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E-learning and early childhood teacher education: what does the future hold?

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Abstract: There is a pressing need for early childhood educators to upskill. Distance education approaches are the obvious solution, as they permit scalable and flexible education for isolated learners. E-learning provides many teaching and learning possibilities, particularly using Nipper's (1989) third generation of distance education. This third generation is characterised by communications between instructor and students and between students themselves. However a fourth generation is now possible, one that places the student at the very heart of the education experience. This paper considers the potential for third and fourth-generation distance education in the context of early childhood education.

Distance education and e-learning

Distance education has a rich theoretical framework (Holmberg, 1977; Keegan, 1996; Lockwood, 1995; Moore & Kearsley, 1996; Peters, 1998) and has been well served by a well-respected literature, in particular by a book series published by Kogan Page (Open and Distance Learning Series) and Routledge (now RoutldegeFalmer). There exists a broadly accepted literature relating to most aspects of practice including instructional design (Lockwood, 1998; Melton, 1997), pedagogy (Evans, 1997; Latchem & Lockwood, 1998; Marland, 1997; Morgan, 1997) and management (Freeman, 1997; Rumble, 1997). Many of these principles have been expanded on within more recent works specifically associated with e-learning (Garrison & Anderson, 2003; Jochems et al, 2004; McVay Lynch, 2002; Naidu, 2003; Salmon, 2002; Stephenson, 2001; Weller, 2002). The dates of these books, all from the same publishers, are somewhat telling. As technology has advanced and e-learning has enabled new forms of distance education literature has, for the most part, kept apace.

Generations of distance education

In 1989, Søren Nipper suggested three generations of distance learning (Nipper, 1989). The third of those generations describes the paradigm for contemporary distance education literature. The first generation was characterised by written or printed material sent to the student. Communications were solely through assignment submission and feedback. The second generation added multi-media in the form of audio and video cassettes, and instructional television. Some telephone counselling and face to face tutorials were also added, but the latter were not a primary teaching strategy. Nipper suggested that the technology of asynchronous online discourse made a third generation possible,

permitting flexible and convenient instructional communications between instructor and student, and between students themselves. While computer technologies can certainly be used to improve first and second generation distance education, it is their third generation usage that makes distance education constructivist (Garrison & Anderson, 2003) and frees it from its industrialised roots (Peters, 1998). Distance education providers have been most enthusiastic about the potential for e-learning, and so it is no wonder that a great deal of practice-based literature has emerged from within distance education circles.

Social constructivism and networked learning has become more viable in distance education as e-learning continues to evolve. The term 'connectivism' has been used to describe the distributed nature of knowledge and the potential of technology to facilitate interpersonal networks of knowledge (Siemens, 2004), and the term 'heutagogy' is used to describe self-determined learning (Hase & Kenyon, 2000). While the novelty of connectivism is questionable (arguably, the only new thing about it is the ease with which ideas can be shared and accessed by others), it is now possible to apply it in ways that blend formal, informal, lifelong and work-based learning (Wilson, Liber, Johnson, Beauvoir, Sharples & Milligan, 2006). This might be considered a fourth generation for distance learning, a generation that applies networked (web-based) tools in such a way that the learner, rather than the course or online tools, is at the centre of activity. In the knowledge era of the 21st century, 'life-based learning' (through 'learning ecologies') has been developed as a metaphor for learning that is holistic, adaptive, dynamic and interconnected with all life contexts (Department of Education, Science and Training [DEST], 2006). The fourth generation could be characterised by the gradual development of the learner, rather than the passing of particular courses or specific learning events within courses (Barrett, 2006). This style of distance education was envisioned by distance education theorists before Nipper's third generation was widely implemented by mainstream practitioners. Peters (1998; see also, Sammons, 2003) suggests that,

> The university of the future uses components of traditional university teaching, distance education, and digitised teaching. In this way it will become more flexible with regard to teaching and learning forms than ever before. Depending on their inclinations and necessities, students may decide on the following modes of learning: lectures, seminars, practical studies, work with self-instructing distance-teaching courses, all forms of digital learning (e.g. multimedia, hypertext and teleconferencing), open autonomous learning, and closed self-study with highly structured learning packages. They can combine these modes of study together, either in parallel or consecutively. It is even possible to make use of the teaching programmes of several institutions at the same time... distance education has the power to alter traditional teaching and learning systems structurally, and to accelerate the change. It can extend and diversify the student body considerably, make studies more variable and flexible with regard to both curriculum and methods, integrate electronic information and communications media into the teaching and learning process and substantiate this integration pedagogically on the basis of years of experience (pp.219-220).

The expansion and popularity of Web 2.0 tools are such that it is increasingly feasible for higher education to realise Peters' vision.

Web 2.0 and the fourth generation of distance education

The distinction between Web 1.0 (read-only content) and Web 2.0 (characterised by social software, shared information, negotiated meaning and the mutual creation of knowledge) is central to any distinction between Nipper's third generation and the fourth proposed above. It is helpful to consider these differences in terms of being between a 'read-only' web where content is largely pre-determined, and a 'read-write' web (Web 2.0), where content is negotiated (Gillmor, 2004; see also, Alexander, 2006). Work on PLEs (Personal Learning Environments, or online systems centred around individuals rather than papers or institutions) is already underway, particularly through the activities of the *Joint Informations Systems Committee* (JISC) and the *Centre for Educational Technology and Interoperability Standards* (CETIS) Pedagogy Forum (Wilson, 2006). PLEs are linked to concepts of lifelong learning, informal learning, and social learning (Attwell, 2006), so are not solely concerned with formal higher education. Technologies such as FOAF (Friend Of A Friend), which encourages networking through online associations, and RSS (Really Simple Syndication) that permit users to subscribe to particular online resources both add to the interconnectedness of Web 2.0.

Many Web 2.0 tools (such as blogs, wikis, open file repositories, ePortfolios) are yet to be widely used in formal education. Even when these are applied in higher education, they tend to be utilised in ways characteristic of Nipper's third generation. It should be noted, then, that merely applying Web 2.0 tools in distance education is not sufficient to embody the fourth generation. In fourth generation distance education, learners will make use of Web 2.0 tools themselves as tools that aid their own learning within a less structured educational setting (see Tosh & Werdmuller, 2004). The fourth generation of distance education has at its very heart notions of emancipation and social constructivism, and is therefore implemented primarily at the level of curriculum. Here, at least within distance education and e-learning literature, potential is outstripping literature and educational research, and technology is ahead of pedagogy. Mobile technologies will also feed this fourth generation.

It must be remembered that not all e-learning practice is associated with distance education. Guri-Rosenblit (2005) reminds us that distance education and e-learning are not the same thing, and that in fact most e-learning activity takes place in what might be considered on-campus courses. The benefits of asynchronous communications, rich media and resource access through the Internet via e-learning are transferable across all learning contexts.

Applying e-learning in early childhood education

Within the context of early childhood teacher education, e-learning has become a practical solution to an identified problem. The New Zealand Government's 10 year strategic plan for Early Childhood Education, *Pathways to the Future: Nga Huarahi Arataki* (Ministry of Education, 2002) contains an objective that all

people working in teacher-led, licensed early childhood services will be qualified, registered teachers by 2012. As at July 1st, 2005, only 54.2% of all people in early childhood services held either the Diploma of Teaching or a higher recognised early childhood teaching qualification (Grayson, 2006). The Ministry of Education has created a raft of solutions for trying to achieve this national goal, including scholarships and support for the development of new distance and online learning programmes. The demand for increased credentialing of teachers has led to enormous growth of early childhood teacher education and placed significant demands on initial teacher education providers to develop appropriate programmes, methods of delivery and methods of support for students in isolated parts of the country (Kane, 2005).

The early childhood sector in New Zealand is characterised by being almost entirely female, with less than one percent of the workforce being male (Farquhar, Cablk, Buckingham, Butler & Ballantyne, 2006). Early childhood educators are often more comfortable with arts and languages in an early childhood context and tend to be technophobes, who avoid science, maths and technology whenever possible (see Fleer, 1989). This has changed somewhat in recent years with the introduction of the 'Learning Stories' approach to assessment (Carr, 2002), which involves teachers in collecting evidence for children's portfolios, which may include digital photographs. The use of digital photography has led many teacher s to becoming far more proficient with the use of a computer than previously, although there is well documented evidence that teacher education does not prepare teachers well for integrating technology into the classroom (Wursta, Brown-du Paul & Segatti, 2004). It is important then to consider the scenario for those who are untrained, in isolated areas, and having to use technology to complete a mandatory teaching qualification. In particular, the perennial issue of student ability to use the technology to study online is an important consideration with this target market.

One of the dangers of any teacher education programme is that students engage in apprenticeship-like practicums where teaching practice is modelled on the observable behaviours of supervising teachers, rather than students engaging in 'knowing in action' (Kane & Broadley, 2005), where they learn to apply the knowledge they have been learning in their teacher education programme. When students just adopt a model of practice, adopted on a practicum placement, it can be argued that they have an insufficient basis for developing full competence as a teacher. A robust system whereby students and associate teachers engage in collaborative reflection on practice, thinking, context and curriculum is necessary for students to be able to effectively interrogate actions and systems (Kane & Broadley, 2005). The difficulties for students who are isolated from teacher education staff are obvious and thus the challenge for online teacher education is to find ways to enable students to develop as competent and reflective teachers in isolation.

Furthermore, international reviews of initial teacher education (see for example, Cochran-Smith & Zeichner, 2005; Darling-Hammond & Bransford, 2005) have struggled to identify what the crucial factors in teacher education are, apart from being able to identify that teacher educators are actively responding to the issues of teacher quality and quality teacher education, with the goal of preparing teachers who can help students achieve high quality learning outcomes. As Cochran-Smith and Zeicher (2005) state, although there is growing consensus that educators matter, there is continued uncertainty as to

"how and why they matter or how they should be recruited, prepared and retained in teaching" (p.1). Even less is known about how well online teacher education prepares students for teaching.

There is also conflicting evidence over whether pre-service teacher education equips students adequately for teaching. A recent study by Russell (2002) found that 90% of third year students in a degree level programme felt confident that they had gained appropriate professional knowledge, yet Smales' (2002) study of beginning teachers found that many of them perceived that their time in university did not prepare them for the realities of teaching. As Ball, Russell and Smales (2005) state, it "becomes an ongoing battle to help students build a "self as teacher" image that is well grounded in relevant theory, knowledge and skills and sufficiently robust to ensure that students face the realities of teaching without lapsing into survival mode" (p. 291). This is compounded in early childhood teacher education in New Zealand by inconsistent processes of induction into teaching. While all teachers are supported through a two-year, mentored registration process, arguably only the Kindergarten Associations have robust systems of preparing new graduates for teacher registration. Although the Ministry of Education has recently released funding to centres to support teacher registration in early childhood, the realities of finding a mentor to support students is a serious issue for new graduates.

Another challenge is changing teachers' beliefs, especially when they have been working in early childhood centres for some time, in an unqualified capacity. Changing teachers' implicit beliefs is a difficult task, as beliefs, once formed, are legitimated and reinforced in the context of the school or centre (Greene, 1988). Greene (1988) describes a teacher's strongest beliefs as 'governing obsessions', which tell a lot about what people believe to be 'good practice'. These beliefs govern how teachers perceive children, development, learning and assessment practices that underlie curricular decisions and interactions. Often within an early childhood centre, a particular discourse about children, teaching and the school will be dominant and will shape teaching practice within that school. Foucault's (1982) concept of discourse is useful for explaining the way that people develop understandings and make sense of their experiences. Foucault suggested that the 'self' (in this case the self as teacher) is constructed as the subject and object of discourse at a particular historical conjuncture. The important point about the discourse in a centre is that it is socially and historically constructed and may be eclectic and contradictory in expression of beliefs and practices. Foucault said that a person's discourse results in ingrained practices which he calls 'regimes of truth'. These regimes of truth produce ways of thinking about teaching and children which are self validating. Breaking into a regime of truth, with another truth may prove difficult.

As Pajares (1992) persuasively argued, it is incredibly difficult to change a teacher's beliefs, because they are so entangled in teachers' episodic memory, with ideas drawn from prior teaching and other experiences and cultural sources of knowledge transmission. Pajares (1996) stated that teachers' beliefs, rather than knowledge of an issue, are more likely to be used for decision making when teachers are in unfamiliar territory or under pressure. As he explained,

> The nature of teaching and the teachers' work is often so ill defined that educational beliefs are particularly vulnerable to become what Nespor (1987) called an entangled domain. Such domains hold

> entities that do not share important criteria with other entities in the same domain. Their thematic features only partially overlap, and their connections are incomplete and unclear. When a teacher encounters an entangled domain, cognitive and information processing strategies do not work, appropriate schemata are disconnected and unavailable, and the teacher is uncertain of what information is needed or what behaviour is appropriate. It is the episodic core of beliefs that makes their use so likely in just such a circumstance. Unable to use more appropriate knowledge and structures and cognitive strategies in these situations, the teacher uses beliefs and belief structures, with all their problems and inconsistencies. This mode of functioning is especially unsuitable in a profession characterized by what Marshall McLuhan calls hot action, where teachers may have as many as 1,000 interpersonal contacts daily and often most function on impulse and intuition rather than reflection (pp. 311-312).

Beliefs are distinct from knowledge, which Pajares argued can be much more readily changed. Furthermore, changing teachers' practices around the use of technology is difficult and complex, because of the complex nature of teacher beliefs (Ertmer, 2005).

It is apparent, therefore, that implementing e-learning as a strategy for teacher education presents many challenges. There are beliefs about personal competence to use the learning technology to overcome, the isolation from lecturers and alternative models of practice, the difficulties of changing beliefs and practices when teachers are working in centres already or have no ready access to diverse models of early childhood practice, as well as the normal issues of juggling work, study and family commitments. Technical and academic support will both be vital ingredients; assuming these are present, third generation distance education is certainly a viable solution.

Applying e-learning in early childhood education could take either a pragmatic (third) or radical (fourth generation) approach depending on the pedagogical objectives of a particular programme, the willingness of the academics teaching it, the technologies supported by the institution, and the flexibility of internal systems. Broadband access, it is suggested, is not mandatory for effective e-learning; while the speed of transmission is greater, broadband use tends to be capped meaning that high quantities of online video or audio are still best made available using offline media such as CD-ROM.

The pragmatic approach

For the time being Nipper's third generation is the pragmatic paradigm for e-learning, as it is already mainstream practice and is therefore fully compatible with existing institutional systems. Pragmatically, there are five main possibilities for e-learning practice in this third generation (not all might be appropriate for early childhood education).

Firstly, advantage can be taken of communications technologies that connect instructor and student, student(s) and student(s), and everyone and online communities of practice. These communications technologies include both

synchronous (chat, instant messaging, real-time video and audio) and asynchronous (email, discussion board, listserv, blog, wiki, ePortfolio) tools, and a broad variety of pedagogies as outlined later. Technologies such as Adobe Acrobat Connect Pro (formerly Macromedia Breeze Meeting), Horizon Wimba and Elluminate can bring academics and students together in real time for presentations. The potential of online communication for distance education was comprehensively addressed before the 1990s (Mason and Kaye, 1989). Salmon (2002) provides ample guidance for effective asynchronous practice. More radically, but still within Nipper's third generation, students might 'meet' with their instructor for virtual block course sessions in an avatar-based environment such as Second Life, where they could watch instructional video together and discuss practice-related issues through their avatars (already a reality for one Harvard law course; see http://blogs.law.harvard.edu/cyberone/).

Secondly, the media mix used in distance education can be changed. Bates (1995) gave a comprehensive treatment of technologies and media for distance education that included instructional television and audio cassettes. Much has changed in intervening years. When Bates was writing podcasts did not exist, and CD-ROMs were not a viable medium for digital video. Now, using MPEG 4 compression, about three hours of high-quality video suitable for instructional purposes can be stored on a single CD-ROM. The main barrier to instructional television and videocassettes was their expense, not only for production but also distribution. The costs of these media are now vastly reduced through digital editing and CD-ROM, DVD or (increasingly) online distribution. Further, digital audio files can be prepared from the desktop, and compressed to the extent that it is not unrealistic to make a half-hour discussion available to dial-up users through the Internet. Such files can also be played back on mobile phones and other portable devices, and can be made available over the Internet publicly or kept within password-protected environments.

Thirdly, there is vastly improved access to all kinds of resources through the Internet. Refereed journals are increasingly available through library database subscriptions, or else are available for free online (see for example, the Directory of Open Access Journals, DOAJ). Online magazines and reports, including official policies and documents, are conveniently accessible through internet searches. Increasingly, conference presentations and papers, video (from services such as Youtube and Google Video, but also from institutional web sites), and audio (from free services such as iTunes, Odeo, Podcastalley) relevant to formal education can be sourced. Online repositories of information and re-usable simulations can also be found for a variety of subjects.

Fourthly, the industrial model of distance education production and distribution can be superseded. Some course materials can be created ‘just in time’, and updates in literature and errata can be made instantly available to students directly through a course Web site. Teaching can also be more flexible and situational, as variation from pre-written course materials is possible. Weekly audio messages of updates and reminders to students can be directly prepared by teachers from their own desktop computers, and uploaded to the Internet.

Finally, many new forms of teaching and learning are made possible by established and emerging technologies (see for example, Beldarrain, 2006). Group activities, popularised through the discussion board features of Learning Management Systems such as Blackboard and Moodle, already enjoy popularity

in distance education. Case studies, role plays and simulations can be developed using such technologies as linked Web pages, though they might also include simple multi-media and Flash or Java programming. More recently, wikis, glossaries, blogs and ePortfolios can be harnessed for third generation distance education. Even though these latter tools have Web 2.0 status, it is possible to apply them within those formal course structures typical of Nipper's third generation.

The radical approach

As we have seen, there is now potential for a fourth generation of distance education, a generation that places the learner at the very centre of learning activity. Realising the fourth generation in the current educational environment could be termed a radical approach, as the emancipation of the learner is something yet to be popularised in mainstream teaching and learning. The fourth generation challenges the distinction between formal and informal education, and between institutionalised and lifelong learning; indeed, it aims to combine them. It is suggested that this radical approach would be particularly suited to particular post-graduate students, but the (admittedly, controversial) work of A.S. Neill and Ivan Illich provide clues as to how such a radical form of education might function at additional levels and in different settings. Indications are that the technology, at least, is ready – as is the emerging generation of students (Oblinger, 2003; Oblinger & Oblinger, 2005; but see also Ashton & Newman, 2006).

The challenge of the fourth generation is to provide an element of guidance, so that education is not emancipatory to the point of abandonment. Students would, conceivably, still 'enrol' in programmes of study and be assessed. Academics would still be a necessary and central aspect of the education experience. But there is potential for much creativity within this framework. Students learning in fourth generation environments might be expected to maintain a blog throughout their enrolled studies, perhaps within an ePortfolio environment that could be public and/or private (an open source ePortfolio application in development, named 'Mahara', will enable artefacts and reflections to appear in multiple views, each available to a different audience, as nominated by the user). Learning stories fit well with this approach. Students would also be encouraged to form social networks, not only with their programme 'coach' or 'mentor' but also with an institution's academics, one another, and online communities of practitioners and theorists. The dominant education paradigm might be one of scaffolded serendipity, with coaches and mentors guiding learners to appropriate starting places and providing clues as to the next steps they might take. The tension will be one between didacticism and empowerment; both will likely co-exist. This approach to education might be very suitable for early childhood educators, who often come with diverse prior learning and qualifications which standard 'recognition of prior learning' procedures in institutions make difficult to recognise. Qualifications could be awarded once broad, formal criteria in the shape of graduate outcomes have been met. Assessment, such as it is, might be solely through students' own formal ePortfolio of evidence, assembled from the various blog reflections and artefacts generated during their own practical learning experiences, reading, inquiry and participation in (perhaps compulsory) case studies and scenarios. In the fourth generation, teachers would bridge the 'sage on the stage' and 'guide on the side' dichotomy by becoming active

protagonists of student learning, themselves maintaining blogs and ePortfolios that form a significant part of each student's own learning network. Wikis might be used by groups of students to generate publishable articles, which might be a requirement for receiving the overall qualification. Enrolment provides access to academics, dedicated 'coaching' or 'mentoring', feedback on progress, and assessment against graduate outcomes. A formal higher qualification could be awarded in as little as a few months, or over a period of years. This 'radical' fourth generation approach might be particularly suited to students who are already skilled practitioners, who might primarily need the opportunity to reflect and develop further based on their own perceived needs in the context of a graduate profile. The profile itself would emphasise teacher beliefs and other higher-order factors that contribute toward the reflective practitioner.

Of course, such a radical approach assumes highly motivated and IT literate students, a broad-minded academic board, flexible academics and the willingness to challenge incumbent institutional systems at all levels. It is not an approach for the weak-hearted, or for the isolated early adopter (no matter how motivated they might individually be). The fourth generation as described here, though, may well be the key for equipping students to become effective lifelong learners in a world where learning networks and communities of practice – characterised by connectivism – are critical (Peters, 1998; Siemens, 2004; Wenger, 1998). Internationally, the fourth generation seems to still be in the formative stages, though moves are already being made toward the radical approach by providers of early childhood education (Ashton & Newman, 2006).

Conclusion

It is clear that e-learning provides a remarkably diverse range of possibilities for distance education. At present there is much of value for distance early childhood education in the third generation, and it is a 'safe' environment for innovation. Clearly this is the area that is of most value to the 45.8% of early childhood teachers in New Zealand who still need to gain a teaching qualification before 2012, as well as to the academic staff in institutions who work within conventional programme approval and accreditation processes. However of particular interest is the potential of the fourth generation, one characterised by networked learning and structured emancipation, as this has the power to recognise some of the incidental prior learning that early childhood educators bring to their teaching and learning with young children, which is often hard to have recognised in conventional programmes of study. Rigorous research in the areas of instructional design, pedagogy and management is required for this generation to move beyond its conceptual stages.

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