Exploring the Use of Electronic Portfolios

A Secondary School Case Study

Faithe Hanrahan

2006 Efellow

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Acknowledgements

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Ka nui te mihi atu ki a koutou katoa.
Tena koutou, tena koutou, tena rawa atu koutou katoa.

Abstract

This case study explores the use of electronic portfolios and how they can be used to assist schools in managing and reporting on students' learning within a rapidly changing technological world. While most secondary schools have embraced the use of computers and see them as worthwhile tools in assisting to promote learning and teaching, their use as effective tools for managing and assisting students to become better reflective learners in the form of self directed electronic portfolios is still to be embraced and proven within the secondary sector. This research examines how far along one secondary school is in the use of electronic portfolios with its students, with findings reflecting the view that in general while teachers have started developing digital portfolios for assessment purposes, they are yet to make an appearance in other areas of learning and teaching.

Ko Tongariro te maunga

The mountain from whence I draw inspiration is Tongariro

Ko Rotoaira te moana

The spiritual waters that nourish my spirit are those of Lake Rotoaira

Ko Motuopuhi te pa

The sacred land that holds the bones of my ancestors is the island of Motuopuhi

Ko Te Wharerangi te tangata

He who holds the mana of my people and from whom I descend is Te Wharerangi

He Whakaaro: Introductory Thoughts

The above pepeha (proverb) is a reflection of who I am. It acknowledges and connects me to the land and to the rest of my iwi (tribe), hapu (sub-tribe) and whanau (family). For me the use of this pepeha places into context this piece of research, for what use is newfound knowledge if it can not be connected to Te Ao Marama – the world of light and understanding; what has been, what is and what is yet to come. It is part of the continuous process of life that we as Maori use to acknowledge the past as well as the present, for without both there is no future. There is the belief amongst us that all three timeframes are connected and that all things, including knowledge have a time and place, and that while some things can be planned, many cannot and are seemingly serendipitous events or happenings. Maori of yesteryear and many

today believe in the connectedness of all things - the tangible and intangible; the seen and unseen; the people to the land; people to people and beyond.

It is this notion of connectedness that has been the impetus for this project, and for me it has been timely. It is about connecting the world of ICT to people and to the landscape in which we must all interact. In doing so, we are reminded of that well known Maori whakatauki or saying;

> He aha te mea nui o te Ao?
> *What is the most important thing in the world?*
> He tangata, he tangata, he tangata
> *It is people, it is people, it is people.*

The time is right as we embark on a new journey into the 21st Century to explore new ideas and tools such as electronic portfolios. The future promises to be full of technological challenges and new ways of doing things and through professional development teachers are currently being led to the proverbial ICT water trough and been invited to drink. For many of us who have been at the chalk-face since the last round of educational changes introduced in 1989, such change is proving most challenging as we see our paper domain slowly giving way to that of the digital. In the last three years in particular, this has seen the majority of us at secondary school level launched into learning again via professional development and the Laptops for Teachers Scheme (STELA). Four years down the track teachers like myself who have seen the potential of computers to be used as tools to enhance and improve students learning, as well as involve them more in their own learning, are asking how tools such as electronic portfolios can be used to extend our understandings of the way we teach and manage students' learning, as well as the world at large that we now operate in. It appears that the world of school as we currently define it is about to have its walls knocked down, or extended as the world outside makes itself more visible and accessible inside our classrooms via wireless networks, not to mention the students themselves who come wired with all the latest communication gadgets.

This research seeks to explore how tools such as electronic portfolios can be used as effective tools for managing students' learning and for assisting them to become better reflective learners. It is dedicated to the many children that I have taught over the last twenty five years, both at primary and secondary levels who encouraged me to keep abreast of new technology as it became available, from the first Commodore 64's to the latest laptops. As I have told many of my colleagues

"they have been my best teachers". All have individually and collectively connected to and with me and have contributed to my development as a teacher. All have helped me come to a better realisation of the meaning of the following well known quote:

> "The only truly educated person is the person who has learned how to learn"
> Carl Rogers

Figure 1: Students - our best teachers.

Special parts of this research report are especially dedicated to my 2004 Year 11 drama class who readily agreed to opt into a Digital Opportunities (Digi Ops) project with me and become guinea pigs for some ideas I wanted to trial regarding the use of shared wireless laptops within interdependent learning situations. Without their buy-in I would not have had the opportunity to complete this particular piece of research, and they are truly an example of today's tech savvy Generation Y. Like other Generation Yers that the young writer Peter Sheahan (2005) mentions, they too proved that they are early adopters of new technology, fast learners, resourceful, readily welcome change and are not afraid to take risks. We learned together that electronic portfolios have the ability to transform the way we manage our learning if we are but prepared to share the responsibility for doing so. We also learned that electronic portfolios have the potential to present who we are collectively and individually as learners in a manner and form that is more relevant and consistent in today's changing digital world.

Figure 2: Raranga as a research metaphor

Making Connections

Connecting the use of electronic portfolios to a framework that makes sense to me as a teacher, researcher and individual has proved to be culturally challenging. This has been made doubly so knowing that I must not only be able to place it within a context that I can understand, but one that my colleagues will be able to understand and connect with as well. So, in search of meaningful insight I consulted the Collins Dictionary and found that the word 'connect' means 'to link or be linked'. On further reflection it then occurred to me that there was a definite link between electronic portfolios and the art of raranga or weaving. Raranga involves the weaving and linking together of certain fibres, usually flax, in a particular way or pattern to create something for a specific purpose, and sometimes for a special person. Finished products might include korowai (cloaks), whariki (mats), or the familiar kete or kit, and are the result of following a process that has changed very little over time. I have often admired many such 'works of art' and the people that own them often tell me each kete has a story, and when you listen to that story it becomes obvious that each is also unique.

It also struck me that teachers throughout New Zealand have been well exposed to the notion of learning via the raranga metaphor for the last seventeen years, when with the advent of Tomorrow's School's each core subject area was given a new curriculum syllabus. Teachers were also given instructions to weave together the various learning strands of content, skills and processes that each new document contained. A good example of this was the Early Childhood curriculum document aptly named 'Te Whariki' (the woven mat). More recently, the Ministry of Education's website Te Kete Ipurangi used the metaphor of raranga to put across the

idea of its online learning centre as being a place for the weaving together of a New Zealand online community of educators and learners. Via this bilingual portal-plus web community educators and learners are able to access quality resources and information. The ability to set up personal kete to act as electronic storage folders is a strength of this site and allows for easy archiving and accessing of electronic resources anywhere and anytime. So the ideas of weaving together strands of information and the storing of objects in containers either electronically or otherwise are not unfamiliar to the psyche of teachers in this country.

Just as there are many different subject strands that can be woven together into a multitude of kete, so too are there different types of electronic portfolios, the contents of which can also be woven together to present a more rounded picture of a student. Like whariki, korowai and kete, each has a specific purpose which is dependent on the person it is being made for and the occasion. While some of these are for everyday purposes others are for more illustrious occasions. For instance, my mother has a kete that she uses specifically for tangi (occasion for mourning) which is adorned with a beautiful pattern and colour that is much admired by all who see it. Likewise, I have seen samples of students' electronic portfolios that proudly display the efforts, aspirations and achievements of their owners. Many are beautifully created works of art, often themed and similarly organised, and like kete their contents reflect a specific purpose. It is obvious that each has been carefully crafted to make the most of the medium they are created from, and while some of these finished artefacts may end up on CD's or websites, my findings show that others rarely get beyond the confines of the school. As containers for holding personal objects each is unique and it is this uniqueness that for me makes them worthy of consideration as tools for helping individual students tell their own histories or 'herstories' of learning to the wider world beyond secondary schooling. I believe that they have the potential to connect learners with themselves; with other learners; with other teachers; and with their parents in ways that paper portfolios could never do.

Figure 3: Kete and e-portfolios have much in common. Each is unique and has its own story.

Paper Habits vs Electronic Habits

Prior to the advent of computers in classrooms and electronic portfolios teachers were expected to store a selection of paper based student portfolios that reflected what their students had learned that year. Needless to say, the portfolios selected were often those of the 'good' students, and were invariably crammed away in a corner cupboard of an already overcrowded English resource room, until such a time as they were required for demonstration purposes to either a colleague, for appraisal purposes, or as sample evidence of students' learning when meeting with the Education Review Office. The remainder were expected to be passed on to the next year's teacher, but in my experience these portfolios were already fairly full, and most teachers either gave them to their owners at the end of the year, many of whom would then throw them into the nearest bin, or shove them into another cupboard to be forgotten.

That was ten years ago and recent interviews with staff at my school show that such practices are still happening within secondary schools today. While some teachers may have progressed to storing samples of students work in a digital format, it appears that the type of content they contain which is used as evidence of students' learning has changed little, likewise the involvement of students themselves in their construction. My eleven years of secondary teaching experience has shown me that many secondary departments have their own way of doing things and stand alone as individual silos within their schools, backed up by administration systems that limit the type of information that can be reported on. The sad part about this is that rarely

do these 'silos' get a chance to combine their invaluable wider insight about the individual students that they share, and their learning, except on a formal report issued two or three times a year. Neither do they get many opportunities to share information with others outside of the usual channels, as so often they are limited by who they get to share learner information with, time constraints and traditional ways of doing things. This includes the traditional ten minute parent interview at which caregivers must hurriedly rotate around numerous departmental teachers to get an overview of their child's learning. What is even sadder is that the students themselves are often not in attendance.

Figure 4: A silo mentality inhibits departments sharing what they really know about individual students and their learning

My belief is that there is a wealth of invaluable learner information tied up within individual departmental portfolios, digital and non digital, that is just waiting to be released and shared with the wider school community. All that appears to be lacking is a good reason for doing so and an efficient way or process for making this happen.

In one of her essays dedicated to the development of electronic portfolios, the well known digital folios pioneer Dr. Helen Barrett noted that when more mature students were familiarising themselves with the e-learning process, they tended to use familiar tasks when learning new tools, and similarly use familiar tools when learning new tasks. She noted also that for some teachers creating an electronic or digital portfolio was quite a daunting task (Barrett, 2000). However, I would argue that such a task would be no more daunting than it is for those teachers who still utilise mainly paper-based portfolios, especially if the tasks are still the same. While the new tools

of technology such as hardware and software may be daunting to newcomers, I would suggest that what is really daunting is the entire thinking behind their use in today's digital world. I believe that the challenge for educators lies not in the tasks and the tools associated with digital portfolios, but in the rhetoric and practises that surround their use, and to the way teachers continue to teach in a changing digital world in which the needs of today's learners are very different to those of learners a decade ago. So why bother?

The Catalyst

I first got involved in the use of electronic portfolios for students in the year 2004 when as a drama teacher I put my hand up for a Digital Opportunities (Digi Ops) project. At the time my school had just acquired a set of ten wireless laptops (MOBLAPS) and the Ministry of Education was interested in finding out how they could be used in classrooms as tools to enhance students' learning. As drama involves a lot of cooperative group work I offered to trial them within an interdependent learning situation. In order to better manage students' learning in groups, and to monitor the project itself, I found that I needed to develop a better tracking cum filing system. As the learning context was new to the students and involved exploratory research around the theatre form of 'Clowning' we chose to utilise the Action Learning Research process (Gawith, 1991). This research process enabled us to see what each other (in groups and as individuals) was doing at various stages of this Unit Standard as well the Digiops project itself. As a result the students and I agreed to trial the idea of using electronic group portfolios utilising the new learning management system that had been installed on the school's network called 'Smart Tools'. Through trial and error we developed our own way of organising and managing our expanding folders of learning artefacts and digital objects, and in fact I didn't even give the process a name until later, and only after the realisation came to me at a conference workshop early in 2005 – that what my students and I had designed almost intuitively was this phenomenon called student driven digital portfolios.

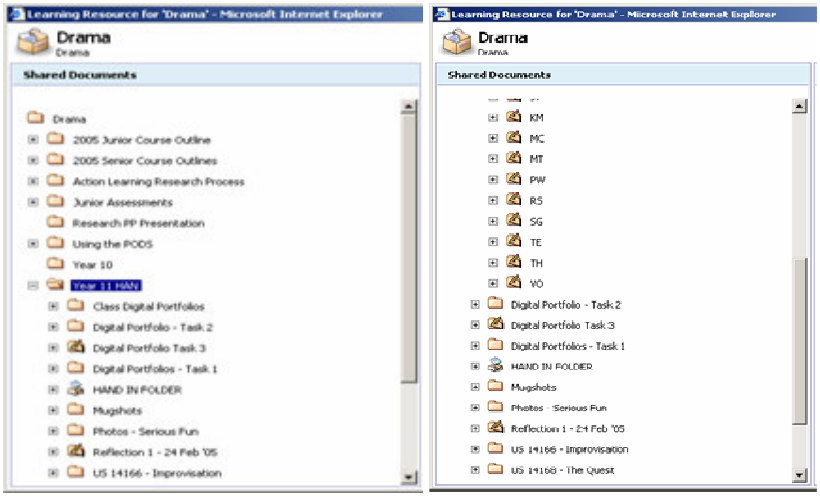

Figure 5: Screenshots of class and individual electronic portfolios

By the end of the year they contained a wealth of students' shared and individual work samples and evidence in the form of performance video clips (rehearsals and final), self and group reflections, task rubrics, multimedia presentations, formative assessments and so on, that bore witness to us as a class working interdependently with wireless laptops embedded into our learning activities. Some of this work I was able to later share at parent interviews in the form of an electronic showcase portfolio for those students who were being interviewed (parent interviews). I well remember the response of amazement on the faces of those parents who had never seen their child perform before, or seen (written down) their son or daughter's goals and aspirations for a particular subject area which in this instance was drama. That was my 'high' for the year while my 'low' came later on at the end of the year when I needed to clear space on the school's network for my next year's class. I became disillusioned over the fact that there was no facility set up to archive any of this wonderful work, and that the only way it could be saved was to burn students' work to disk, and then give these to the students themselves for safe-keeping for possible future use, or for inclusion in their paper based curriculum vitae. I was also somewhat saddened by the fact that apart from myself, the students, one parent interview evening at which only a few portfolios were shared, nobody else would get to share the students' work or their successful involvement in this project. As a result I became determined to see if this situation could be changed, hence this piece of research.

Literature Review

New Zealand is still in the very early stages of exploring the phenomenon of electronic portfolios and finding literature or schools that have a history of their use within this country have been difficult. While there are some 'innovators' and 'early adopters' who are prepared to trial them, or are in the throes of doing so, much of this appears to be happening within the primary sector and at tertiary level. As a result much of the literature that is referred to in this report comes from the United States, where despite a paucity of paper books on the topic much can be found within research journals via the internet and institutional electronic databases. Much of what I have been able to access has been practitioner based and conducted by teachers who are looking for other ways of managing their students learning as they embrace the use of computers within their classrooms. Such research has been especially valuable in helping to give me an overview of their place within the wider sector of education today.

One major and rare discovery was pointed out to me last year by Dr. Helen Barrett, one of the keynote speakers at the 2005 Auckland ULearn Conference, and this was Mount Edgecumbe High School in Alaska. This high school has been using electronic portfolios with their students for over a decade now and their web based samples of students' portfolios are for me a good indicator of how, when schools are prepared to change their views about the way they teach, manage, and engage students in meaningful learning situations, we can use the tools of technology to involve them in their own learning – and do so with pride. The site outlines the process the school underwent as an experimental school to introduce a new curriculum with a new learning and teaching philosophy based upon **their** definition of total quality principles. A visit to this site at www.mehs.edu.state.ak.us/portfolios/portfolio.html reiterates what we already know - that a school's primary focus needs to be on the development of student involvement in the continuous improvement of their own learning. It is inspiring to read some of the students' view points about their involvement in this whole school and community project, and it is even more inspiring to think that we here in New Zealand now have an opportunity to do something similar with our own new curriculum. Research findings clearly demonstrate that electronic portfolios have an important part to play in the preparation of students for life and life-long learning, as well as serve as a

means of assisting the larger endeavour of linking learners to and across our society as they move into further study and employment.

Metaphors for Electronic Portfolios

Many metaphors besides the kete metaphor have been developed in an attempt to explain the wide use of digital portfolios, and following are some of the more popular metaphors mentioned by Helen Barrett on her www.electronicportfolios.org website. These include the use of the mirror, map and sonnet as put forward by Dr Mary Diez (1994). The first of these, the mirror metaphor encourages learners to use the portfolio as a reflective tool to assist one to see oneself i.e. self assessment. When linked with that of a map image she states that portfolios can also be used as the framework or springboard for where to go to next i.e. goal setting. Her sonnet metaphor likens the portfolio to a sonnet in its form and structure, which if put together properly and with discipline enable its owner to express meaning. This metaphor she notes best suits showcase portfolios that require learners to demonstrate a range of best performances.

On the other hand educators Pearl and Leon Paulson (1991) use the metaphors of story, journey and laboratory to describe electronic portfolios. Each is linked and the first likens the portfolio to a story; a story of what a student knows, why they believe they know it and why others should know what it is that they know. They state that the portfolio is merely a student's opinion that is backed by fact – samples of their work that are intended to communicate a story that is told from their perspective. The journey metaphor in many respects reflects the process involved in putting together the story, while the laboratory metaphor is likened to the actual construction of meaning from the learning experiences students have chosen to reflect on in their portfolio.

A more contemporary set of metaphors put forward by Serge Ravet, Chief Executive of the European Institute for e-Learning (EL*f*EL) includes the likening of digital portfolios to digital clones, butlers, dashboards and planners. He notes that digital clones can be viewed as digital extensions of oneself (my eSelf), while a butler may be viewed as a service provider to oneself. The dashboard he likens to the interface on an Apple computer that acts as an informative display of the state of one's skills and knowledge, while the planner is as it suggests – an assistive tool to be used in the planning of one's learning journey.

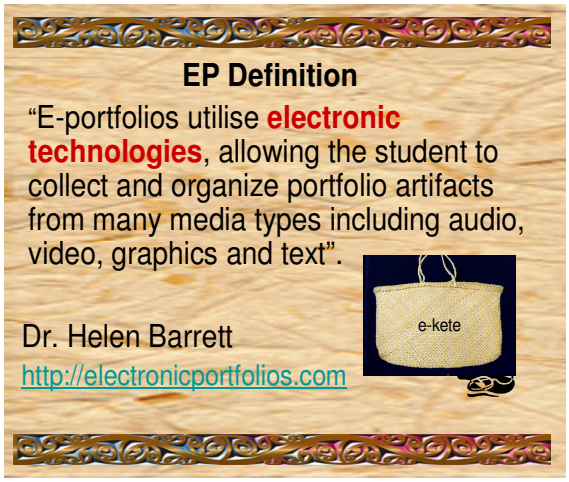

Figure 6: Definition of an e-portfolio/e-kete

Definitions of Electronic Portfolios

As one can see from the metaphors mentioned electronic portfolios can have many uses and because of this various researchers define them differently depending on how they are used. But for the agreed fact that e-portfolios can be viewed as storage containers, there is no agreed definition. However, within the context of this piece of research an electronic portfolio (EP) can also be referred to as a digital portfolio (DP), an e-folio or a multimedia portfolio. Irrespective of which term one uses EPs are basically very similar in function to the traditional paper-based portfolio long used within schools, and that is to provide physical evidence of students' learning. The main points of difference are in the way that information is collected, saved, stored, who is involved in the process and who gets to see it. Barrett (1998) makes the following distinction between paper-based portfolios folios and electronic portfolios.

Paper portfolio allows:	E-Portfolio adds:
▪ Collecting ▪ Selecting ▪ Reflecting ▪ Projecting ▪ Celebrating	▪ Archiving ▪ Linking/Thinking ▪ Storytelling ▪ Collaborating ▪ Publishing

Milman (1999) supports the above distinction and states that within secondary schools many electronic portfolios are often organised using a "combination of electronic media such as audio recordings, hypermedia programmes, data spreadsheets, video, and word processing software, as well as CD-ROM and the WWW" (p.4). Tuttle (1997) further adds that the content of an electronic portfolio and how it is eventually shared with others or 'published' is very much dependent on a teacher's objectives, its purpose and the 'target' audience. As a result electronic portfolios can take many forms including personal development, showcase, descriptive, evaluative, and composite, or be used for assessment, employment and teaching purposes. Each of these various types has unique content and methods for assessment (Shackelford, 1997) and the purpose for utilising them ultimately determines the form they take, while the audience determines content and quite often the style of presentation.

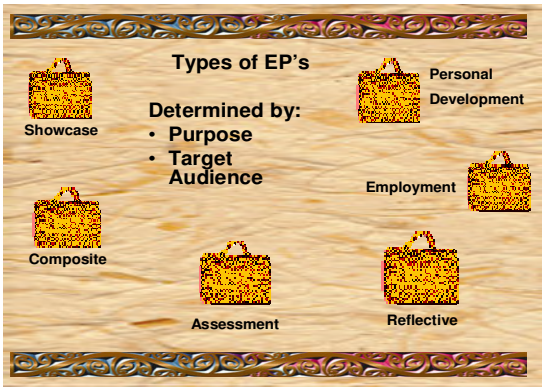

Figure 7: There are as many different types of e-portfolios as there are kete.

The type of electronic portfolio this piece of research sought to explore is the composite style, which is basically a combination of all of the above types of EP's – a style of electronic portfolio that is able to provide a richer picture of student performance than can be gained from more traditional, objective forms of assessment. The main difference with this type of electronic portfolio is that it is student driven and involves the learners themselves self selecting content according to a pre-determined set of criteria related to the EP's purpose and targeted audience. This includes not only possible assessments and evaluations by teachers, self and peers, but includes exemplars of work that have been reflected on; be it a student's proudest piece, their most challenging or work currently in progress. This style of electronic portfolio is intended to be a personal expression of a student that reflects his/her

values and individuality, in addition to providing information on the skills and knowledge s/he has gained in class over a designated period of time. Well rounded electronic portfolios such as these may also include hobbies or extra-curricular activities related to a student's chosen industry where appropriate. They are about presenting a 'bigger picture' of a student and his/her learning profile in relation to their aspirations. Composite portfolios offer the opportunity of bringing together a variety of learning evidence that a student has stored in various electronic folios within a department, or indeed within various departments across an institution and storing them altogether in one portfolio set up for specified purpose. With students as the drivers Whitsed (2005) noted that when they (students) are involved in the process the production of putting together an electronic portfolio can itself be a formative learning process, i.e. it is as much a 'journey' as an end point. An example given is that of a student interested in working in design focussed industries, such as engineering or architecture and how the contents of their electronic portfolio would include along with samples of formal assessment and evaluations, work samples such as photography, paintings or freehand drawings, in order to demonstrate that they have a broader creative ability outside their class work (Lippert (2004). Many of these types of EP's may also end up as web folios such as the Edgecumbe High School samples in Alaska, thereby making them a lot more accessible beyond the confines of a student's immediate school. Through such means students are able to demonstrate their learning to a much wider audience, whenever and wherever.

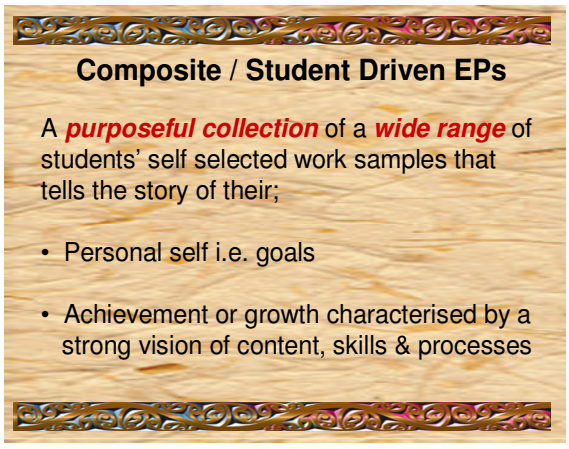

Figure 8: Student driven portfolios are a formative process in themselves.

Development of Portfolios in Schools

Teacher researchers such as Laura Dowling (2000) have observed that as computers have become more common place within education over the past few years, so too has the growing interest in the use of digital portfolios. While digital portfolios have been widely used in other professional and business sectors of the community for at least a good decade, their use is relatively new within the world of education. With the growth of the Internet and improved computing technology in schools, as well as improved access to personal computers and professional development, teachers appear to be poised on the brink of making a shift away from paper-based portfolios towards electronic portfolios.

While this is a good thing my experience as an ICT facilitator over the last three years is that much of this is happening haphazardly, and is being driven by self motivated teachers who have an interest in ICT initiatives being sponsored by the Ministry of Education. Many of these people are what Zemsky and Massey (2004) term 'the innovators'; those who are intrinsically motivated and who are willing to experiment with new ideas and technology by so called trial and error, often on a shoe string budget and with equipment they themselves have often purchased. They add that the role of these pioneers is to "determine how to use the new product or service and to determine its potential value" (p9). While this can be viewed as a good thing and we will always need pioneers who are willing to 'step outside the square' and to challenge the status quo, I am concerned that such venturing is often undertaken without due consideration to the accelerating rate of innovative change, or without any deliberate thought as to what constitutes good and effective practice within this relatively new area of ICT. Zemsky and Massy (2004) also noted that what is missing in the implementation of many e-learning programmes or innovations is a proven knowledge base of sufficient breadth to persuade other staff members that such new ideas might indeed be worthy of consideration and adoption.

E-learning research suggests that in order for any new idea to be embraced effectively it is important that certain critical discussions take place within schools among staff and within departments. There is a plethora of research surrounding how this might happen within education at various levels of the system, and as mentioned earlier, while much of this comes out of the United States and reflects educational practices within that country's learning system, I believe that there is much that we in New Zealand can draw on and learn from. Important research such as that by Zemsky

and Massy (2004) needs serious consideration if we too as a nation aren't to be 'innovatively thwarted', and I believe that it is important that when exploring the usefulness of electronic portfolios, that we place them within the bigger context of e-learning and start such a discussion by looking at factors that are likely to affect the final outcome of whether or not the use of electronic portfolios for students is worthwhile adopting. What then are some of these factors?

Important E-Learning Assumptions

Zemsky and Massy's research entitled "Thwarted Innovations" (2004) aimed to track changing climates for e-learning across College campuses throughout America and their final report states that they 'trumped' what they consider to be three current assumptions of e-learning. While aimed at the post high school sector of education their research has I believe invaluable lessons for us here in this country in our current state of ICT innovation.

The first is the assumption that if we build it i.e. e-learning courses – students will want to come to our classes or opt into our courses. However, their results showed that this was not the case, and that while there were a high usage of course management systems that touted 'easier' learning and PowerPoint lectures incorporated into 'new' courses with high components of e-learning, there was little increase in 'outside' enrolments. While this piece of information seems irrelevant within a high school context I believe that it sounds a warning to us – not to rely on the wizardry of technological gadgetry to entice students. After talking with teachers it is my belief that some would consider electronic portfolios for students as somewhat gimmicky, and that once the wizardry had worn off students would revert back to their 'old' selves. So, they (EP's) are therefore something that is at best to be avoided in an already busy schedule. In fact Dowling (2000) noted that when introducing and trialling the notion of student driven electronic portfolios within schools, the initial expectations of teachers regarding their students and their ability to work within a self regulating environment, were not very high at all.

The second assumption and expectation that students would take to e-learning naturally was also found lacking and results showed that for many students e-learning was more of a convenience, and that when utilised for any real purpose, that purpose in their view (the student's) was more often than not linked to connecting themselves

to each other, or for providing entertainment in the form of music, games and movies. The upside of this was that they **were** prepared to utilise all of the aforementioned in presenting themselves and their work – in my eyes a good case for the use of student driven electronic portfolios.

The third assumption that e-learning would force teachers to change the way they teach was also found to be lacking in evidence. In fact, what Zemsky and Massy's research did show was that even when using e-learning technologies teachers still tended to teach as they have always done. That is, in a lecturing style aimed at supplying students with the basic knowledge that they need and their somewhat damning statement - "hence the success of course management systems and PowerPoint – software packages that focus on the distribution of materials rather than on teaching itself" (2004, p6).

As a result of challenging these three assumptions they have been led to the belief that e-learning (which encompasses the use of electronic portfolios) will only become commonplace when teachers change the way they teach, and not before. I believe that these findings in particular demonstrate an even bigger need to allow learners themselves to become more involved in the management of their own learning through the use of electronic portfolios. So what other reasons are there for using electronic portfolios?

Portfolios Uses

For anything new to be embraced there must always be a reason and Dowling (2000) along with Barrett (2004) suggests that there are a multitude of reasons for the inclusion of electronic portfolios in the management of students' learning that have been well trialled and researched. Cambridge (1998) in particular notes four common features of electronic portfolios that are worthy of consideration. These include their use as a means of featuring multiple examples of students' work; for offering opportunities for selection and self assessment; for their ability in providing the kind of in depth description that helps a learner to understand an outcome and the reason for that outcome; and finally for their ability to offer a look at a student's development over time. She states that electronic portfolios can facilitate each of these if we consider the technology used to create them as but one of many essential features of decision making.

By their very nature e-portfolios within virtual learning environments (VLEs) now offer learners new ways of collecting and manipulating material suitable for recording and presenting a range of skills and knowledge to support a variety of purposes. Because learning objects are stored electronically it is much easier to integrate and pull together different types of files such as text, music or video that may be stored in many locations on a school's network. If a school has in place a system for storing students' work electronically then it is relatively easy for a student to pull from his/her different subject portfolios digital artefacts to create a specific type of electronic portfolio. For instance when my students developed their first showcase e-portfolio they were able to choose examples from a variety of digital portfolios that had been set up for specific purposes including personal, research, rehearsal clips, reflections, work in progress and assessment to name a few.

Offering opportunities for selection and self assessment is maximised within VLEs especially if teachers have set up digital portfolios to reflect different types of learning opportunities and purposes. For instance as the concept of lifelong learning becomes more popular many schools at senior level are developing personal folders that reflect not only work a student may have done in school, but outside of it as well. Whitsed (2005) notes that e-portfolios as tools of lifelong learning is currently being debated from pre-school-aged children, but suggests that for many it begins with work experience at high school, then extends through the remainder of fulltime education and into the work force. On the other hand personal folios offer students an opportunity to personalise their portfolios with the inclusion of goals, assessment or exam results, evidence of skills, work experience and so forth. A portfolio of this type is usually focused on allowing a learner to measure their progress against specific learning outcomes or self-selected goals. Such portfolios are also retained and controlled by the students themselves and it is not uncommon for them to go from one learning institution to another with their owner. Hence, their often being referred to as 'a story of learning'.

There are many pieces of research that report similar findings including one undertaken by Herman and Winters (1994) which also makes reference to an important study undertaken in Vermont Public schools regarding the effects of portfolios on the educational environment and teachers' expectations of their usefulness. Both researchers noted that teachers whose expectations were initially very low regarding the ability of students to be genuinely involved in the process, had

a change of heart over time. Comments from teachers post implementation show a change in attitude with responses noting that many eventually came to see that the implementation of portfolios was something that positively influenced and eventually changed their expectations of what students were capable of doing. Two thirds also reported improvements in student levels of problem-solving and higher-level learning, while a corresponding number of teachers reported a substantial change in the way they thought about their own teaching. The same number of teachers also observed that they had more time and opportunities to assist individuals and to engage more students in group activities (Aschbacher, 1993).

As well as reiterating the findings of the former researchers, Milman (2005) and Lippert (2004) also observed that portfolios have the ability to assist teachers in helping to engage students in the learning of difficult content, and that students are able to feel more ownership as they become more actively involved in the selection and evaluation of content. Another positive they observed was the ease with which hyper-linking of a wide variety of artefacts in audio, visual, and textual forms could be made, and that students were able to see at a glance what and how much they had done. This they stated was an important factor in keeping students motivated, especially if that glance provided them with feedback from the teacher.

Having been involved in our school's Digi Ops project I was intrigued to discover that these findings were very similar to what I had experienced as a drama teacher when observing my students conducting action learning research, mastering new performance skills, and when organising their showcase portfolios for their peers and others. As a teacher I was able to use the facilities available to track where each group was at, and more importantly comment on their progress and to make relevant suggestions as needed. For us electronic portfolios became more than a collection of assignments and video clips designed to impress, and more of a testament of our ability to work together to solve problems and achieve a collective outcome.

Juniewicz's (2003) research which examined teachers', students' and parents' perceptions of the effectiveness of student-led conferences when using electronic portfolios, provides us with another good reason at to why we should look at using electronic portfolios within our classrooms. Her research aimed at assisting in the promotion of real world skills suggests that, they (EP's) have an important role to play in the *act* of learning today. She notes that there is much talk about the need for teachers to provide students with authentic learning situations that model real life

situations, as well as provide opportunities for authentic assessment. Her findings acknowledge that using portfolios in such situations promotes real world characteristics, as well as provides invaluable life-long skills practise such as personal responsibility for one's own learning, self assessment and goal setting. In agreement, Cruikshank (2002) notes that teachers need to allow students opportunities to be more responsible for their own learning if they are to become more responsible thinking citizens. The process of using portfolios for student led conferences supports the notion that this process genuinely involves students in their own learning.

Cambridge (1998) adds to this by referring to two very important practices that offer ways of making meaning of information: reflection and social construction. She notes that reflection is crucial to the creation of electronic portfolios and that without them they (reflections) are merely scrapbooks of material containing an accumulation of information. She states that "What turns the data into evidence is reflection about the meaning of selected materials" (cited in AAHE, 2000, p4). Cambridge's comment that social construction of knowledge is also an important tenet of portfolios supports the notion of distributed learning or networking beyond the immediate learning institution of learners.

This same set of social skills being referred to is mentioned in The New Zealand Curriculum: Draft Consultation for 2006 (2006) and forms part of the set of 'Managing Self' skills listed under 'Key Competencies'. It mentions that these sets of skills are about helping students to know who they are, where they come from and where they fit in. As part of a bigger set of key competencies they are identified as "the capabilities people need to live, learn, work and contribute as active members of their communities…people draw on and combine all the resources available to them: knowledge, skills, attitudes and values" (p.11). It is my belief that the use of digital portfolios in the future is worth considering as schools start looking for ways to show evidence of students' mastery of these key competencies.

Another reason for the use of electronic portfolios that has already been alluded to is the future – that point in time that is ahead of us yet needs to be planned for today if our learners are to be able to function as effective digital natives and citizens in tomorrow's world. Our new curriculum draft is in one respect a reflection of this realisation, and is the result of government initiatives aimed at transforming our country into a knowledge-based economy and society worthy of a place on the rapidly developing global stage of technological change. The Hon Steve Maharey,

Minister for Education states that "we need to build an education system for the twenty-first century…today's students are different from those of yesterday…they think and engage differently" (2006, Covering Letter included in Curriculum Draft). To ensure that this happens the government has taken the initiative of including a separate e-learning plan entitled 'Enabling the 21st Century Learner: An e-Learning Action Plan for Schools 2006-2010'. Included in this plan is a section on the need for schools to develop evidence-based approaches to decision–making by embracing a culture of reflective practice. This notion of reflective practice acknowledges the digital world of today's learners, their place in it and how we as educators need to adopt new technologies, e-services and ways of doing things, that are reflective of an e-world, in order to maximise opportunities for learning in today's classrooms. Electronic folios are already ubiquitously integrated into the digital world of educational institutes who embrace e-learning, and electronic portfolios in particular have proven to be an effective tool for assisting in the development of reflective practice, not only with students, but teachers as well. (Strudler, 2005).

Methodology

The Case Study

The secondary school at the heart of this research is a Decile 2 rural school with a role of approximately 530 pupils, at which I in 2004 carried out my initial piece of research under Digi Ops. As a result of this initial research I requested the opportunity through an e-fellowship to continue exploring the use of electronic portfolios within my school, with a view to a possible trial and implementation in another sector of the school in the near future. As a member of the school's ICT Operative I have also been involved in the development of a school-wide IT strategy and have over the last two years developed a rapport with many of the participants. However, in saying this I had little knowledge of what different departments were actually doing in terms of using computers with their students; or what sort of portfolios, digital or non digital were in use, if at all. I realised very early on in this project that if I wanted to 'pique' the interest of my colleagues in this topic I needed to find out where they were at in terms of their understanding of digital portfolios as well as the notion of student directed portfolios, and if possible examine some of their current practices and thinking surrounding their use.

Since opting into the Teachers Laptop Scheme four years ago, the school has adopted the practice of whole school professional development which has been carried out by competent staff members, as well as involvement in the Eastern Bay of Plenty School's ICTPD Cluster initiative, of which I was a member. Three other teachers had also been involved in their own DigiOps projects and I therefore expected to see a high use of digital folios on the school's learning management system.

Research Aims

The aims of this project were to explore the current use of electronic portfolios within education in general and to examine the way my school uses them. This involved a look at the way our school collects, manages and shares its own students electronic portfolios internally and externally, as well as looking at ways of extending current practices to include the use of integrated school-wide electronic portfolios. Project questions were therefore structured in the following way:

Key Question

- How might electronic portfolios be used to enhance the way teachers manage students' learning?

Literature Review Questions

- What are electronic portfolios?
- What are some of the best practises surrounding the use of electronic portfolios that secondary schools are most likely to use?

Research Questions

- What portfolio practises are currently in operation within the school?
- How might electronic portfolios improve the way the school manages its students' learning portfolios, internally and externally?
- What needs to happen in order for the school to consider using electronic portfolios?

Participants

The participants in this research project were a small group of teaching departmental heads (HODs) from core curriculum areas. They took part in completing a survey, and then from this sample a smaller focus group was identified for further interviewing. All participants have access to the school's network and have departmental folders set up on the intranet. All have been involved in whole school professional development over the last four years, with the exception of one recently qualified teacher.

Method

The methodology used to frame this piece of research is that commonly used with case studies. As a piece of research it is essentially an exploratory study with a focus on the contemporary phenomenon of the evolving use of electronic portfolios within a real life context such as a secondary school. For reasons already outlined this particular piece of research has been framed to assist in the future development and implementation of the case study school's IT Strategy, and the survey findings are unique to this school, its partcipants and situation.

The first term was used to familiarise myself with the literature surrounding the use of electronic portfolios within New Zealand and internationally. As mentioned earlier this was almost non existent within this country, likewise the number of schools who had embraced their use. The information gained from this exercise assisted me in placing 'my school' within the bigger context, and helped me to put into perspective why perhaps certain things were or were not happening.

In term two I began the process outlined by attending a Curriculum Operative meeting within the school at which all departmental heads were expected to attend. Twelve were in attendance and I presented them with a PowerPoint presentation explaining the purpose and reasons for the research project. After being shown exemplars of the type of electronic portfolio this project sought to explore, HOD's were invited to ask questions to clarify any queries that they might have before completing a survey.

This first survey was used to determine what sort of portfolio practises (digital and non digital) were currently in use within the school. The information provided was used to identify staff familiar with digital portfolios – student driven or otherwise, and the likely contents and purposes for their use. Those identified as users of digital

portfolios within the school's network became involved in further follow up interviews throughout terms two and three. The number of participants involved in this was four. At the same time evidence backing up survey findings was gathered through a thorough perusal of each department's digital portfolio housed on the school's intranet. Screenshots were taken of the set up and contents of each department's main screen as well as the contents of various folders.

The analysis of this survey, follow up interviews with the small number of users, and the gathering of visual evidence were all complete by the end of term three.

Findings

Of the twelve departments surveyed seven of these stated that they were familiar with the term 'digital or electronic portfolios'. Further analysis showed that of this seven, four of them had ready access to computers within their normal teaching duties and all were teachers of computing or involved in media studies. The other five who did not have ready access to computers within their normal classrooms stated that they were able to access computers via the school's new IT laboratory (I-Tiaki Suite), or the wireless MOBLAPS. Of all the twelve departments only one department (other than mine) was using them in a manner that this piece of research sought to explore – student driven, purposeful, and reflective of self selected student work samples targeted at an identified audience.

A further analysis of the types of portfolios currently in use showed that three quarters of those surveyed still used paper based folios (scrapbooks), folders or flip files, while the remaining quarter were in the habit of using digital folders but mainly for assessment purposes . This was especially the case within the senior school where large numbers of electronic folders were dedicated to the provision of standards based assessment units and activities, as well as digital objects and artefacts directly associated to Achievement or Unit Standards (NCEA). It was also clearly evident that the majority of these users had adopted the practise of storing all their departmental procedures on the school's system within departmental folders that included course statements, student assessment procedures, research assignments as well as PowerPoint presentations 'teaching' basic knowledge requirements.

While this was the case within the senior school, the same could not be said for the junior school, and there was a lot less evidence of folders being set up for junior students and their work. Those departments that did have digital folios in place

included content directly related to the teaching of junior units of work such as activity worksheets, quizzes and reading samples, as well as portfolios of archived web objects for reinforcement such as 'Do Now' activities or research purposes. Of this same group a small percentage (10%) were also observed as using digital portfolios for Junior Achievement Motivation (JAM) purposes.

When surveyed about what happened to these same portfolios at the end of the year, one half of those who had year group or class portfolios set up stated that those portfolios that contained evidence of students' work, assessment or otherwise were burned to CD or DVD, or retained as exemplars for moderation purposes in their departmental folders on the school's intranet. The other half stated that they tended to delete them to free up space on the system.

It was interesting to note that of those departments who maintained pre-dominantly paper-based folios, half of them stored them longer, either on a shelf or in a cabinet within the classroom or in the department's store room, while the other half sent them home with students or destroyed them.

Findings regarding who had access to these folders was also limited and was as I had already experienced – that apart from the class teacher, the occasional classroom support teacher and the students themselves, these portfolios did not get beyond the departmental folder or outside the school's network. The exception to this was three departments who showcased some of their students portfolios at the schools annual 'Night of Celebrations' held in the college hall at which large numbers of caregivers and the public were in attendance.

Further Investigation

Although initial survey findings showed a low percentage of departments employing student driven electronic portfolios, further discussions with various staff showed that while they were yet to embrace the use of student managed digital portfolios as envisaged by this piece of research, many **were** using computers with their students and storing samples of work within specifically targeted digital folders i.e. class or units of work. The common practise was that while completing electronic assignments or activities students 'house' their work in their 'My Documents' folder on the school's system, before printing out their final copy, or posting their work to a Hand-in box. Once posted to this electronic receiving box, their work could not be retrieved and only the teacher had access to it. Discussions with teachers noted that

this was more often than not most likely to happen when students were conducting research , however as access to students' personal folders was unavailable to me, such a statement could not be verified apart from what I noted when working with my own students in 2004. What I did see when looking at departmental folders was an eclectic mix of folders, and while half were highly organised with folders named by year, class and unit of work, others were what one of my senior students termed 'messy housekeepers'. This was reflected with samples of student files 'floating' in a folder that was dedicated to all sorts –part assessment, reflection, research etc. In other words there are no set procedures or format for setting up departmental folders on the school's system or for storing samples of students work short or long term. Every department appears to be responsible for their own students and subject content, and the facility for the 'sharing' of much of this content in the form of a single portfolio for each student is still to happen.

For those few teachers who were in the practice of involving students in the construction of their own or group digital portfolios comments were very positive and one teacher had this to say:

> "It's great for engagement…students love having this to show off …pride and engagement is high".
> (Survey, April 2006).

Two other teachers in the habit of storing students work digitally confirmed this teacher's comment and added that from personal experience using digital folios was:

> "Great for archiving student work …assessments are not lost".
> (Survey, April 2006)

Though not in the habit of sharing evidence of students learning inter departmentally, these teachers could also see that there would be some merit in doing so. One noted that it would make for:

> "Easier cross-curricular discussion and departmental sharing"
> (Survey, April 2006)

Other positive comments included the belief that digital portfolios would make for:

> "Better reporting to parents…more depth" (Survey, April 2006).

Discussion

One often hears the comment that we (schools) are assessment driven rather than curriculum driven, and that further up the chain of institutional learning one climbs the worse it gets. Added to this are the comments one often hears within the staffroom of the overwhelming amount of work that NCEA has added to an already over crowded curriculum and busy teaching schedules, as well as increased assessment and moderation demands. As one teacher succinctly stated:

> "We need to be convinced it is beneficial and worthwhile".
> (Survey, April 2006)

I was therefore not surprised on first analysis of data to see that teachers had used the school's computing system to assist them in the day to day management of learning and teaching, NCEA material and for moderation purposes. However, what was surprising was the extent to which this has been done within the senior school and seemingly to the exclusion of other forms of valid assessment of student's learning, that once upon a time used to be a large part of our paper-based portfolio practises in the past. While to some degree this is understandable from a teacher's point of view in helping them to manage workload, as well as utilise the ready availability of electronic resources to assist in the teaching of units of work - one can't help but question what has happened to best practises surrounding the collection of holistic/wider evidence to demonstrate students' learning. While current practise is still to formally report two to three times a year to parents in a format that has changed very little from ten years ago, except for the introduction of the NCEA grading system (i.e. achieved, not achieved; with merit or excellence), one can't help but feel that there is a mismatch somewhere between assessment for compliance and assessment of and for learning.

Mindful of the fact that this is the fourth year that my school has been involved in ICT initiatives, and that staff have been provided with a reasonable level of professional ICT support, I expected to see evidence of not only teacher driven

'activity folders', but some sign also of the use of more personalised student or even class folders. What I saw was evidence of individual students' work files 'housed' within a folio designated for hand in purposes only, or for other purposes such as 'Unit Standard 1234' or 'Research Assignments' .

While research shows that there is a definite place for Assessment and Course Content portfolios, it also shows that what we collect and store on behalf of our students needs to be representative and reflective of the whole learner. This needs to include evidence of right brained activities as well as left brained activities, and be reflective of process and not just outcome. Strudler (2005) adds that this is very important in a world that is now geared for conceptual thinking; a world which demands that its citizens be more creative and innovative and be able to demonstrate such skills.

Opportunity was also given to peruse twelve other curriculum folders, and while not involved in the initial survey it is interesting to note that there were similar findings. However, it is beyond the scope of this research to comment any further on these observations, and so it must be kept in mind that what is represented here is but a 'snapshot' of a part of the case study school.

Recommendations

As stated in an earlier section, research notes that there are certain considerations that need to be made before schools are ready to adopt the practice of electronic portfolios. Barrett (2004) in particular suggests that we need to look at **context, product,** and **process**. Context involves the need to examine where we as teachers are at, in terms of our understanding of where education is in respect to a rapidly developing technological society. She suggests that we need to collectively discuss the whole notion of what it means to be a teacher in the Conceptual Age of the 21st century. I personally think this is particularly important for those teachers born in what Daniel Pink (2005) refers to as the era of 'left brained' capabilities that powered the Information Age in which we - 'the baby boomers' grew up. New Zealand teaching statistics show that the average age of secondary teachers is in the late forties, so that means that for many in this age group, (and this is the case within this school), many teachers trained in the 1970's were grounded in teaching theories such as Piaget's, behavioural theory, that reflected society's beliefs then about the way we as individuals learned and behaved. While some of this is still relevant, much water

has since gone under the bridge, and new theories such as the theory of change (Fuller, Hall & Hord, 2001 cited in Strudler, 2005) dominate much of today's discourse regarding e-learning. This theory of change views change within education as a complex process that takes a minimum of three to five years. While the school has been involved in ICTPD via the laptops scheme over a period of three years, a review of the school's professional development programme during this time notes that there has been a focus on up-skilling teachers in the use of computing tools, with an emphasis on learning how to use generic software and hardware. It is my belief that while this has been necessary and an important part of laptop use, such use needs to have been grounded within informed learning and teaching pedagogies.

Research already mentioned shows that if computers are to be seen as more than tools for improved presentation of students work, discussion of their place within learning and teaching must be part of the professional development package. Bergman (2004) reiterates what Fuller and his colleagues have to say and states that it is important for teachers to imbed the implementation of electronic portfolios within learning theories that support their use, as well as supports the school's philosophy, and beliefs about what constitutes good learning and teaching practise in the 21st century.

We as professionals need to look closely at some of these newer theories with a view to discussing them within the wider context of what is happening within our changing society and respective schools concerning e-learning, the new curriculum and the teaching of 21st century learning skills. Having been involved in the schools PD programme I am aware that discussion surrounding such pedagogies has been minimal, and that there is a very real need for informed debate. Teachers completing the survey suggest that this needs to happen at all levels of the school and that people need to become more informed about what they (EP's) are, and start to look at where they might fit into the bigger picture of learning and teaching within the school.

Hand in hand with this is the belief that we also need to include discussions around the implications of the new school curriculum document which outlines exactly what some of these new 21st century learning skills are. As we become more familiar with this document we also need to read, discuss and understand its accompanying 'Action Plan for e-Learning 2006 - 2010: Enabling the 21st Century Learner. This is the first time in the history of our education system that we have had such a document to guide us, and we need to ask ourselves "Where is the place for

digital portfolios within our school's IT/e-learning strategy?" We need to ask the hard questions and become informed about the impact such a practise will have on the way we teach, as well as the impact such a tool will have on the way we manage our students' learning. As research shows too little of this (meaningful discussion) happens before adopting innovative ideas, and as a result many good ideas are often left to die on the shelf of the first stage of innovation due to a lack of informed understanding and professional support.

Barrett (2004) also includes the need for us as educators to have discussions around their purpose and to determine content, as well as identify who the possible audience(s) might be. Bergman (2004) goes further and states that schools need to collectively establish its baseline requirements for content, and that in doing so they will establish the consistency necessary in determining their (EP's) capacity for all sorts of purposes. He proposes that schools draw up general guidelines that include the development of a strategic plan and processes that incorporate a clear connection to the school's mission statement – one that is developed by as many key stakeholders as possible in order to gain acceptance and instil ownership. While our school already has in place such a plan it is imperative that this be reviewed in line with the new curriculum document and emerging IT pedagogies and practices.

From the digital portfolio samples that I have seen it is obvious that portfolio content can be wide and varied, and may include static information and archives, speeches, career development, media clips, essays, research, photos, tests, drama scripts, short and long term goals, reflective summaries, pamphlets, statistics, content for websites, assessments, experiments, posters, mock scenarios, and so much more. As Bergman (2004) notes "the first audience is the author…it (a portfolio) is at the heart of a learner's demonstration, documentation and defence of their learning and ability" (p4). Findings within the school show that a few individuals within different departments are already familiar with collecting and storing a variety of samples of students' work digitally, and it is my belief that these same people need to be encouraged to share the benefits of what they are doing with their comrades. I also believe that the school and its departments need to collectively decide on a wider purpose and reason for the collection of such artefacts, and to start thinking about ways of including the students themselves in the process. As one teacher enthusiastically stated when commenting on the involvement of students in the construction of their own student driven portfolios:

"Imagine! ...What a fantastic idea!"
(Survey, April 2006)

As there are different models for different purposes and audiences it makes sense to build on what we already have and to start with the familiar. Findings show that teachers have already started developing assessment portfolios and though limited in their current scope and contents, I believe that with careful planning and review we can collectively extend the process to be more inclusive across all departments. Such a step would enable us to seriously look beyond the use of IT within the school for management and assessment purposes, and bring us to a point where we will be in a better position to perhaps start looking at how they can be used to better manage students' learning in general, as well as involve the students themselves in the management of their own learning.

As they (EP's) are meant to be shared, Barrett (2004) and Bergman (2004) both agree that the issue of ownership or property rights of portfolios needs to be discussed, and once again preferably with as many future key stakeholders as possible. They suggest that we start slowly and seek linkages for stakeholders by making available models that have relevance, are realistic and allow for continuous improvement and growth as we evolve. As the famous John Dewey realized we all can learn from examples – from the prior learning of others. I believe that all models have some value in what they illustrate and we just need to find or adapt examples such as those on the Mount Edgecumbe High School website, of the type that we are interested in developing, and then through discussion decide on a style that suits **our** developing school and community needs.

Of importance also is consideration of the tools for implementation i.e. software and hardware, as well as the technological skill level of teachers and students. I believe that the school already has in place most of the necessary common authoring tools for the creation of those digital artefacts and objects contained within a well rounded digital portfolio. However, when looking at the integration of media clips and the supply of tools needed to generate photos, video and other digital artefacts, it is evident that the school will need to obtain more of these. One quarter of those surveyed believed that the demand for computers and the necessary tools

required would be a major factor in whether or not teachers would embrace the implementation of electronic portfolios. As one participant noted:

> "There is a need for more data loggers and video cameras".
> (Survey, April 06)

These electronic tools are not cheap so there will also be implications for departmental and school budgets. What I do know and have seen and heard from teachers is that when equipment is readily available and easily accessible, teachers will use it. However, if it means that they have to traipse half way around the school to fetch it and then spend five to ten minutes setting it up at the start of each period, then they are more likely to not use it.

Likewise the technological expertise of the teachers themselves – this concern was also mentioned in the survey with a quarter of participants of the belief that more professional development was needed to master using computers with students (Survey, April 2006). While on the whole many teachers are already users of a range of generic tools and software, it is obvious from talking with teachers that there is a wide range of ability among teachers. However, I believe that the professional development support that is already in operation is well placed to work with those teachers who need further assistance. There are also students in place who are well versed in working alongside teaching staff and their peers, and are able to demonstrate how to create digital artefacts beyond the use of PowerPoint. The I-Tiaki Suite that is manned by 'teacher – students' already has a proven success of students taking the initiative and lead in helping everybody in the school to become better users of computers and their various accessories. Teachers in the survey also mentioned concerns about workload and time and clearly stated:

> "We need more time to develop our own technical skills and to set them up" (Survey, April 2006).

Time also for students to accomplish set digital tasks in an already over burdened timetable and limited computing resources was also expressed.

> "How can we ensure that every student has an opportunity to develop their own electronic portfolio?"
> (Survey, April 2006)

Discussions with teachers show that there is a belief that in order for the implementation of electronic portfolios to go ahead there would need to be better timetabling access to computers within the school.

When considering product Barrett (2004) states that we need to once again consider the type of software and hardware available in a school. The more common publishing tools of 'Office' and 'FrontPage' and customised tools such as the Smart Tools system already available on the school's network are good starters for helping to develop electronic portfolios with students. While the question of who would do this and how was asked in the survey, I believe that this question would in the long run be determined by purpose and audience, and by the students themselves. My experience through the DigiOps project showed me that not everything has to be done by the teacher, and that the students themselves are quite capable of problem solving and helping teachers to set up portfolios. It is also my belief that an electronic portfolio isn't the responsibility of one or two people, but of all those people involved in a student's education. All have something to contribute and the six million dollar question and challenge is:

> "How can we overcome our individualistic departmental thinking practices to bring together in one central place, a unique portfolio that reflects and demonstrates a more in-depth picture of each of our students' learning?"
> (Researcher, 2006)

The storage of portfolios over time also needs consideration and with overloaded systems already we need to ask ourselves whether or not it is feasible to allocate space somewhere within the school's system, or externally on another web server. Or do we think along the more disposable lines of CD-R, DVD-R, or flash drives to name just a few and trust that the students themselves will take responsibility for them. All of these questions relate to both short and long term storage.

Barrett (2004) states that once all of these considerations have been looked at, then schools need to ponder over the actual process of implementation itself. I note that this stage I note is closely related to that of context and requires a rethink of what it means to 'make' an electronic portfolio. Traditionally when utilising paper based portfolios the practise is to collect, select, reflect, direct and where possible celebrate the final product, usually at a parent/teacher interview. However, within the context of e-learning today electronic portfolios enable us to add to this process, as well as involve the students themselves in the process of self selection and archiving, linking and thinking, storytelling, collaborating and publishing. Barrett (2004) notes that the implications of the affect this has on teachers and the way they teach are not to be underestimated and requires careful consideration and forward planning.

As I myself discovered through the DigiOps project, one becomes more aware of one's social interactions with students and I witnessed personal changes in my own behavioural teaching interactions with them. This necessitated my having to shift from what Bergman calls a gatekeeper's position. As the students became more independent of me and more interdependent on others in their group, I also became aware of the changing nature of my role of key transmitter of knowledge, and I noticed myself becoming more of a facilitator and collaborator in a quest for knowledge alongside the students. In many respects I found myself becoming more of a mentor for the ideas my students wanted to develop - the guide on the side rather than the sage on the stage.

While the experience pushed all my 'teaching buttons' for challenge and working in a stimulating environment, it was also exhausting. Working with the students and their portfolios required regular feedback. I could not take a set of papers or books home at the end of the day and I had to find extra time to sit at a school computer and look at their, in this instance, work in progress folios and give them feedback. Often I wished that I had extranet access to the school's system at home where I could sit and work in comfort at the end of a long day. My 'techie' skills were also stretched to the limit and in many cases I had to eat humble pie and admit to the students that I did not have an answer or a solution, and that we needed to work together to solve 'the problem'. Often I was the learner and they (the students) were the teacher, and role reversals in terms of technological 'know how' were a common thing and I learned much from my students. For all of these reason, I believe that it is all worthwhile and that the learning experience that took place that year, in that

particular class and situation was for me a career changing experience that led me to where I am today; an eFellow – seeking ways to convince my colleagues that electronic portfolios are worthy of consideration and implementation.

Conclusion

Recent work shows that introducing electronic portfolios into schools is not for the faint hearted as they threaten to question much of what we currently do with our students in terms of the management of their learning and the way we teach and evaluate that learning. Research suggests that there are many reasons why we should include them in our school practices. For learners these include the ability to collect, store, manipulate and share evidence of their own learning in a variety of digital formats and for a wide range of purposes and audiences. More importantly electronic portfolios can be viewed as powerful vehicles or containers for fostering internal and external understanding of what it is they (students) believe they know through self selection and reflection of portfolio contents. For schools, electronic portfolios add another dimension to what they already do in terms of assessment and being able to demonstrate what their students have learned over periods of time by involving the students themselves in the process of selection of evidence and reporting.

Research also demonstrates that electronic portfolios lend themselves well to emerging digital practises within education and that they enable students to make sense of themselves as learners, as well as provides them with visual evidence of what they have achieved. They can also offer a bridge of communication between all the key stakeholders involved in the life of a learner and are to be recommended as futuristic reporting tools for the 21st century.

While secondary schools such as the one at the centre of this study have yet to fully embrace the notion of student driven digital portfolios, there is an awareness of the need to plan and prepare teachers and students through collaborative discussion and decision making processes. Such preparation needs to be strategic and include discussions around their use within the wider context of society, learning and teaching, as well as include guidelines for producing the finished product and for the process to be used. The introduction of a new school curriculum within New Zealand is timely and is a blueprint initiated to help us plan our way forward in this sea of change, and for all the above reasons electronic portfolios demand that we give them consideration as serious tools for assisting in the management of students learning.

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