

THE CHALLENGE OF INFORMED USE OF LEARNING TECHNOLOGIES

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Abstract

The paper proposes that the grand narrative of educational policy statements lack clear guidelines on the desired Information and Communications Technology (ICT) integration. Also, a review of the academic literature fails to provide consistent strategies for institutions and practitioners determined to adopt ICT in an informed way. This paper therefore develops and applies the notion of informed use of ICT to support a student-centred pedagogy and associated tasks. The context for the paper is the 'iPod therefore iWrite' longitudinal research project where multiple media content is developed for the portable iPod.

1. The Challenge of Informed Use

In the past two decades the uptake of Information Communications Technology (ICT) in education has been inconsistent. Some countries, districts, and educational institutes have certainly embraced ICT as a central component of their teaching and learning experiences: Singapore's Masterplan for IT in Education (Goh, 1997) and one-to-one learning in Maine, USA (Greenstone, 2006) come to mind. There are also a number of

excellent research studies of 'good practice' in ICT integration (Sandholtz, Ringstaff & Dwyer, 1997) and extensive literature reviews (Parr, 2003). Despite the huge financial investments made by nations and individual institutions, however, many practitioners recognize ICT adoption is not universal in mainstream education. Becker & Ravitz (2001) found that only 25% of secondary English teachers, 17% of science teachers, 13% of social studies teachers, and 11% of maths teachers made weekly use of computers. Moreover, the computers were not used to develop deeper understandings of concepts, tackle difficult topics or change the approach to teaching methods. Additionally, educators like Stanford University professor Larry Cuban (2002) are unimpressed by attempts to inculcate ICT into mainstream education:

Although promoters of new technologies often spout the rhetoric of fundamental change, few have pursued deep and comprehensive changes in the existing systems of schooling. The introduction of information technologies into schools over the past two decades has achieved neither the transformation of teaching and learning nor the productivity gains that a reform coalition of corporate executives, public officials, parents, academics, and educators have sought. (p.195)

Cuban's observation appears to be supported by academic research and agency reports of ICT adoption. Reviews of the academic literature that considered the effect size of research in the 1990's portrays a varied picture of *some* gains in quantitative tests by students in experimental groups (Kulik, 1994; Wood, Underwood and Avus, 1999; Parr, 2003). Kulik (1994) used meta analysis to aggregate the findings from 254 controlled evaluation studies, and discovered that technology rich classes produced an effect size of 0.3 on quantitative measures of educational performance; considered significant but

moderate (Fitz-gibbon and Morris, 1987; Cohen, 1988). Apologetically, the British Educational Communications and Technology Agency (BECTA) reports that it will take time for empirical evidence of the positiveness of ICT integration to emerge (Cox, Abbot, Webb, Blakeley, Beauchamp & Rhodes, 2003). Why is this? Selwyn (1997) argues that education policy statements and the discourse of promoters of technology often lack a solid rationale for ICT adoption. In other words, despite the implementation of technology in schools and universities, there lacks direction about ICT's integration into course curriculum and pedagogical practices. This deficiency is supported by Avriam (2000) who argues that:

the introduction of ICT into education has often been carried out with vague and confused conceptions of the desired model of learning which the new technologies were supposed to enhance and without clear conceptions of any guiding educational values. (p.332)

An example is Singapore's first Masterplan for IT in Education (Goh, 1997). Four key statements summarise the Masterplan's goals:

- Teachers and pupils will communicate and collaborate with other institutions
- Innovative processes in education will be generated
- Creative thinking, lifelong learning, and social responsibility will be enhanced
- Administrative and management excellence in the education system will be promoted

However, how these were to be achieved remained unclear (Deng & Gopinathan, 1999). Towndrow (2001), in an article explaining the human capital construct in the modern

Singapore context, considered that without a solid rationale, ICT investment in education is 'a leap of faith in the dark' (p.27). Pearson (2005) later critiques Singapore's second Masterplan where the intention is to move beyond equipping schools with computers and a network access to a focus on pupil-centred pedagogies. Yet the development of a schools network infrastructure was given scant attention until it emerged that technology adoption was not becoming ubiquitous in the Singapore schools as initially desired by the policy makers. In other words, technology implementation simply sustained a teacher focused, didactic pedagogy and not the student-centred, constructivist pedagogy anticipated. Again in the second Masterplan policy makers provide little help in how any change in pedagogy, with or without technology, will be achieved. Pearson (2005) explains:

the relationships between 'pedagogy' and the conditions that might help to bring them about, receive scant attention in these policy statements. Most comments about pedagogy are general in nature ('student-centred' and 'active learning'), and there is seldom any recognition that the ways in which infrastructure has been installed, and what has been done – or not done – in 'basic training' are likely to impact on current pedagogical practices and attempts to change them in the future. (p.141)

Whether or not such a high investment generates returns in the form of pedagogical change may be a moot point though as, after all, parents, students and institutional leaders want computers in their classrooms. However, it should be recognized that adding ICT to the learning situation may indeed solve some problems (e.g. universal access to information and development of computer skills) but will bring new, additional problems (e.g. how to evaluate information and development of digital literacy skills). It is

acknowledged that ICT has the potential to impact upon a pedagogical evolution as, 'computers not only bring something new to the learning environment ... they change it and they change learners too (Heppell, 1993, 233). Yet the impact has not been as dramatic as anticipated. Fourteen years after Heppell's comment, the UK Government released its Education 2020 Review where it categorically admits schooling needs to change further: 'it seems clear to us that the education system will not achieve the next "step change" in raising standards simply by doing more of the same: a new approach is required' (Facer, 2007).

How can educational institutes move forward in light of inconclusive research findings, report comments and lack of pedagogically focused guidelines for educators? Diana Laurillard (2002) in her book *Rethinking University Teaching* proposes that, unlike in the business sector, technology cannot be standardized into education and goes on to suggest that nationwide policies are unhelpful. She asserts that governments should not be responsible for ICT integration. The accountability lays with academics as it is they who are responsible for what and how students learn. *Rethinking University Teaching* proposes a Conversational Framework: 'At the heart of a university is the iterative dialogue between teacher and learner, nurturing the ideas and skills that constitute understanding' (Laurillard, 2002, 241). Keri Facer (2007) recommends transforming schools into knowledge building communities:

- In curriculum - knowledge creation, collaboration, community navigation, learner responsibility
- In pedagogy - how we teach, who teaches, techniques. Authentic activities – immersion and reflection

- In institutions - knowledge building communities, networked to the wider world-children, education professionals working alongside others from (virtual / physical) community

There is a recognition though that financial investment and the 'grand narrative' of policy statements do not necessarily lead to the desired transformation in practice. Returning to Singapore, a Core Research Program has therefore been set up, at great expense, for a systematic focus on classroom practices throughout the nation. The multidisciplinary evidence will be used to inform pedagogical innovation and educational reform (Luke, Freebody, Lau Shun & Gopinathan, 2005).

Alternatively, Mouza (2002) suggests a reason for failure to adopt and adapt technology in mainstream education is due to inadequate training of new teachers. It has been argued that often training is provided in technical literacy skills focusing heavily on the hardware and software, whereas effective training has been shown to focus upon curriculum development and integration into pedagogical practices. Success is based upon the development and teaching of digital, or ICT, literacy. Gilster (1997) defines digital literacy as 'the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers' (p. 1). Another definition of digital literacy is offered by Educational Testing Service (ETS):

ICT literacy is using digital technology, communications tools, and/or networks to access, manage, evaluate, integrate and create information in order to function in a knowledge society. (Digital Transformation, 2002)

A commonality of these definitions is the focus upon cognitive competencies over and above any technical skill sets.

Characteristics	Key Factors	Description
Activities	Flexible	be flexible enough to address different learning styles (Jordan & Follman (1993), (Sandholtz et al. 1997).
	Pedagogy	focus on quality of teaching and types of learning as many studies in technology integration tend to concentrate merely on practical advantages (Knipe & Lee, 2002).
	Opportunities for learning	a key factor to success of synchronous inter-networking is the instructor's skill in creating opportunities for interaction (BECTA, 2003).
Integration	A constructive environment	use technology to create constructivist environments which supported higher level thinking skills (Hesselbring, Barron & Risko, 2000).
	Integration	training in the integration of technology into the curriculum is nearly always more helpful than basic technology skills training alone (Parr, 2003).
	Adding value	if ICT is used in learning then it should be done with the intention of adding value to good tasks. That is, the technology should make these tasks even more worthwhile (Towndrow & Vallance, 2004).
Collaboration	Collaboration	collaboration among students (Sivin-Kachala & Bialo, 1996).
	Cooperation	use cooperative learning models (Sandholtz et al, 1997).
	Communication	increase communication between students and teachers (Jordan & Follman, 1993), (Sandholtz et al, 1997).
Shared spaces	Shared space	the activities, learning context and shared space should aim to meet the five qualities within a knowledge construction, constructivist learning environment: (1) teachers supporting teachers; (2) dialogues; (3) reflections; (4) observing best practice (5) taking risks (Jonassen, Peck & Wilson, 1999).
	Making connections	relate the skills to real-life situations (Jordan & Follman, 1993), (Sandholtz et al, 1997).

Table 1. Key factors for informed ICT integration

Given these definitions then one has to respond to Selwyn's earlier observation about the lack of a solid rationale and guidelines, and ask how can technology be integrated successfully in an informed manner and how can we apply informed use in our

classrooms. The literature on ICT integration and its impact on learning do not provide a clear picture though. The analysis may imply that computer assisted learning is no more effective than other types of intervention (Parr, 2003; Cox et al., 2003). The vast literature on education and technology has highlighted some key factors for informed ICT usage though and has been categorized into four characteristics that represent the key factors of informed learning: activities, integration, collaboration and shared spaces (Selwyn, 1997). These characteristics have been used to summarise a portion of the literature (Vallance, 2006a). See Table 1 - Key factors for informed ICT integration.

It is argued that, due to the varying complexities of ICT and its utilisation, there needs to be continued research on 'informed use' to promote effective processes and positive outcomes in learning when using technology. In an attempt to answer Selwyn and develop a statement for informed use, Towndrow and Vallance (2004) turn to Candlin's (1987) criteria for good task design, believing that tasks are at the centre of a teacher's daily practice:

- promote attention to meaning, purpose and negotiation
- draw objectives from needs of learners
- allow for flexible approaches and different solutions
- involve (target) language use in task process
- feedback and co-evaluation - teacher and students
- students to estimate consequences of task solution/s (prediction)
- promote awareness of data and learning process
- share information and expertise

Candlin does not specifically mention activities that require the use of technology. However, he has provided a useful list for practitioners to refer as a checklist to at least begin the process of informed integration. The criteria has therefore been used by Towndrow and Vallance (2004) as a reference upon which to develop a set of criteria for teachers when considering integration of technology in their daily practices:

- encourages discussion, consultation and sharing
- focus upon process and product of task and learning objectives
- integrate multiple media
- allow access to a wide range of information
- facilitate and/or negotiate students' periodic outcomes
- provide a channel for feedback and assessment
- flexibility of when and where learning occurs
- question whether the activities required in the Task process can be done 'without' IT. (p.105)

2. The iPod therefore iWrite Project

Project Summary

The next section will provide an example of ICT integration in practice that attempts to marry the notion of 'informed use' in the classroom (the micro level) with the ideals of future education (knowledge creation, collaboration, learner responsibility) by policy makers (the macro level). This is the 'iPod therefore iWrite' project that is in its early stages of research (the meso level).

The longitudinal study involves students planning and developing multiple media content for the portable iPod. Due to a Notes reader in the iPod it is possible to add text and link that text to audio and video files such as Podcasts, movie clips, and multiple-choice questions. For an overview of the initial development of the project see Vallance (2006b). For a summary of a pilot study see Vallance (2006c). For information about the software used see Vallance (2006d). To quote liberally from Vallance (2006c):

Many teachers are (or should be) familiar with online diaries, BLOGS and WIKIS. These Internet resources provide the writer with an extended readership beyond the classroom. Readers can also add comments to BLOGS for consideration by the author. In addition, WIKIS allow for text to be amended so resulting in a collaborative writing artifact. Some teachers and probably many learners may perceive such writing as typically 21st century. But online writing by English learners, and differentiated by computer technology, originate over two decades ago as exemplified by the works of Higgins and Johns (1984) and Rinvoluceri and Berer (1981), and demonstrated by a computer-based text simulation entitled London Adventure (Hamilton, 1986). These were called Mazes, which were essentially hypertext stories. At the beginning of a maze (or, in digital jargon, *interactive story*) a problem is posed and a number of solutions are offered. The learner selects one of the given options which will then link to the next corresponding link. Subsequent actions are offered and the maze progresses until some outcome is reached. The paths taken by learners differ based upon their responses. Durani (1989) comments positively, 'In maintaining the learner's interest, the branching structure of the maze is without doubt more stimulating than the linear or circular structures of routine exercises. (p.43)

Mazes though are inflexible and can become rather repetitive and boring. For potential language learning success, the simulation that a maze represents needs to be connected to planned, real world activities. Higgins and Johns (1984) called this the 'briefing-execution-debriefing paradigm' (p.67).

The iPod now offers the provision of portability of such interactive stories. Although essentially an audio and video player, the iPod can also display images and text. By using iWriter software see <<http://www.talkingpanda.com/iwriter/>>, teachers and

students can develop interactive stories that can be displayed and manipulated on iPods. If students do not have access to iPods then the iWriter project can also be displayed in a Web browser.

Observations

The next section will discuss the procedure for developing iPod content and tag the components of informed use. The first stage of the project was the development of Podcasts, multiple-choice questions (MCQ) and text using the iWriter software for the iPod. See Figure 1 – iStory. The aim of stage one was to develop initial content and, more importantly, facilitate a process that symbolizes sharing, cooperation, student-centred engagement, and good learning.

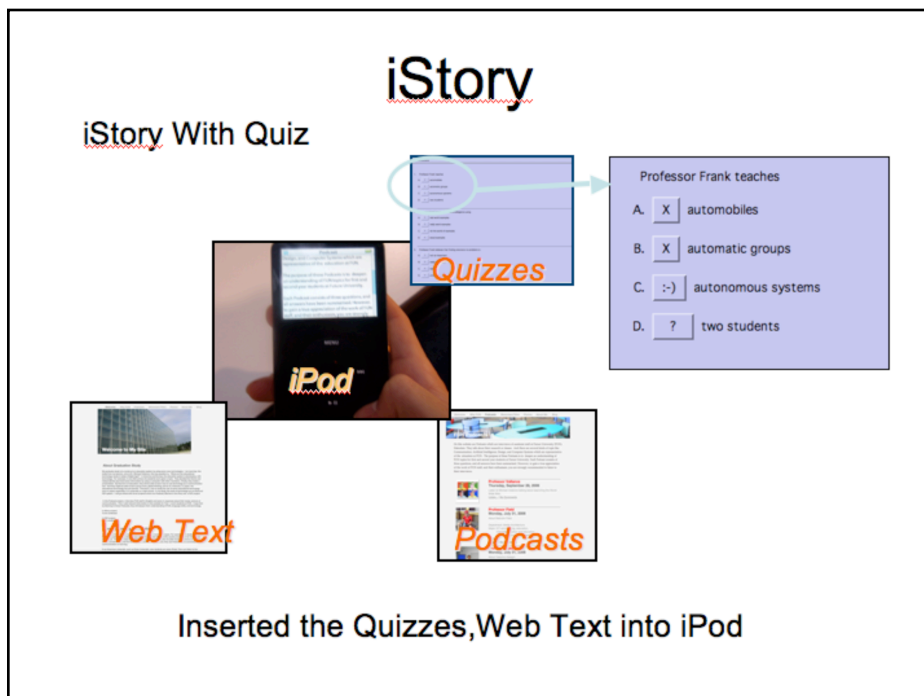


Figure 1 - iStory

Students (n=41) were provided with an objective (to produce English content about Future University - Hakodate aimed at local university students and a selected

Secondary school in the UK). The students formed teams, and ideas were brainstormed using Inspiration software. Consecutively, a Graduate student began work on his Study and developed similar content. The result of the Graduate student's plan is shown in Figure 2 - iStory plan.

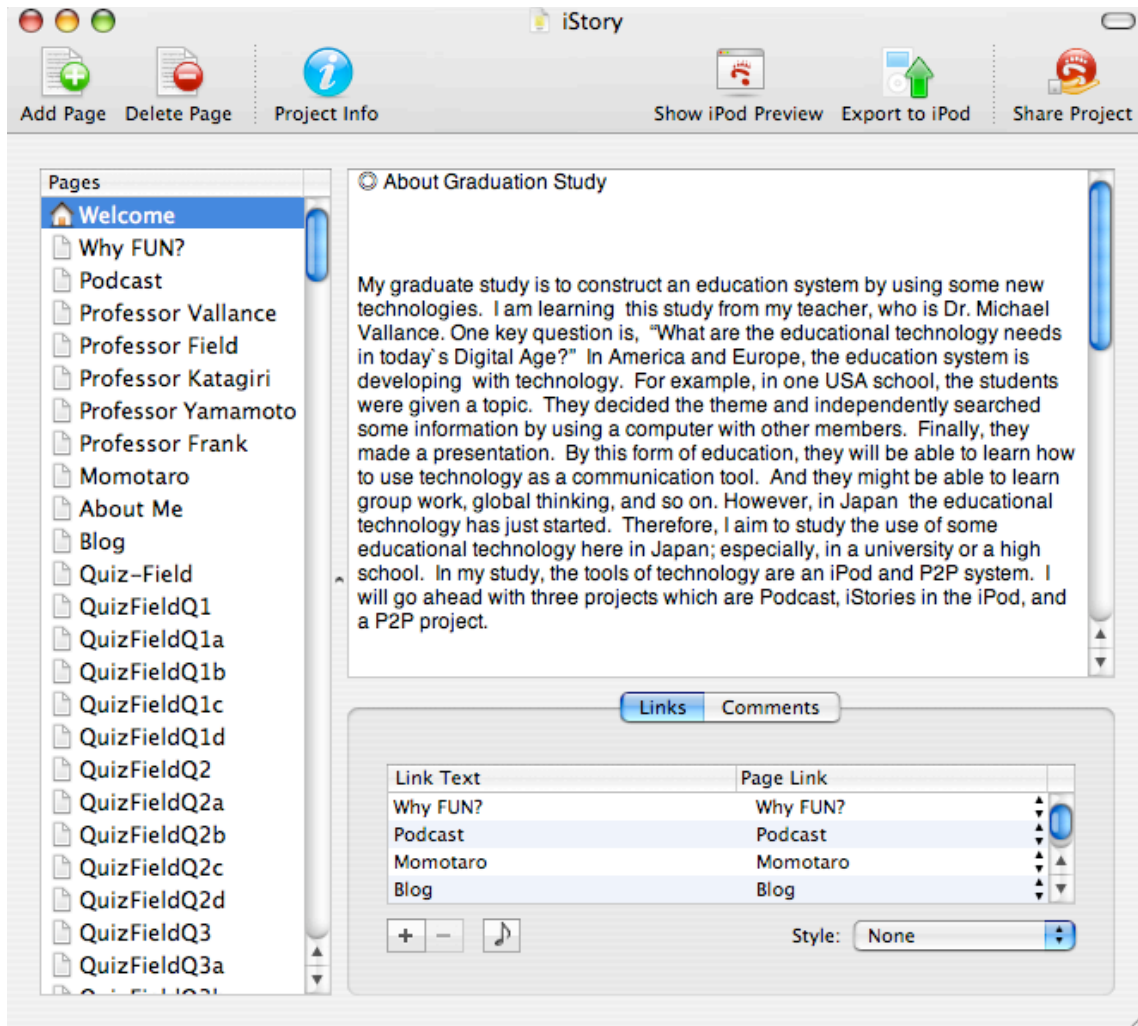


Figure 2 - iStory Plan

For the groups of students this was an opportunity to discuss and share ideas about what would be considered useful and informative for their peers and those outside the university. In addition, all students searched and evaluated relevant information about

Future University and their target international audience using criteria proposed by Towndrow and Vallance (2004). The criteria is provided in Table 2 – Website evaluation criteria, with scores in each category ranging from 0 to 5. All relevant Websites and commentaries were also posted on a course Bulletin Board system (BBS) for others to view and respond.

Website	Informative 0-5	Current 0-5	Navigation 0-5	Attractive 0-5	Total 0-20
What is the website's address?	Does the website contain relevant information?	Does the website contain new information? Is there a date on the website?	Is the information easy to find or is it difficult?	Is the website professionally designed?	

Table 2 – Website Evaluation Criteria

The students gradually began to piece together ideas for a meaningful project. One activity in particular that motivated the students was the digital photography week. Five themes were chosen (study, fun, resources, free time, and courses) and all students had to use their cell phones or a digital camera to take one picture that represented each theme. These were all uploaded to the BBS for sharing and selection. In all, some two hundred photographs became a useful resource throughout the course, with no copyright restrictions.

However, inputting text into iWriter and the iPods was unfortunately restricted at the mid point of the semester, mainly due to the funds for twenty iPods being stalled. This led to a decision to develop video content on the same topic (Future University) and themes (study, fun, resources, free time, and courses) by the groups. The movies could be uploaded at an alternate date to the iPods and incorporated in the projects. Meanwhile,

the Graduate student had recorded five interviews with academic staff at Future University, and uploaded as enhanced Podcasts to iTunes online. In addition he had created multiple choice quizzes for each Podcast and used iWriter to link each Podcast with relevant background information and the quizzes. In all, 217 pages were created.

Figure 3 – iWriter interface, provides an illustration of the work involved.

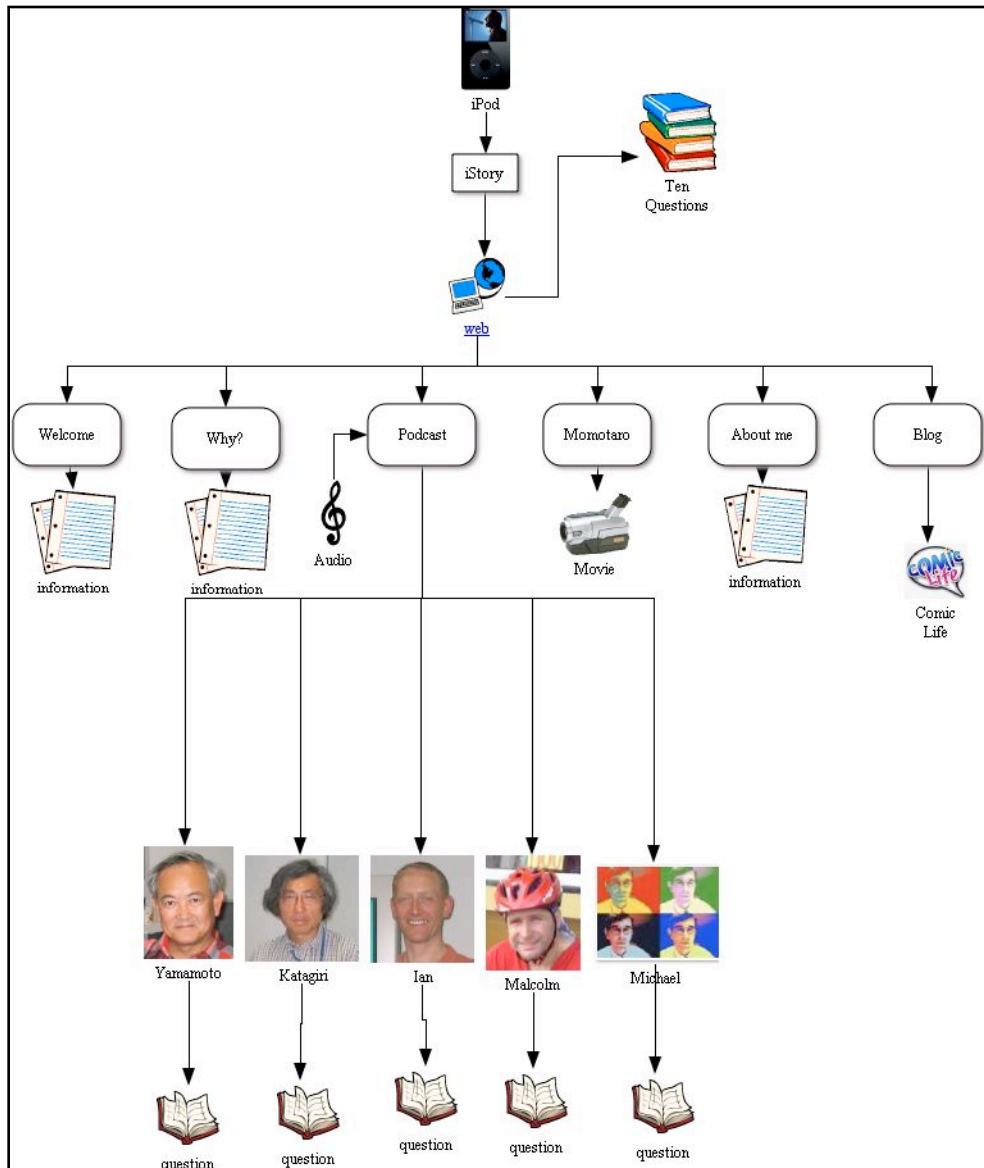


Figure 3 - iWriter interface

Meeting the Challenge of Informed Use

How does the project, in progress, attempt to meet the criteria for informed use? This can best be shown in Table 3 – Informed use and the ‘iPod therefore iWrite’ project. Although opportunities for discussion and sharing were provided and encouraged, the interactions in the monolingual group were conducted in Japanese. English was only used to present the product of the groups’ artifacts. More frequent instances of communication with the international students via e-mail, the BBS or iChat is recommended. In addition, the students had only developed initial ideas for sharing information as a digital artifact. To enable a more strategic approach to planning, peer evaluation will be given a more prominent role. To further help the process a number of regular milestones will also seek to improve the time management of the groups. In effect, more could have been done by the first year groups but it is surmised that as not enough iPods were available to the students as planned, then the ‘authenticity’ of the task was diluted.

The motivation to quickly develop digital content was rekindled when international students (from Brynteg school in Wales, UK) provided a three-minute movie of their school. The Future University students responded with similar video content in ‘m4v’ format that could be uploaded to iPods. The exception was the Graduate student who was very focused upon developing supporting material for the iPods and his Podcasts. The initial stages of this project has not been without its surprises and disappointments. It is encouraging that the Graduate student developed so much content and linked up with the first year students to coordinate some of the information.

Informed Use	This Study (2006)	Next Stage (2007)
Encourages discussion, consultation and sharing	Discussion, consultation and sharing within class but limited use of English for communication	Require more frequent instances of authentic communication (e-mail, BBS, chat, video-conference)
Focus upon process and product of task and learning objectives	Students negotiated process and product	Students negotiate process and product
Integrate multiple media	Multiple media used. In order of usage: 1. PPT with movie. 2. iMovie. 3. iPhoto book. 4. iPod story	All students require iPods rather than HTML export/viewing for a tangible product
Allow access to a wide range of information	WWW access with an evaluation criteria	Deep Web - OPAC, library sources
Provide a channel for feedback and assessment	BBS (Moodle) used	Encourage further peer evaluation
Flexibility of when and where learning occurs	FUN has 24/7 room access	FUN has 24/7 room access
Facilitate and/or negotiate students' periodic outcomes	Poor time management	Need milestones. One iPod per student. Will encourage authentic iStory developments
Question whether the activities required in the Task process can be done without IT	IT requires for sharing and communication	IT required for sharing and communication

Table 3 – Informed use and the 'iPod therefore iWrite' project

The observed successes of the first stages of the project may therefore be considered to be: (a) the flexibility in the task process and teaching strategies, and (b) the universal access to information afforded by the technology. These two pragmatic outcomes begin the process of supporting Selwyn's call for a framework of informed ICT utilization, informs the research literature (the meso level) and should be considered by policy makers (the macro level).

3. Conclusion

This paper has presented the early stages of a research project entitled 'iPod therefore iWrite' which is attempting to answer Selwyn's call for a solid rationale for informed technology adoption by educators. The foundation of the research has been laid by

constructing and implementing criteria for informed use to support a desired change in education. The development of multiple media content for authentic and meaningful sharing by students within an institution and internationally set the context for some early observations of mobility in access to information and learning, and flexibility in the task process and teaching strategies. It is anticipated that as the 'iPod therefore iWrite' project evolves, further advice will be offered that will be supported by empirical data. Practitioners are therefore recommended to consider the criteria of 'informed use' provided in this paper and reflect upon the challenge to their pedagogy posed by ICT in education.

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