagogical framework, the relative newness of this field or the diverse backgrounds of the researchers: Certainly a review of research practices in nursing literature (Benton and Cormack 2000) indicated an expectation of particular structures and always a clear methodological framework that is missing from much of the literature reviewed here.

As we have observed, there appears to be some correlation between research paradigm and pedagogy and so we will now discuss the pedagogical framework for the literature under.

3. PEDAGOGICAL FRAMEWORK

Although the authors have embraced the constructivist viewpoint, we found it appropriate to classify the literature with regard to the educational philosophy, be it instructivist or constructivist, when analysing studies of a pedagogical nature. Instructivist and constructivist pedagogies are at two ends of a continuum of teaching and learning theories. Instructivist pedagogies are based on transmission of knowledge which is teacher directed, systematic and structured whereas the constructivist viewpoint sees knowledge as constructed, participatory and meaningful, where the learner directs their own learning in order generate their own knowledge (Roblyer and Edwards 2000). Instructivist and constructivist pedagogies have their parallels in the quantitative and qualitative research paradigms. Approaching the research through a pedagogical lens allows us to explain the tendency of the qualitative researcher to be less method-specific, in

that the constructivist worldview sees knowledge as constructed by the learner, raising awareness rather than answering specific questions (Roblyer and Edwards 2000). It also important to understand the different components of a computer-based cognitive tool (CBCT) and Kennedy and McNaught (2000) promoted the following categories: Software tools, content and educational environment. A distinction can also be drawn between tools that facilitate the delivery of the content rather than being teaching tools in themselves.

The Educational Review Office (ERO) provides a context for educational technology and its impact on pedagogical issues in its 1997 report (Education Review Office 1997). In a quantitative study, Patek, Kinshuk and Russell (2000) evaluated student's preferences for using computer-based intelligent tutoring tools that provided students with an instructivist environment for learning. They commented that the computer-based approach was effective in the acquisition of different phases of skills in a cognitive apprentice-based learning environment.

Scott and Skerman (2000) promoted a constructivist approach to assist teachers to create learning environments where meaningful learning can occur. Different models for teaching technical subjects to tertiary students were discussed by Burrell (2000) and Laxer (2000), the former reflecting on personal experiences of teaching object-oriented programming and the latter, examining perceptions that computing students often lack mathematical skills, postulated that this was a barrier to learning in technical disciplines. Similarly constructivist in approach, Fletcher (2000) used case studies to highlight factors of website design that engage students in purposeful and interactive learning on a science website. A study looking at the relationship between the introduction of multimedia into a learning environment and the impact this has on teaching (Hill 2000) presented a variety of learning theories, classroom management and teaching techniques that were relayed from the experiences of classroom teachers.

The majority of literature addressing pedagogical issues focused on the Internet as an educational tool, although often without stating whether this is focused on computer-based cognitive tools as opposed to the computer-facilitated delivery of content. Online and distance education as well as synchronous and asynchronous communication are prominent topics. Johnston (1998) identified changes to pedagogy required in this new environment, contrasting these with the traditional role of the teacher.

Using multimedia for creating engaging learning opportunities also features in the literature. Multimedia learning environments for students with special needs are the subject of a study by Roder (1998) and Koh and Thurston (1998) explored the use of multimedia in teaching fractions, albeit through advocating the use of "drill and practice" testing and retaining an instructivist paradigm. Koh and Thurston discussed learning theory as it relates to the delivery of courses using multimedia and reflected on experiences with special needs students. The personal experience of the learner and the process of learning being factors that greatly contributed to success.

Research paradigm	Primary	Secondary	Non-specific	Total	Primary & Secondary		Tertiary	Adult/Lifelong
Qualitative	3	1	2	9	2	6	23	
Quantitative	1	1	3	3	1	1	10	
Triangulated	-	2	1	6	2	-	11	
Experimental-	-	-	1	-	1	2		
Total	**4**	**4**	**6**	**19**	**5**	**9**	**46**	

Figure 2

Research paradigm by level

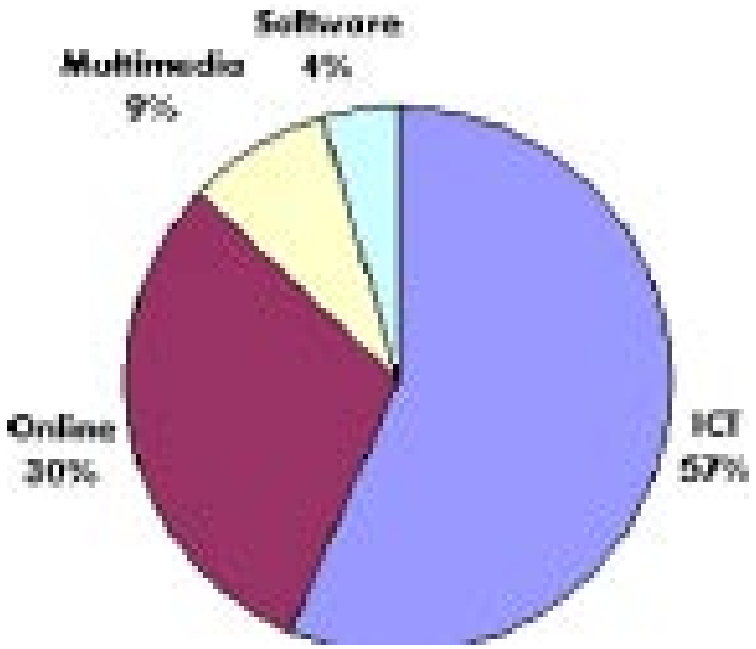

Figure 3

Technology

4. EDUCATIONAL LEVEL

Figure 2 indicates the research paradigms used with respect to the different educational levels, showing that there is an emphasis on research in the tertiary sector. The literature itself shows that a significant factor in this is "show and tell" research, where practitioners are describing their own teaching process.

5. TECHNOLOGY

The literature primarily focused on strategies and methodologies for exploring, developing and implementing traditional and ICT-based learning tools. Figure 3 indicates two primary areas of research, the application of technology as a learning tool in the traditional classroom environment and the use of online technology to extend the teaching and learning environment.

The research shows that technology empowers teachers and students to explore learning concepts through the use of real world data and simulations of real world events, it is not itself the focus of learning. Educators trained in the uses of technology must know how to integrate it into their curricula and must integrate ICT in its broadest, all encompassing sense. Assessing technology's impact on learning is a priority and the research indicates that schools and tertiary institutes are grappling with the problem of developing accurate instruments to measure the benefits and drawbacks of educational technology. In this context, we will now look at the literature with regard to the development of policy around the application and development of educational technology.

6. POLICY DEVELOPMENT

Government drives education policy, yet Roberts and Peters (1998) argued that successive governments have kept policies regarding educational technology at arms length. They argued that current policy has failed to keep pace with the rapid changes in technology. Jones (1998) concurs, observing that New Zealand has failed to differentiate between

the design and the delivery of technology related areas at a policy level. Countering this, a study by Higham, Sharp and Priestley (2000) concluded that New Zealand has developed an educational policy with a focus on ICT integration, resulting in significant investment in ICT.

Supporting the development of ICT policies is the need to critically analyse how technology is being implemented in schools. Jones and Moreland (Undated) suggested further research to understand the impact of technology on assessment practices in primary schools. ERO (2000) examined how effectively schools are implementing ICT and whether ICT is used effectively to support teaching and learning. This study focused on the technical aspects of ICT, although it did discuss ethnicity, socio-economic factors and the technical and pedagogical of teaching staff. This report is the definitive observation on the current state of ICT in teaching in New Zealand schools, dealing with issues such as funding, policies and procedures. At tertiary level, new educational technologies are identified as impacting on the way teaching occurs (Gunn 2000) and on staff development (Gunn, Lefoe *et al*. 1999).

Ryan (1999) stated that technology is not of itself value-free, suggesting that the modern curriculum include consideration of the ethical dimensions of technology. However, teacher education is required since current knowledge is a limiting factor. Jones (1998) supported this need for better policy integration and Hunt (2000) raised the additional issue of increased integration of ICT within courses, documenting the experiences of student teachers in managing the increasing amount of technology in the classroom. These findings are supported both by ERO (2000) and in a comparison study of New Zealand and English schools (Higham, Sharp *et al.* 2000). Gunn (1998) observed that the use of ICT by academic staff is limited by factors that include interest, competence, availability and resources. This research identified adequate financing, support and training as barriers to the uptake and effectiveness of educational technology at tertiary level.

Just as Hunt (2000) and Gunn (1998) discussed how educational technology impacted on teachers, technology also impacts on students. At tertiary level, students are impacted by the real world that they are about to enter, raising issues about how technology students are themselves taught. Both Fielden (1998) and Goodwill (2000) observed that understanding technology is not enough, there must also be an understanding of the context and that, to succeed in today's workforce, students require a broad range of skills. Extending this concept of the appropriateness and context of technology, Brown (2000) discussed how the delivery of education must change to encompass not only the Internet but also the concept of a society as knowledge-based, where learning is lifelong, tailored to need and culturally appropriate. Brown observed that this shift in the delivery of education is difficult to achieve without sound policies for addressing and managing it.

7. HISTORICAL PERSPECTIVE

Much of the research described so far has been anchored in praxis and looked forward to recommend strategies for educational technology. In this section we will discuss how the literature approached educational technology from an historical perspective, identifying elements that draw on historical information. Few of the papers dealt with the historical perspective; only five papers are referred to in this section with a tendency amongst researchers to focus on current practice and to project this forward into recommending ways of improving teaching and learning.

The effectiveness of ICT in schools from an historical perspective is described by ERO (1997; 2000). The 1997 report situated ICT in the current educational context and the 2000 report discussed the evolving usage and uptake in ICT in the context of the socio-economic and political climates. Other researchers also situated ICT in a social context and looked at the historical development of ICT in New Zealand. Gunn (2000) discussed how rapid changes in educational technology have created challenges in the tertiary sector. The author reviewed historical developments and identified the motivations that drive educational technology. Earlier, Gunn (1998) reviewed how academic staff used ICT and identified factors limiting this usage.

8. CONCLUSION

In reviewing the 46 papers, we have seen a wide scope of research being undertaken and New Zealand research being presented in a variety of national and international contexts. There is no question about the quantity of work being produced; the question we posed in the introduction was related to the quality of the work. Our results can best be described as a "mixed bag"; we reviewed papers that are well grounded, applying research and praxis to a situation and then building on these findings to improve educational technology. We have also reviewed research that is light, poorly grounded and inconclusive. A theme seen across the majority of the literature is that of referring to overseas literature, there being a paucity of reference to studies by other New Zealand researchers. This leads the authors to conclude that, though most literature is useful, an undercurrent of research for the sake of research outputs exists in New Zealand and that the lack of depth in many studies leaves us to question whether the levels of funding available for such research are sufficient.

We have seen a clear correlation between pedagogy and research paradigm; instructivist educators are more likely to produce quantitative research whereas the constructivist educator is more likely to be qualitative in their approach. Pedagogy, like research, is a continuum and this is seen in a large number of papers that triangulate quantitative and qualitative research. There is a definite pattern of qualitative research that focuses on current praxis, deducing from the researchers own experience and the environment they are in strategies to take educational technology forward. We have observed that the instructivist/quantitative researcher operates from an epistemology of a systematic body of knowledge where rigour is critical to ensure that new information transferred to the learner is validated. For the constructivist/qualitative researcher, knowledge is constructed and grounded in praxis ready for the learner to comprehend within their own context and worldview and this reasoning perhaps negates the reliance on rigid definition of method and methodology at this level of research.

This grounding in praxis is also reflected in the choice of technologies being researched, new technologies such as Internet and multimedia pre-dominate and the focus on policy research is the impact that such policy has on teaching and learning, again a research focus grounded in praxis and in particular a strong correlation between government policy and funding and staff training and knowledge.

Educational technology research in New Zealand is evolving and perhaps immature (when compared to other bodies of knowledge), its constructivist heritage and tendency to follow qualitative methods leads us to conclude that this is an alive sector of research intent on bridging the theory/practice gap to offer practitioners real solutions for generating improvements in their own teaching and learning environments.

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