Session 12

Using Technology to Support and Address Integrated Curriculum, Different Learning Styles and Differentiated Instruction

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> *"The principal goal of education in the schools should be creating men [and women] who are capable of doing new things, not simply repeating what other generations have done; men [and women] who are creative, inventive and discoverers"* (Jean Piaget cited in Pulaski 1971:200).

1. Abstract

The high uptake of Information & Communication Technologies (ICTs) by young people and the pervasiveness of a digital culture in our society are well documented. This culture differs from a previous media culture (based primarily on analogue technologies e.g. broadcast radio, television and print-based texts) in that it offers learners many opportunities to create digital texts for real audiences and to collaborate and share ideas with others in a global network.

ICTs and the wider digital culture are having a deep impact on schooling in that teachers should be re-conceptualising notions of curriculum and should be re-thinking pedagogies. Together with an increasing emphasis on constructivist learning environments and a deepened understanding of the nature of human intelligence in the last few decades, teachers are developing educational practices that support and enhance learning and that cater for individual differences in student-centred learning environments.

ICTs are also giving educators the opportunity to explore how curriculum can be viewed from the perspective of different learning styles with multimedia applications stimulating individual learning preferences which have been ignored in traditional educational practices.

This paper examines how ICTs can be used as tools to accommodate individual learning styles. It advances the notion of differentiated curriculum by focusing on the following:

- The relationship between the demographic group referred to as *millennials* (Howe and Strauss 2000) and ICTs and their implications for classroom practice
- The relationship between digital culture and schooling
- The relationship between different learning styles and ICTs
- The ways in which new internet technologies (in particular, podcasts, social bookmarking, RSS, weblogs and wikis) can be used to address different learning styles
- The planning of lessons involving learning styles and ICTs.

2. Demographics and Digital Culture – Who Are We Teaching in Our Schools?

Discussions of the integration of ICTs in schools should be prefaced with an understanding of the demographics of our classrooms and the wider culture in which schools exist. Howe and Strauss (2000), in their seminal book Millennials Rising: The Next Great Generation, coin the term *millennials* to describe a generation of young people who were born between 1982–2002. This group follows previous generations including Builders (1925-1942), Boomers (1943-1960) and Generation X (1961-1981).

It is widely accepted that the attitudes and values of young people today differ to those of previous generations. This is largely due to changing cultural, social and political contexts (Howe and Strauss:2000; McCrindle:2004; Tapscott:1998). In particular, “Generation Y’s have lived through the age of the internet, cable television, globalisation, September 11, and environmentalism” (McCrindle 2004:2).

Howe and Strauss (2000) state that because millennials are confident, adept at using technology and are focused on achieving in their studies, they will become one of the most influential generations. Frand (2000) states that millennials have grown up with an information-age mindset. Integral to this are the following values - that computers are not considered to be technology (but rather a natural part of life), the internet is better than TV, multitasking (doing several tasks at the same time) is a way of life and staying connected to others through the use of technologies is essential (Frand:2000).

Further to this, Jonas-Dwyer and Pospisil (2004), Oblinger (2003) and McCrindle (2004) point out that it is imperative for educators to understand the mindset of this generation. This includes an understanding of the following learning preferences:

- The need to be socially connected
- A preference for experiencing (rather than simply listening to what teachers say).

Jonas-Dwyer and Pospisil (2004), in their study of students in Australian universities, assert that millennials display learning preferences that emphasise collaboration, hands-on experience and the use of technology to communicate with peers. They state that "email and instant messaging are natural communication and socialisation mechanisms for teenagers today" (Jonas-Dwyer and Pospisil 2004:195).

These preferences challenge the way teachers have traditionally communicated to students in classrooms (i.e. *talk and chalk*). As McCrindle states:

> *"The traditional talk and chalk won't work with this generation. Our communication style is structured, yet they want freedom. We stress learning, they like experiencing. We react, they relate. We focus on the individual, while they are socially driven"* (McCrindle 2004:4).

Jukes, Dosaj and MacDonald (2000) in their work on information literacy suggest that there is a fundamental disjuncture between the way young people think, learn, and communicate and the ways that schools interact with them. In particular they conclude that:

> *"students live, breathe, and play in the real world that exists outside of education, and they bring an immediacy of that world into their classrooms. The more archaic and disconnected the curriculum becomes, the more disengaged students become from what and how they learn"* (Jukes, Dosaj & MacDonald 2000:107).

What is suggested here is not only an understanding of generational attitudes, beliefs, communication and values but also an understanding of preferred learning environments. Prensky (2001) argues that because today's students are surrounded by an ubiquitous digital environment, they "think and process information fundamentally differently from their predecessors" (Prensky 2001:1). However the majority of schools are currently designed to deliver curriculum in a manner preferred by past generations. In many classrooms the learning preferences and needs of today's students are not accommodated.

In these environments, *digital immigrants* (Prensky 2001), the educators for whom technology is an adopted (second) language are educating their students, *digital natives* (Prensky 2001) for whom technology is a first language.

3. A *Flat* World: Changing Media, Literacies and Pedagogy

To further understand the preference for the use of technology by today's students it is also important to understand the fundamental differences between analogue and digital media. Analogue media (e.g. free-to-air television, radio, film, textbooks) are linear texts which provide the reader with limited active interaction. On the other hand the new digital media and technologies are non-linear with multiple pathways and significant interaction built in for the user. Tapscott (1998) states:

> *"To the digital savvy N-Geners, television should be interactive….This shift from broadcast to interactive is the cornerstone of the N-Generation"* (Tapscott 1998: 2-3).

In a wider sense, the notion of authorship also differs within analogue and digital cultures. Past generations consumed texts within a dominant print culture where there were barriers to authorship and hence few authors. However in a digital environment, new technologies give us greater opportunities to create as well as consume or read texts. In a digital culture there are multiple authors. One only has to look at the multiple authorship and interactivity that is conventional in video sharing websites (e.g. *YouTube* at http://www.youtube.com) and the reality television genre that has become popular over the last few years. Programs such as *Australian Idol* and *Big Brother* encourage viewers, through the use of ICTs (e.g. digital video cameras, mobile phones and websites), to create content that is built into the program structure.

This also signifies a cultural shift from a broadcast model where information is communicated to mass audiences to a network model where different individuals, technologies and texts are linked together to communicate understandings as well as to collaborate and create new forms of knowledge. Castells (1996) contends in his influential book The Rise of the Network Society that within media culture (and in our society) networking is the new dominant paradigm. As Castells states:

> *"As a historical trend, dominant functions and processes in the information age are increasingly organized around networks. Networks constitute the new social morphology of our societies, and the diffusion of networking logic substantially modifies the operation and outcomes in processes of production, experience, power, and culture. While the networking form of social organization has existed in other times and spaces, the new information technology paradigm provides the material basis for its pervasive expansion throughout the entire social structure"* (Castells 1996:500).

Friedman (2005) builds on Castells' notion of social networking by arguing that the globalised world in the 21st century is the result of new internet technologies that

have ‘flattened’ geographical, political and social borders. Hence Friedman’s central thesis is that the world is *flat*.

In explaining this metaphor further, Friedman gives examples of how structures of work have changed. He suggests that internet technology has created new work flows that emphasise the collaboration and flow of ideas across the globe. Hence it is possible for a consultant in Brisbane to be authoring solutions for colleagues in Boston without ever leaving home.

However learning environments need to reflect the wider digital (network) culture that is synonymous with a *flat* world. Traditionally learning in schools has reflected the broadcast (*one size fits all*) model where there are limited opportunities for authorship. In this case the teacher transmits information and knowledge to all students regardless of ability. Work produced by students is generally for the teacher and not shared with other individuals. However to accommodate different individual learners, schools and teachers need to explore the impact of the wider digital culture.

Dixon (2001) takes this further by stating that educators need to focus on *re-engineering* practices in schools so that they are relevant to the attributes and skills required in a knowledge-based society. This necessitates a paradigm shift in the way curriculum is conceptualised. In particular, curriculum needs to be viewed in terms of a networking of multiple pathways which are facilitated by ICTs that contest the transmission of knowledge in a traditional (linear) model.

Part of the re-engineering of curriculum includes re-worked notions of critical literacy. The construction of texts within a network paradigm necessitates different ways of reading. Whereas texts published within a print culture demand reading in a linear form, the multimodal and interactive texts produced and shared with a networked audience (e.g. via the internet) use a variety of codes and are hyperlinked to various other texts. Hence the texts produced in a digital culture rely on notions of hybridity and intertextuality (Luke 2000:73). As Luke states:

> *“Meaning-making from the multiple linguistic, audio, and symbolic visual graphics of hypertext means that the cyberspace navigator must draw on a range of knowledges about traditional and newly blended genres or representational conventions, cultural and symbolic codes, as well as linguistically coded and software-driven meanings”* (Luke 2000:73).

The interactive capabilities of ICTs, the positioning of schools within a wider digital culture and the *re-engineering* of curriculum and critical literacy in a knowledge society that is characterised by multiple pathways, work to prioritise the notion of a differentiated curriculum. Such a curriculum “relates to understanding individual differences and devising institutional strategies to cater for students’ needs” (NSW Department of Education and Training 2004:6). ICTs are pertinent here as these

tools promote critical pedagogies that encourage students to collaborate with others and to author new concepts and ideas (knowledge) which are structured as multi-modal texts to be shared with real audiences. In other words, ICTs provide learners with greater opportunities to assume individual ownership of multiple pathways in the learning process and to construct, display and publish their own knowledge and understanding. As Luke comments:

> *"The ability to import, download, drop and drag text and imagery……creates new skills, processes and multimodal forms of 'textual' production that encourage interdisciplinarity, creativity and imagination, collaborative authorship, editing, reading and writing, and problem-based learning"* (Luke 2000:87).

4. Constructivism and ICTs

The emphasis on creating texts within a digital culture (and a *flat* world) and the notion of a differentiated curriculum are also aligned to the philosophical underpinnings of constructivism. As a learning theory constructivism evolved from cognitive learning theory and has been increasingly aligned to the work of Bruner, Dewey and Vygotsky (Roblyer:2003). It puts forward the idea that learners actively construct their own knowledge and understanding of the world. The construction of knowledge is influenced by the learner's past experiences and understanding of the world. Within this paradigm, knowledge is not absolute as it is individually constructed by learners and is based on their own interpretations of the world.

The idea of constructivism as a philosophical approach to learning is evident in the findings of the social researchers and writers mentioned above. McCrindle (2004), Prensky (2000) and Tapscott (1998) state that today's students value learning which is based on experience and which encourages social interaction. Further to this, these values are complemented by the belief that knowledge and truth are relative and not absolute (as was the belief with previous generational groups). As McCrindle states:

> *"the concept of absolute and inherent truth has been banished as truth is deemed to be relative to one's own backyard and understanding"* (McCrindle 2004:3).

Such an assertion opposes the concept of instructionism which is grounded primarily in behaviourist learning theory e.g. Skinner, Gagne (Roblyer:2003) which dominated the modes of learning promoted in schools throughout the 20th century. As a theory instructionism puts forward the idea that learning occurs when knowledge is transmitted to people and that knowledge is seen as having a separate existence outside of learners.

Complementing the idea that knowledge is constructed by learners, constructivist theorists share the beliefs that:

- Learning should be seen as a social activity
- Learning should be relevant to the real world.

As an example Dewey (1916) promoted the concept of social constructivism. He believed that constructivist learning should:

- begin with students' interests (learning that is student-centred)
- emphasise a connection to the real world
- be hands-on and experience based.

ICTs are well suited to the ideas of constructivism. Put simply, ICTs provide the tools that allow learners to construct their understandings of the world. Further to this, the constructivist approach with the use of ICTs has removed the notion of the teacher as the gatekeeper of information and replaced it with the notion of students accessing information independently and directing their own learning. Hence the role of teachers must change from instructors/transmitters of knowledge to facilitators (expert learners) in the learning process.

The development of new internet technologies over the last few years is aligned with Dewey's (1916) notion of social constructivism and further emphasises the network model mentioned above. 3G mobile phones, blogs, GPS devices, podcasts, RSS aggregators, VoIP and wikis are some examples of how the internet allows access to network applications which are used to create texts as well as collaborate, communicate and share information and knowledge.

These developments are also consistent with original intentions stated by Tim Berners-Lee, the founder of the World Wide Web. As Berners-Lee (1995) stated:

> *"I had (and still have) a dream that the web could be less of a television channel and more of an interactive sea of shared knowledge."* (http://www.elon.edu/predictions/tim_berners_lee.aspx Accessed 21 September 2005).

Schneiderman (2003) suggests that there should be a greater emphasis within education on creative uses of the internet rather than using the internet as a resource. Implicitly learners should be encouraged to function as active creators of knowledge and not as passive consumers. As Schneiderman states:

> *"the World Wide Web.....cannot be a solution to educational needs unless the creative component is included. We have to do more than teach kids to surf the Net; we have to teach them to make waves. Finding Web resources is fine; creating new ones is the key to the new education"* (Schneiderman 2003:118).

Schneiderman's (2003) assertion is aligned with Dewey's (1916) philosophy of social constructivism. Although Dewey's (1916) published work and beliefs about learning were considered radical in the early 20th century, the authors suspect that he would be well pleased with the capabilities of the new technologies of the early 21st century. In particular, the increased capabilities in new internet technologies for students to communicate and collaborate with each other and to construct knowledge about their world, appears to be well suited to his philosophy of learning and the ideas put forward by other constructivists.

5. Learning About Learning

The use of digital interactive texts as curriculum resources also allows students and teachers to explore different learning styles that were often not actively promoted in a print culture and in traditional forms of schooling. In particular, digital resources can be used by students as a way of understanding their own learning preferences and to determine their strengths and weaknesses. At the same time, teachers can use digital resources as a way of accommodating different learning styles in the classroom.

5.1 Why is it important for students to know about Learning Styles?

An understanding of personal learning preferences offers the following advantages to learners:

- Students are given the language to describe the learning process so they can talk, write, think, use and understand a commonly accepted vocabulary.
- Students can use their *natural learning strengths* to significantly cut their *learning time* on new work and improve their *motivation* and *memory*. They will find learning more interesting and enjoyable because it will seem easier and they will want to learn more.
- When material is not presented in the way students prefer, they can use their knowledge of learning styles to adjust and be flexible, no matter who their teacher is and what the topic might be.

5.2 Learning Style Models

There has been a great deal of research on learning styles over the last two decades. This includes several different models which describe learning styles.

One example is the model developed by Dunn and Dunn (1978) which focuses on identifying relevant stimuli that influence learning and manipulating the school environment. Other models include Gardner (1983) who identified individual talents or aptitudes in his theory of multiple intelligences.

Even though these approaches look at learning styles in different ways, they all have merit. Each one uses different language which can be confusing for teachers and students so schools need to choose one model as a way of promoting consistency and simplicity for learners.

5.3 The Dunn and Dunn Model: An Example of a Learning Style Model

Research by Kenneth and Rita Dunn (1978) provides one of the most comprehensive models with the most widely used language. They put forward a model that divides all learning styles into three basic categories:

- Visual learners - learn best using diagrams, pictures, colour pens, reading books, graphs and flow charts (Seeing and Reading)
- Auditory learners - learn best by speaking in conversation, reading aloud, listening and group discussions (Talking and Listening)
- Kinaesthetic learners – learn best using action, handling concrete materials, drawing, moving, physically doing and touching (Moving, Doing and Touching)

This obviously has many implications for teaching. According to Dunn and Dunn (1978), we each usually have a dominant strength and also a secondary one. Hence, in a classroom, if a student's main learning strength is not matched with the teaching method, they may have difficulty learning, unless they can compensate with their secondary strength.

This has major implications for the opportunities offered to learners. In the past, schools have traditionally provided one curriculum, one teaching environment, and one teaching methodology to fit all learning needs. This *one size fits all* approach suited a wider (analogue) culture. However this structure favoured some learners and left out others as their learning styles did not match traditional schooling. Hence teachers are working with young people who are living with the effects of *learning style-biased* educational experiences.

5.4 Determining Your Learning Style – Some Web Resources

There are some web resources available to assist students and teachers in determining individual learning styles. The following websites offer a free inventory and automatic scoring which give a good indication of the relative strengths in the visual, auditory and kinaesthetic learning modes:

https://www.baker.edu/departments/etl/resources/Learning%20Style%20test.doc
http://www.nwlink.com/~donclark/hrd/vak.html
http://www.chaminade.org/inspire/learnstl.htm

5.5 ICTs and Learning Styles

There is no doubt that when ICTs are used to their potential, they will provide teachers with the tools to assist students with understanding their learning preferences. Each student has a unique learning process which ICTs are capable of supporting and can enable students to become self-directed, successful learners. Further to this, ICTs are very flexible as they encourage students to use their preferred learning styles and thereby help them to identify their strengths. Even as early as thirty years ago Dunn and Dunn (1978) stated:

> *"Youngsters have been exposed to highly stimulating technology and an exciting world….To bring them into a confining environment and to group them in a way that makes educational sense is virtually impossible unless we examine each of these complex individuals to identify exactly how he or she is likely to learn most effectively"* (Dunn and Dunn 1978:2).

Gardner (1999) arrives at a similar conclusion in referring to the relationship of technology with his theory of multiple intelligences:

> *"It is not easy for teachers to provide individualized curricula and pedagogy……Happily, we have in our grasp today technology that should allow a quantum leap in the delivery of individualized services for both students and teachers……that addresses the different intelligences (and) that allows students to exhibit their own understandings in diverse symbol systems (linguistic, numerical, musical, graphic, and more)"* (Gardner 1999:179).

6. Using the Internet to Cater for Different Learners – New Possibilities

As mentioned previously, the development of new internet technologies, and in particular the development of Web 2.0, has seen a change from the web as a medium to access information to a networked platform that encourages collaboration and interactivity between applications and users. Roush (2005) states that the multi-faceted nature of the internet is due to "the emergence of the web as a platform for personal publishing and social software" (Roush 2005:49). Examples of this are websites with links to multimodal texts (e.g. virtual tours, video and audio), informational websites that encourage the sharing of content and networking such as blogs and wikis, websites that allow users to categorise and

tag uploaded data (e.g. *tagging* uploaded photos on www.flickr.com, finding data that has been *tagged* by other users on www.technorati.com), a growing space for open source applications to be developed and social software applications such as GPS receivers, PDAs and 3G mobile phones.

6.1 Duty of Care

It should also be stated here that the use of new interactive tools implies further responsibility for teachers with regard to the online safety of their students. Web 2.0 tools promote collaboration with an audience that goes beyond classroom walls. Hence there are opportunities for outside experts to communicate with teachers and their students. The teacher here has a responsibility to check those who are involved in this process. At the same time, students who publish information on the World Wide Web (e.g. via blogs, wikis) should be educated about the need to keep their personal identities anonymous in an online environment.

6.2 Some New Ways of Learning from the Web: Wikis, Weblogs, Podcasts and RSS and Social Bookmarks

In using the World Wide Web in learning environments, one could add new technologies such as podcasts, RSS, social bookmarks, wikis and weblogs as useful tools that can be used to address a differentiated approach to curriculum delivery.

(a) Wikis

A wiki is a free online encyclopedia which is best described as a collaborative environment that allows learners to share knowledge. This is facilitated by allowing learners to add new content on the wikipedia website (http://www.wikipedia.org) and to edit existing content.

Other wiki sites that are available in the public domain for adding and/or editing content include the following:

- Wikibooks (http://en.wikibooks.org) – a collection of open-content books
- Wikitext (http://wikitextbook.co.uk) - textbooks for different subject areas
- Wikinews (http://en.wikinews.org) – news content
- Wiktionary (http://en.wiktionary.org) – a collaborative multilingual dictionary
- Wikiquote (http://en.wikiquote.org) – an online collection of quotations
- Wikisource (http://en.wikisource.org) – a repository of primary source texts
- Wikispecies (http://species.wikipedia.org) – an open online directory of species

- Wikipedia Commons (http://commons.wikimedia.org) - a repository for images (e.g. animation, paintings, photos), music, sound & video clips
- Wikitravel (http://wikitravel.org) – travel guide of worldwide destinations.
- Wikiversity (http://en.wikiversity.org) - a free learning community

The use of wikis does challenge traditional practices and thinking. In one sense, the idea of using a resource that can be authored and/or edited by anyone in the world can be viewed as a *leap of faith* for some teachers who are more comfortable with textbooks. This is because textbooks appear to have greater authority due to the credentials of an established author. However at the same time there is potential here to create opportunities that encourage students to develop their critical literacy skills. In other words, the open authorship of content in wikis promotes further the need to question the validity of information.

The notion of collaboration that is encouraged by wikis also challenges traditional practices in that teachers are required here to relinquish some of their *control* (as in teacher-directed learning environments) and give students greater scope to work with their peers in creating and publishing content. However in doing so, teachers are creating several meaningful learning opportunities. As Richardson (2006) states:

> *"(wikis are) a very democratic process of knowledge creation. In using wikis, students are not only learning how to publish content; they are also learning how to develop and use all sorts of collaborative skills, negotiating with others to agree on correctness, meaning, relevance and more. In essence, students begin to teach each other. Teachers who impose a lot of right and wrong on that process can undermine the effectiveness of the tool"* (Richardson 2006:65).

Further to the existing wikis that are available on the World Wide Web, there are also several free tools that can be used to create new wikis which can be accessed only by authorised users. These tools include *PBwiki* (http://pbwiki.com) and *Wikispaces* (http://www.wikispaces.com). In particular, these tools allow users to create password protection so that only authorised students and/or classes have rights to edit and publish content. Further to this, these tools allow authorised users to upload images and files.

(b) Weblogs

Weblogs (commonly known as *blogs*) have become increasingly popular. They allow users to publish content to personal websites and are generally written in the form of a diary or journal.

Blogging has become mainstream following its success in presenting eye-witness accounts during the war in Iraq and as a tool in promoting political candidates (e.g. Howard Dean's attempt to be elected as the Democratic candidate during the 2004 Presidential elections) and in covering political events. More recently, blogging has raised new questions about citizen journalism given that major news outlets sometimes rely on blogs for content. The popularity of blogs is also evident in the competition between search engines (e.g. Google & MSN) to provide users with easy access to blog creation tools and with the convergence with other technologies (e.g. the use of mobile phones for *moblogging*).

Like wikis, blogs are a new space within cyberspace. They give users opportunities to share ideas and thoughts. So pervasive is "blogging that it has become a social force in its own right generating its own lexicon: the 'blogosphere' (the blog ecosystem)" (Barr, Burns and Sharp: 2005).

Within an educational context, blogging is a tool with not only the potential for sharing ideas and collaboration but also for reflection of events, issues and processes. The greater emphasis placed on the learning process in student-centred environments (as put forward by constructivists) gives learners greater opportunity to structure well considered opinions and reflect on their own critical thinking and decision making. This form of metacognition is particularly evident in subject areas where student journals are an integral part of the learning process.

The use of blogs provides several other advantages. In the first instance, blogs can target a wide potential audience for student work. Ideas and opinions can reach real audiences beyond classroom walls. Secondly, blogs support different learning styles. The student who is reluctant to express opinions in classroom discussions may find a *voice* in an online environment. This is because the reflective nature of blogs give students *time* to think about their own perceptions and ideas before articulating well considered opinions. In classroom discussion there is sometimes the pressure of constructing ideas and statements in a relatively short space of time.

Thirdly, blogs promote information literacy. Richardson (2006) cites Olofson (1999) who states that "the extent of our collective knowledge doubles every 18 months" (Richardson 2006:28). Hence Richardson (2006) asserts that:

> *"it's imperative that we give our students the skills to analyse and manage it (information). The act of writing in a weblog or "blogging" can go a long way to teaching skills such as research, organization, and synthesis of ideas"* (Richardson 2006:28).

Finally the introduction of blogging can be used to scaffold student learning. For example, it may be a more appropriate starting point for students to start with the basic task of finding websites relevant to a topic and then writing descriptive

information that is useful about these sites. Students could then build on these skills by moving on to higher order skills (reflection, metacognitive writing, analysis and synthesis).

(c) RSS

Blogs also have links to syndicated RSS (XML) feeds. RSS is an abbreviation for Rich Site Summary or Really Simple Syndication. In simple terms it is commonly referred to as a *feed* to news headlines, summaries of news content, authors and other blogs that are accessed by RSS readers or aggregators. One example is *bloglines* (http://www.bloglines.com) which allows users to access content updates from various sources on a regular basis. Learners may use this tool to follow the development of a particular event and/or issue and to follow commentary from various authors, blogs and news sources. Hence RSS can be used as a useful research tool to organise content and to assist with making conclusions and as a social networking tool.

(d) Social Bookmarking

Another Web 2.0 tool that also promotes collaboration and interactivity is social bookmarking. Website such as *del.icio.us* (http://del.icio.us/) and *Furl* (http://furl.net) allow users to follow and annotate favourite websites. Some tools such as *Furl* also allow users to save a snapshot of a bookmarked web page. This provides the advantage of retrieving pages that no longer exist. Further to this, users can add keywords (*tags*) to categorise information. These features can be simplified further by downloading a *widget* that is a plug-in to the web browser.

On the surface, this appears to be the same as the *favourites* feature in a standard web browser. However social bookmarking software offers the following significant advantages that are synonymous with the Web 2.0 environment:

(1) The bookmarks can be accessed anywhere (usually through a login)
(2) The bookmarks can be shared with like-minded people.

The idea of sharing bookmarks with like-minded people is a powerful tool. An example is the website *An Inconvenient Truth* at http://www.aninconvenienttruth.com.au/truth/. This site is based on former US Vice President Al Gore's recent film of the same name on global warming. If one *bookmarks* this site on *del.ciou.us* with the keywords (tags) *global warming*, one will also receive links to others who have bookmarked the same site and who share the same interests. More importantly, one will also see links to other websites that have been bookmarked under *global warming*.

The advent of social bookmarking has also marked a shift in the way information is organised. Traditionally we have relied on librarians, as trained professionals, to

categorise and classify information through taxonomies. However in this new Web 2.0 environment, users are able to categorise and classify information in their own way and to share this with others. Hence as Richardson (2006) states, “the process (of organising information) is no longer taxonomy but ‘folksonomy’” (Richardson 2006:92).

In the classroom context, social bookmarking sites can be used to build a list of relevant online resources that can be shared among learners. Students may begin their research in a topic area by looking for relevant online information and then by adding or bookmarking sites under relevant categories and classifications. Hence students are initially organising information which is part of the information literacy process.

(e) Podcasting

Put simply, podcasting refers to the publishing of audio programs on the internet that can be downloaded to computers and/or portable audio players. The word *podcasting* is a combination of *broadcasting* and *iPod*. However this is misleading as an iPod is not required to access a podcast.

Learners (and educational institutions) are able to access podcasts by subscribing to RSS feeds that are available on websites. Some useful podcasts that can be used as learning resources include the following:

- Australian Broadcating Corporation (http://www.abc.net.au/services/podcasting.htm)
- Special Broadcasting Service (http://www20.sbs.com.au/podcasting/)
- Podcasting News (http://www.podcastingnews.com/forum/links.php)
- Podcast Alley (http://www.podcastalley.com).

Further to this, podcasting allows learners to produce audio programs that can be published online. This can be done by using free audio software (e.g. *Audacity* at http://audacity.sourceforge.net/).

The Apple iPod (and other portable audio players) is best known for downloading music files to .mp3 or AAC (Apple iTunes) format. As a result, there is sometimes a negative discourse surrounding the use of iPods as some teachers see this technology as a distraction to effective learning. This viewpoint fails to recognise the potential of the iPod as a learning tool. Such a viewpoint ignores the capacity to store photos and podcasts as well as music.

A voice recorder can also be used to record voice onto some versions of the iPod. This can be used by learners to record observations and thoughts during learning activities. Further to this the recorded voice can be imported into audio recording

software (e.g. Audacity) and mixed with other audio tracks (e.g. music) to create audio programs (podcasts).

7. Putting it All Together - Unit/Lesson Planning

While this paper has focused in part on possible links between ICTs and curriculum, it has been the experience of the authors as designers and presenters of professional development for teachers that sometimes one loses sight of the role of technology in the learning process. This is because sometimes technology is unintentionally viewed as an end in itself. However as all teachers will attest, ICTs are only tools which help to engage learners and to facilitate learning. Real learning is the result of sound pedagogical practices.

With this in mind, it is critical that teachers do not lose sight of the learner and intended learning objectives and outcomes. It is the curriculum which drives the technology. Hence the planning of units and lessons should always begin with the individual learner before being followed by a consideration of learning objectives. Once these are determined, teachers should give consideration as to which learning styles will stimulate learning. Finally it is the technology which best accommodates the selection of learning styles that teachers should consider.

8. Conclusion

Demographic changes and new digital technologies have created a new culture of authorship, individual expression and learning preferences as well as new forms of social collaboration which were not valued in print (analogue) cultures. Yet our schools are traditionally influenced by practices and resources that reflect the characteristics of a print (analogue) culture. This has presented the significant challenge of re-conceptualising notions of curriculum and schooling that are better suited to learners in the 21st century. While the integration of ICTs is now a high priority within schools, it is imperative that educators and curriculum leaders explore extensively how technology can be deployed within a new cultural framework. This challenge is essentially the design of differentiated curriculum that promotes a constructivist approach to learning and that also values the needs of diverse learners.

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Videos

Accommodating Different Learning Styles (Video Education Australasia) - http://www.vea.com.au/php/progEntry.php4?ShortCodePrefix=ACCOM

Websites

(a) General

An Inconvenient truth – http://www.aninconvenienttruth.com.au/truth/
Flickr - http://www.flickr.com
Technorati - http://www.technorati.com
You Tube – http://www.youtube.com

(b) Learning Styles

https://www.baker.edu/departments/etl/resources/Learning%20Style%20test.doc
http://www.nwlink.com/~donclark/hrd/vak.html
http://www.chaminade.org/inspire/learnstl.htm

(c) Podcasting

Australian Broadcasting Corporation (ABC) - http://www.abc.net.au/services/podcasting.htm
Special Broadcasting Service (SBS) http://www20.sbs.com.au/podcasting/
Podcasting News - http://www.podcastingnews.com/forum/links.php
Podcast Alley - http://www.podcastalley.com
Audacity Software Download - http://audacity.sourceforge.net/

(d) RSS

Bloglines - http://www.bloglines.com

(e) Social Bookmarking

del.icio.us – http://del.icio.us
Furl – http://furl.net

(f) Weblogs

Bloglines - http://www.bloglines.com

(g) Wikis

Wikipedia - http://www.wikipedia.org
Wikibooks - (http://en.wikibooks.org)
Wikitext - (http://wikitextbook.co.uk)
Wikinews - (http://en.wikinews.org)
Wiktionary - (http://en.wiktionary.org)
Wikiquote - (http://en.wikiquote.org)
Wikisource - (http://en.wikisource.org)
Wikispecies - (http://species.wikipedia.org)
Wikipedia Commons - (http://commons.wikimedia.org)
Wikitravel - (http://wikitravel.org)
Wikiversity - (http://en.wikiversity.org)

(h) Wiki Tools

PBwiki – http://pbwiki.com
Wikispaces – http://www.wikispaces.com

APPENDIX A – ICTs AND LEARNING STYLES: SOME POSSIBLE CLASS ACTIVITIES

	Possible Class Activities	**Learning Style(s)**
Desktop Publishing Tools (Publisher, Pagemaker)	• Writing text for brochures, magazine advertisements, flyers, catalogues, signs, postcards, greeting cards, menus, resumes	Visual
Web Development Tools (e.g. Microsoft FrontPage, Macromedia Dreamweaver, Adobe Go Live)	• Developing/writing text for a website that sells a product and/or idea and targets a specific audience • Publishing/celebrating student writing on the school intranet and/or internet	Visual, Auditory
Word Processing (Word)	• Writing, rewriting, process writing • Brainstorming, writing ideas • Journal writing • Creating a class newspaper • Creating instruction manuals that outline how to follow a procedure • Group editing of collaborative projects (e.g. a class newspaper, class website), Brainstorming ideas as a group • Brainstorming, writing an autobiography, diaries, journals	Visual
Presentation Tools (e.g. PowerPoint)	• Oral presentations to the class • Teaching a lesson to the class • Presenting results of data analysis • Teaching the class how to follow a procedure (e.g. using a calculator) • Visual layout aspect • Creating group presentations • Presenting data that shows trends and changes over time	Visual, Auditory
Audio recording software (e.g. Audacity http://audacity.sourceforge.net/)	• Recording interviews and oral histories	Auditory, Kinaesthetic
Internet Collaboration Tools (e.g. email, discussion/mailing lists and forums, chat)	• Discussing, debating • Contributing to an online forum debating a topic covered in class	Visual, Auditory

Reference tools (online encyclopedias, dictionaries, CD-ROMs, e-books)	• Researching an issue/topic	Visual
Inspiration and Kidspiration	• Group and/or individual Brainstorming, mind mapping, creating concept maps • Creating & presenting flow charts • Creating a diagram to represent a food chain • Outlining cause and effect relationships	Visual
Digital Still Camera & Microsoft Photo Story	• Creating a photo/visual montage representing an idea and/or issue. Scripting and recording a narration • Add music & sound effects to a photo montage • Record visuals during field trips	Visual, Auditory, Kinaesthetic
Digital Video Cameras	• Writing a video script • Telling a storytelling • Interviewing • Producing a news program or documentary on a topic and/or issue • Speaking, debating, dramatizing • Recording experiments, data gathering • Creating a demonstration of an experiment or procedure • Editing footage for a video presentation • Manipulating images to create alternative meanings • Producing a TV advertisement with a jingle • Creating a video production of dances, sport and role playing, • Record visuals during field trips	Visual, Auditory, Kinaesthetic

Wikipedia	• Writing a summary of the exploration of a topic/issue then uploading this to wikipedia (http://wikipedia.org)	Visual
RSS Aggregator (free RSS aggregator at http://www.bloglines.com)	• Researching the latest developments in a topic or issue that is current in the media	Visual
Social Bookmarking (e.g. del.icio.us at http://del.icio.us & Furl at http://furl.net)	• Create a list of web resources for a topic.	Visual
Weblog (blog)	• Create a weblog that analyses and synthesizes reflections on a topic and/or issue.	Visual
Google News Alerts	• Researching the latest developments in a topic or issue that is current in the media	Visual
Crossword Puzzle Maker http://puzzlemaker.school.discovery.com/	• Creating crossword puzzles	Visual
Spreadsheets (e.g. Excel)	• Data analysis • Calculating formulae to synthesise large volumes of data • Creating graphs to summarise data collection and make conclusions • Create charts, maps or diagrams	Visual
Animation Software (e.g. Macromedia Flash)	Creating a demonstration of an experiment or procedure Producing an animated production for a community service announcement	Visual, Auditory, Kinaesthetic
Databases	Creating a database that classifies & organises data	Visual
Timeline making (e.g. Tom Snyder's Timeliner)	Creating timelines	Visual
Draw programs (CorelDraw, Adobe Illustrator, Macromedia Freehand)	• Creating computer graphics for website or other multimedia presentation • Creating illustrations to be used in a multimedia presentation • Creating a book cover	Visual, Auditory, Kinaesthetic
Photo editing software (e.g. Adobe Photoshop, Microsoft Photo Editor)	• Manipulating photo images (e.g. from news stories) to create alternative meaning • Creating book covers	Visual, Auditory, Kinaesthetic
Image composing programs (Macromedia Fireworks)	Creating computer graphics for website or other multimedia presentation	Visual, Auditory, Kinaesthetic
Paint programs (e.g. Microsoft Paint, Kid Pix)	• Creating posters that illustrate an idea and/or issue or that advertise an upcoming school event • Creating picture dictionaries	Visual, Auditory, Kinaesthetic
Web development tools (e.g. Microsoft FrontPage, Macromedia Dreamweaver, Adobe Go Live)	• Designing a class/school website	Visual, Auditory
Computer Aided Drawing software	• Creating architectural drawings and models to represent concepts and ideas	Visual, Auditory, Kinaesthetic
Simulation software	• Using simulation software to explore concepts, designs and ideas	Visual, Auditory, Kinaesthetic
Google Earth	• Analysing the topography from satellite images	Visual, Auditory
Music composing software (e.g. Sibelius)	• Composing a jingle for an advertisement	Visual, Auditory, Kinaesthetic

iPods and Voice Recorder (e.g. Audacity http://audacity.sourceforge.net/ or Windows Sound Recorder)	• creating songs for mathematical tables and then recording their song onto an iPod using a voice recorder (e.g. Audacity http://audacity.sourceforge.net/) • Using an iPod and a voice recorder (e.g. Audacity http://audacity.sourceforge.net/) to record interviews for a news report • Using an iPod and a voice recorder (e.g. Audacity http://audacity.sourceforge.net/) to record a conversation in the language being studied • Creating a podcast • Record a class discussion	Visual, Auditory, Kinaesthetic
Digital Video editing software (e.g. Windows Movie Maker, Adobe Premiere, Apple imovie & Final Cut Express)	• Producing a music video for a popular song	Visual, Auditory, Kinaesthetic
Logo and Robotics	• Building robots that follow a pre-determined set of instruction	Visual, Auditory, Kinaesthetic
Interactive whiteboards	• Give demonstrations to class	Visual, Auditory, Kinaesthetic
Keyboarding, mouse, joystick, and other devices for movement	• Using simulation programs	Visual, Auditory, Kinaesthetic
email	• Email projects	Visual
Discussion Forums, Chat, Listservs	• Discussing ideas and projects being studied	Visual, Auditory
Web Quests	• Students find the solution to a problem by collaborating with other group members	Visual, Auditory, Kinaesthetic
Multimedia software packages	• Multimedia portfolios	Visual, Auditory, Kinaesthetic
Windows Sound Recorder	• Record audio during field trips	Auditory