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Editorial

Learning Architect

Words lose their meaning from over-use or misuse. *Instructional Design* is one of those terms. It implies that instruction is based on a science of learning including theory, research, and practice. Jerold E. Kemp from San Jose State University published *Instructional Design* in 1971 listing just five references. His second edition in 1977 listed 29 references. Kemp's design model was based on current theories of learning, taxonomy of objectives, levels of learning, and methods of teaching and evaluation. It was a cyclic process that foreshadowed the concept of continuous quality improvement.

During World War II, the military conducted extensive research on design of instruction using audiovisual media. Much of this work was focused around Charles Hoban and researchers at Pennsylvania State University. It was Hoban who determined that *audiovisual* was too limiting a term for educational technologies and coined the term *instructional technology* to encompass new learning sciences and methodologies for individualized and interactive learning. The military were early adopters of instructional design, supported by the research capabilities of Florida State University. Instructional System Design (ISD) became the standard for contractors and internal development of military instruction. ISD was much more than a systematic way of designing instruction; it incorporated much of the existing knowledge and research about adult learning.

Key elements of instructional design were incorporated into the ADDIE model – Assess, Design, Develop, Implement, and Evaluate. This became the pattern for production lines developing instructional materials. The instructional designer no longer guided the entire process but one of a series of specialists in the production team.

In the second half of the twentieth century publishers and industries made numerous attempts to develop products based on new communication technologies. They envisaged their role as part of a technological revolution to solve the problems of American education. Most failed for a variety of reasons: inadequate research, faulty technology, poor instructional design, and failure to achieve overblown predictions of success. Other factors contributed to failure. Education was still a folk culture and teaching was a craft. There was little money for research, technology, instructional materials, and training to use them.

Sputnik led to an infusion of federal money to update science curricula and teaching methods in the United States. Many of these innovations died when funding ceased. The *plight* of U.S. public schools was a focus of attention for half a century with proposed solutions ranging from *back to basics* to instructional technology and instructional design. American education is an under-funded over-regulated industry with continual political interference and freeloading of new programs. For example, bussing students to other communities was the political solution to segregation; mainstreaming reduced the need for specialized institutions for students with disabilities, and homogenous grouping was terminated so that each classroom could encompass children from difference language and cultural backgrounds, ability levels, and special needs. All of this could have been achieved successfully with smaller classes, highly trained teachers, appropriate funding, and learning materials designed for this kind of learning environment. Instead, schools and teachers were mandated to achieve prescribed levels of performance on standardized tests that had little relevance to the needs of the twenty first century.

A blueprint with relevant goals and new learning structures is needed for the new millennium. Rather than return to basics, it is necessary to incorporate the best research and practices to design appropriate curriculum, dissemination tools and teacher training. Learning Architects must Assess needs and Design, Develop, Implement and Evaluate relevant learning experiences to support individuals and societies within the rapidly changing global community.

Editor's Note: This critique was written by Leigh Blackall for the Knowledge Tree, the journal of the Australian Flexible Learning Framework as one of a series of articles that explore challenges and opportunities in the convergence of pedagogy and technology. Australia is advanced in computer science yet disadvantaged by expensive software and internet costs. For example, proprietary desktop software such as Microsoft Windows operating system and Office Suite cost 2 to 4 times more than the United States when compared to Australian incomes. As a result, training and business organizations substitute freeware and low cost alternatives. Expensive internet services from Telstra, the government owned telco, substantially reduces internet access for young Australians and small business. These problems are compounded by privatization, obsolescence and content-based learning so that education and industry in Australia cannot fully realize the benefits of computer technologies.

Leigh Blackall's observations and conclusions guide and reflect solutions adopted by Australia's Tertiary and Further Education (TAFE) community for job training beyond high school. The editors are grateful to the *Knowledge Tree* and *Australian Flexible Learning Framework* for permission to republish this article.

Digital Literacy:
how it affects teaching practices and networked learning futures
- a proposal for *action* research -

Leigh Blackall

Abstract

In this critique, the author considers how digital literacy affects teaching practices in Australian education. Consideration is given to understandings of digital literacy, the impact of open source software and the place of content within the worldwide rapid publishing and networked learning revolution (Web 2.0). Participatory action research is suggested as an approach to developing awareness of new models for online learning, improving digital literacy skills and enabling networked learning practices in Australian education.

Introduction

The tone and direction of this critique will be determined by consideration of:

- the tension between an understanding of literacy based on print traditions and an emerging understanding of literacy based on Information Communications Technology (ICT) or digital literacy.

- migration to free and open source software and courseware within the Australian education sector and the subsequent impact that may have on levels of digital literacy, including access and equity.

- the influence that the 'content is king' period (1998 - 2004) has had on the collective thinking about online teaching and learning in Australia and the impact it is having on networked learning possibilities

- the broader picture of the Internet and the World Wide Web, specifically concepts of Web 2.0 and the influence it may have on online teaching and learning practices

- a proposal to initiate action research projects to investigate digital literacy and networked learning futures in Australian education.

What is digital literacy?

It is commonly held that having an ability to read and write impacts considerably on a person's potential to communicate and learn. But how, and in what ways does a person's ability to read and write digitally impact on that potential? Being able to access the Internet; find, manage and edit

digital information; join in communications; and otherwise engage with an online information and communications network, are arguably aspects of what could be called 'digital literacy'.

At present Australia measures literacy (consistent with International practice) based on '...how well people use material printed in English. Progression along this continuum was characterised by increased ability to 'process' information (for example to locate, integrate, match and generate information) and to draw correct inferences based on the information being used' (Australian Bureau of Statistics 1997: para.13)

Recent publications, looking at technological impacts on education, suggest that there are important forms of communicative literacies that go beyond text and print.

> *Many students are entering their school or college with multiple literacies that go beyond text, and this trend will strengthen over the coming years. Educators will need to acknowledge and recognise these new literacies, and build upon and extend them. (Australian Capital Territory Department of Education and Training 2005:12)*

21st century literacy is the set of abilities and skills where aural, visual and digital literacy overlap. These include the ability to understand the power of images and sounds, to recognize and use that power, to manipulate and transform digital media, to distribute them pervasively, and to easily adapt them to new forms. (New Media Consortium 2005:2)

Clearly there is an emerging belief that a person's ability to 'process' digital information is an important factor in the consideration of literacy. What then is the new scope for measuring literacy if we accept that information and communication technologies are affecting people's ability '…to locate, integrate, match and generate information' (ABS 1997:para.13)

Issues Affecting Digital Literacy in Australian Education

Digital technologies and networked communications are still very much in flux. Past, present and future changes in protocols, standards, operating systems and software platforms, not to mention market and policy directions, have, and will inevitably, change radically, impacting on people's motivation to sustain effective digital literacy.

The following are four major issues affecting the development of digital literacy in Australian education.

1. Adoption of free and open source (desktop application) software in Australian education

While the use of proprietary desktop software is still very prevalent in Australian educational organisations, there has been a notable shift by government organisations around the world to acknowledge the financial savings and ICT (Information Communications Technology) capacity building benefits that free and open source software (FOSS) offers. The United Nations Education, Social and Cultural Organisation (UNESCO) has been documenting this shift around the world, including the eagerly awaited report from the British Educational Communications and Technology Agency (BECTA) which found that schools using FOSS spent between 20-60 percent less on ICTs than non-FOSS-using schools (BECTA 2005:4)

Australia has produced its share of publications looking at the use of FOSS in the education sector with earlier work stating that '...the use of open source software across Australian schools and sectors tends to be idiosyncratic and piecemeal rather than coordinated' (Moyle 2003:30).

Since then there has been an increase in the use of FOSS in Australian education.

The Northern Territory Department of Employment, Education and Training adopted Linux and other FOSS, and there have been numerous incidents elsewhere in Australia of a migration to

FOSS server applications, such as the course management system Moodle (as used by the Education Network Australia). In the case of the Northern Territory's adoption of Linux and other FOSS applications, the following figures were reported to the Open Source Industry Australia.

The decision to use Linux and OSS saved the Northern Territory Department of Employment, Education and Training $1M in the first year, and allowed it to put 1000 more workstations into schools (OSIA 2004:para. 1).

Regarding FOSS uptake in Australia/NZ schools, Moyle in a later paper states:

> *Schools around Australia and New Zealand are experimenting with and deploying open source software in a range of different ways. Although there are no formal measures available, it seems from anecdotal evidence that this use is growing (Moyle 2004:14).*

Financial savings and long term IT capacity improvement - through the use of FOSS, open standards and more versatile desktop applications - has been shown to be considerable at an organisational and departmental level (BECTA 2005). But what are the benefits to individual staff, students and subsequently the Australian population? Case studies of educational organisations in other countries that have attempted to migrate from proprietary to FOSS desktops have strongly indicated that there are substantial challenges - mostly to do with staff and older students being accustomed to proprietary desktop setup supported by community tolerance for pirated software (Reijswoud and Mulo, 2004).

If Australian educational organisations developed more supportive FOSS capabilities, then an individual's option to use desktop FOSS applications and operating systems on their home computers would become a more viable consideration, as their choice to do so would not mean compromising interoperability with the school or college system. By the organisation offering that option and supporting it with educational opportunities, an individual is free to make a choice and to personally save money in licensing fees by transforming their home usage customs to FOSS applications. Opening such an opportunity, within a supportive educational environment, translates into a substantial access, equity and digital literacy investment by the educational organisation. This of course begins to address another issue - the pirating of software by staff and students within the organisation who are trying to remain compatible to the organisation's choices in software. With appropriate levels of encouragement and support from the organisation, the long term benefits of FOSS at an organisation and departmental level could be foreseeable, through the gradual development of skills and digital literacy amongst staff and students in the use of a broader range of applications, such as desktop FOSS.

While the shift in thinking around the world towards the use of FOSS is notable, and the benefits to education are measurable, sadly, it has been difficult to access information on strategic approaches to FOSS in the various State and Federal Departments of Australian education. Very few examples were found of policy-enabled support for training and professional development within Australian schools and colleges on the use of desktop FOSS and other open standards based alternatives. Given this apparent lack of Departmental support or direct financial incentive for schools and colleges to use FOSS, teacher training and professional development programs within educational organisations are likely to continue their ICT training strategies based on proprietary desktop software such as Microsoft Windows operating system and Office Suite. Broadening the scope of the organisation's software training and support capacity beyond the current limitations of the closed standards and restrictive document formats of the proprietary software model - to include desktop FOSS applications - would inevitably broaden the digital literacy of staff and students, including their awareness of global access and equity issues, not to mention alternatives to commercial and/or pirated software.

2. The 'Content is King' era in Australian education

As is indicated by the Australian Capital Territory's Department of Education and Training (ACT DET 2005) recent report on emerging technologies, there is still a big focus at a Departmental level on content centric models of online teaching and learning in Australia. While the ACT DETs report acknowledges some of the newer models for online learning briefly covered in this critique and otherwise known as networked learning, connectivism, or eLearning 2, a great deal of ACT DET's phenomenal report focuses on what might be termed eLearning 1 - the content centralised, closed, learning object model to online learning.

Departments and organisations have invested staggering amounts of money in this model. NSW's TAFE Connect project, Australian Flexible Learning Framework's Toolboxes, and the Le@rning Federation's Online Curriculum are examples of large scale investment in such a model. Much of the content produced has been designed to work within and theoretically across a number of Learning Management Systems (LMS), spawning further content related projects such as research into reusable learning objects, digital [copy]rights management, and meta data tagging. It remains to be seen if these investments are of benefit to teachers and learners, in fact it was argued as early as 2001 by Andrew Odlyzko and also David Wiley, and by others more precisely since (Blackall, Downes, Farmer, Hotrum, Parkins, Seimens, 2004-5), that the LMS, content centric model is not beneficial to teachers and learners, or an effective strategy for online teaching and learning.

Downes spoke about an inevitable shift away from closed-content/centralised/managed learning, to a more open/decentralised/individual model, based on trends in open network Internet usage. Downes used the emergence of the Web 2 phenomenon to illustrate this alternative, demonstrating the interoperability of open network services and arguing that it makes very little sense to remain with the content centric and firewall protected model, and that we need to instead embrace more open, distributed and networked learning models (Downes 2005).

This shift in thinking from a content centralised model to a dispersed networked model is certain to generate tension not only between teachers and their departments, but between teachers and students. The differences and power shifts between the two models are deep, some (Illich:1970:para.3, Seimens:2004, Downes:2004) would even suggest that we are waiting for a paradigm shift in educational ideology.

The likely shift away from centralised models to decentralised networked models will necessitate a more independent level of digital literacy among teachers and learners. Educational organisations may have to consider more substantial initial investments in broad scoped literacy programs to lift the level of digital literacy, something that could perhaps be paid for by a reduction in content creation and an increase in the use of FOSS.

3. Web 2 and worldwide networked learning.

Never before has it been easier to create and publish digital media to the Internet. Not only is it easier, but it is conceivably free, so long as a person has access to a networked device. No longer does a person need to know complex html coding, ftp, or how to manage servers etc. Thanks to a myriad of free web based services, a person can create, publish and manage his or her own content without the need to employ experts or use complex software. This revolution in online communications has triggered an explosion of content creation, much of it licensed to Creative Commons (Linksvayer: 2005) – resulting in a vast range of digital content created by popular participation online, freely available for reuse under Creative Commons Licenses, and ever evolving. This change in the nature of information, communication and knowledge has been dubbed Web 2.0 (Boyd: 2005). It signifies a fundamental change in the nature of the Internet, content ownership, and information dissemination.

The visionary Cluetrain manifesto recognised this change as early as 1999 when speaking of markets in the broadest possible sense:

> *Networked markets are beginning to self-organize faster than the companies that have traditionally served them. Thanks to the web, markets are becoming better informed, smarter, and more demanding of qualities missing from most business organizations. (Cluetrain Manifesto 1999: para. 1)*

Educational organisations in Australia (redefining themselves more and more, for better or for worse, as business organisations) are struggling to position themselves in the Web 2 era. Arguably their heavy investment in the proprietary based, content centric model, typified by the LMS, has made it extremely difficult for organisations to make the change, largely because networked learning does not require such an investment.

As Harold Jarche put it when he joined the online discussion between leading educational bloggers on the concept of 'Small Pieces Loosely Joined' (distributed networked learning), and echoing the concerns of earlier writers (Odlyzko, Wiley: 2001 & Downes: 2004):

This is still a difficult message to get past many educational institutions and training organisations. You don't have to spend a lot on the technology. You need to focus on getting the people and processes aligned so that learning happens. Save the money that you would spend on an LCMS and put it into the time to let people develop processes that work for their unique contexts. (Jarche 2005: para 4)

In Australia we have the opportunity to look to the concerns of North America, and prepare ourselves for the issues they face now, with the view that we will face similar issues when our population acquires a similar quality of online access and experience.

Many schools and teachers have not yet recognized—much less responded to—the new ways students communicate and access information over the Internet. Students report that there is a substantial disconnect between how they use the Internet for school and how they use the Internet during the school day and under teacher direction. For the most part, students' educational use of the Internet occurs outside of the school day, outside of the school building, outside the direction of their teachers (Levin Arafeh Lenhart & Rainie 2002: para 3).

Australian educational Departments and organisations, as do other sectors affected by the changes in media and communications, need to start accepting that there are considerable cultural changes taking place around them that are affecting the fundamental understandings with which they operate. Educational departments and organisations would do well to implement exit strategies from previous content centric models of online learning (Morrison:2004) and invest in digital literacy programs and sustained participatory research. The goal should be to set in motion a continuous and sustainable development cycle focused on flexible models of online teaching and learning that embrace FOSS, Web 2, and open/distributed/networked learning.

4. A proposal for participatory action research to develop digital literacy skills and awareness of new models for online learning in Australian education

The New Media Consortium (2005) outlined 5 strategic priorities for creating change to enable 21st Century literacies:

1. Develop a strategic research agenda
2. Raise awareness and visibility of the field
3. Make tools for creating and experiencing new media broadly available
4. Empower teachers with 21st century literacy skills
5. Work as a community

New Media Consortium 2005: p13) (

Action research could possibly be the most productive research and action methodology for educational departments and organisations to improve digital literacy in their communities and address the broader points outlined by the New Media Consortium. Investment in action research projects would offer incentives to communities (including students, parents and citizens) and educational organisations (including teachers, managers and administrators) to work together, on an equal footing, towards identifying and continually maintaining their collective digital literacy.

The Wikipedia is a comprehensive and participatory source of information about action research that includes this quote by Wadsworth (1998) explaining the methodology.

> *Participatory Action Research (PAR) is research which involves all relevant parties in actively examining together current action (which they experience as problematic) in order to change and improve it. They do this by critically reflecting on the historical, political, cultural, economic, geographic and other contexts which make sense of it. ... Participatory action research is not just research which we hope will be followed by action! It is action which is researched, changed and re-researched, within the research process by participants. Nor is it simply an exotic variant of consultation. Instead, it aims to be active co-research, by and for those to be helped. Nor can it be used by one group of people to get another group of people to do what is thought best for them - whether that is to implement a central policy or an organisational or service change. Instead it tries to be a genuinely democratic or non-coercive process whereby those to be helped, determine the purposes and outcomes of their own inquiry. (Wikipedia PAR, 2005: para 2, citing Wadsworth 1998:para. 33)*

At first it may appear that action research approaches differ little from current professional development opportunities offered by organisations like the Australian Flexible Learning Framework (AFLF). But there are key aspects that are different.

- The explicit aim to engage all stakeholders, especially students, in describing the problems.

- Asking those stakeholders to research the problem and propose solutions.

- Empowering those stakeholders to carry out their plans.

- Repeating the cycle, reflecting on lessons learned and publishing the research.

Remodeling programs like the AFLF's professional development, networking and research programs such as LearnScope, into broader scoped, longer termed, participatory action research projects, may yield interesting results in the area of digital literacy within Australian education. Suggested seed projects might include:

- an Australian version of Levin, Arafeh, Lenhart & Rainie's Research (2002) Digital Disconnect - The widening gap between internet savvy students and their schools.

- a look at Doug Brent's (2005) notion of Teaching as performance in the electronic classroom.

- Research into the idea of generation and digital literacy, modeled on Konrad Glogowski's (2005) Digital Pioneers.

- a look at self directed learning in Australia and the capacity for institutional recognition.

Essentially the idea of participatory action research in Australian education is not new and has been practiced in the form of Parents & Citizens Associations at most schools, student councils and business and industry relations, and in teacher development. This is a proposal to renew and continue such forms of public participation in public education on an equal and engaged footing, in a process of participatory action research.

Conclusion:

Digital media and Internet connectivity continue to offer significant opportunities for learning and so a new form of literacy is becoming increasingly important in Australian society. Educational organisations need to be able to respond to current and future literacy needs in their communities, and be in a position to both recognise and take advantage of the new opportunities for learning. As information and communications technologies continue to develop, at times changing radically, educational organisations need to be flexible and sustainable in their approach to these technologies. Flexibility and sustainability can be achieved through community wide participation in ongoing action research, enhanced by the educational organisation's support for a wider range of software and hardware – afforded by free and open source software, and through encouragement to engage with open and internationally networked communications and information exchange. Centralising information and communications on the other hand, around proprietary based, singular and closed systems, limits the organisations ability to develop widely applicable literacy, and therefore flexibility and capacity to change. Web 2 and networked learning models offer an opportunity for the educational organisation to move away from unsustainable content centric and proprietary models of online learning, and begin to develop, on a participatory action research level, more widely applicable literacies in the community.

Useful Links

The Action Learning Action Research and Process Management Association (ALARPM Inc.) regularly publishes the Action Learning and Action Research (ALAR) journal. Back issues are available online at http://www.alarpm.org.au

Australian writers on PAR include Nita Cherry, Karen Malone, Ernie Stringer, Jan Ritchie, Stephen Kemmmis, Richard McTaggart and Ortrun Zuber-Skerrit.

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Below is a range of voices that support what I communicate in this critique:

Deschooling Society

By Ivan Illich 1970:para 3

Universal education through schooling is not feasible. It would be no more feasible if it were attempted by means of alternative institutions built on the style of present schools. Neither new attitudes of teachers toward their pupils nor the proliferation of educational hardware or software (in classroom or bedroom), nor finally the attempt to expand the pedagogue's responsibility until it engulfs his pupils' lifetimes will deliver universal education. The current search for new educational funnels must be reversed into the search for their institutional inverse: educational webs which heighten the opportunity for each one to transform each moment of his living into one of learning, sharing, and caring. We hope to contribute concepts needed by those who conduct such counterfoil research on education--and also to those who seek alternatives to other established service industries.

Something to do, not something to learn: Experiential learning via online role play

By Mary Aquino 2004 p4

In response to shifts in scientific and psychological thinking coupled with the inescapable impact of technology on cognition and behaviour many contemporary researcher/practitioners are calling for a comprehensive rethinking of teaching and learning methodologies. Prensky (2001) writes largely from personal observation as a designer, trainer and futurist. His work has a distinctly promotional, unacademic tone and his thesis draws on recent and therefore limited research in psychology and neuroscience. However, the essential intuitive accuracy of his observations and the power of his digital native/digital immigrant metaphor have found a receptive audience amongst many teachers and trainers genuinely looking for ways to engage young learners.

Outta My Way Geezer!

By Tom Hoffman 2005

I am thirty six, and I AM A DIGITAL NATIVE. I know you baby boomers have a hard time coping with this concept because it is a threat to your authority, and as a result you seem to be constantly reinventing the concept so that it can't be applied to any actual adults who can compete with you professionally, but I've had it, and I'm calling bullshit.

Some of us are Digital Pioneers

By Konrad Glogowski 2005

Lawrence Lessig says that creativity and innovation always builds on the past. This is exactly what we're doing when we introduce our children to the digital world. Our role as educators, to paraphrase Lessig, is to ensure that the past, the linear, visual mode of thinking give rise to but does not limit the creativity and the energy of emerging technologies. This can happen only if we recognize that we cannot impose the old upon the new just as we cannot create the new in a vacuum. It is our job to ensure that our students acquire the skills necessary to intelligently share their views, whether it's in a wiki, an every-day conversation, or a traditional five-paragraph essay. We need to ensure, as Prensky suggests, that they learn both the legacy and future content. To do that, we need to acquire the skills of digital pioneers, we need to remix and feed forward.

First Monday Special Issue

Various First Monday writers

Research in the Free/Libre/Open Source (FLOSS) arena is inter-disciplinary and varied. At this point, we already have several years of research in this area with many important intellectual contributions (see http://opensource.mit.edu for a list of papers and active scholars). Many of those contributions have appeared in First Monday and hence, this special issue is a celebration of these contributions and their impact on academia and practice.

Total cost of ownership and open source software

Kathryne Moyle 2004

As a result of this research then, while information has been gathered that can inform future work undertaken within schools and jurisdictions, it is also apparent that there remains gaps in our knowledge about the extent of use of open source software in schools and the costs associated with its use. Irrespective of any of this however, schools and jurisdictions are choosing to place open source software into their ICT portfolios. Arising from this research then, comes the challenge of how to respond to and manage the emerging use of open source software in schools.

Sydney Linux User Group posting

By SLUG member 2002

We are a school that is into Linux and OSS at the server level and some applications (web based). The issues you have to deal with I believe are not the execs and top level, but the staff, the front-line teachers as it were. They want to use computing tools but they do not want them to get in their way, they need them to assist the education process not hinder. The vast majority of them are familiar with MS Office apps and Windows in general and see no reason to change and what they use at home they want to use at work - no double learning. Of course cost is NOT an issue the vast majority of the software is pirated [at home] and so is essentially free, a kind of Pirate Public License. So you win no friends by even suggesting that there may be another way, they already know that, but don't care.

Use of Linux in Schools in the Northern Territory

By Open Source Industry Australia 2004

The decision to use Linux and OSS saved the Northern Territory Department of Employment, Education and Training $1M in the first year and allowed it to put 1000 more workstations into schools.

Open source software and Australian school education

By Kathryn Moyle 2003

The direct quantitative costs of open source are lower than that of proprietary software. There is debate however, about the qualitative comparative aspects of the indirect costs of open source software when applied within a school environment. No Australian school education research exists that addresses the indirect costs of open source software as they apply to a school environment. In order to gain some common points from which to conduct discussions, research work on this matter would be make a useful contribution to the debate.

What Business can learn from open source

Paul Graham 2005: para 1

Lately companies have been paying more attention to open source. Ten years ago there seemed a real danger Microsoft would extend its monopoly to servers. It seems safe to say now that open source has prevented that. A recent survey found 52% of companies are replacing Windows servers with Linux servers. [1]
More significant, I think, is which 52% they are. At this point, anyone proposing to run Windows on servers should be prepared to explain what they know about servers that Google, Yahoo, and Amazon don't.
But the biggest thing business has to learn from open source is not about Linux or Firefox, but about the forces that produced them. Ultimately these will affect a lot more than what software you use.

Open Source Software in Schools - A study of the spectrum of use and related ICT infrastructure costs

By BECTA 2005 p3

Proportionally, support costs accounted for about 60% of the total annual cost per PC in both OSS and non-OSS schools. Annual support costs in individual OSS schools varied widely, but on average were 50–60% of those of their non-OSS counterparts, except OSS secondary schools which had slightly higher costs for informal support.
The varying support costs between OSS schools are closely related to the purpose and type of OSS implementation chosen by a school and the purposes for which OSS is being used. The most cost-effective support level and the kind of support required will vary accordingly.

Expenditure on training across all four sets of schools was low. This could partly explain the high support costs; perhaps more or better training could reduce the need for this.

Teachers in the OSS schools view their own skills and confidence in using ICT much more positively than the teachers in the non-OSS schools do, and lower levels of training could therefore be expected.

14-2-05.pdf |Free and Open Source Software for Development - Myth or Reality? Case study of a University in Uganda

By Victor van Reijswoud and Emmanuel Mulo 2004 p9

For the incoming students a compulsory introductory FOSS computer literacy course was introduced based on a manual (available from www.eacoss.org and the university intranet) developed by the university. This greatly reduced the resistance.

Emerging Technologies - A framework for thinking

By ACT DET 2005

Positioning the ACT DET to take advantage of emerging technologies will require acknowledgement of the need for cultural change and processes to support and manage it. Students today are 'native speakers' of the digital language of computers, video games and the Internet. Many devices described in this report are banned by schools. A shift in culture is crucial to ensure that students' uses of these devices are embraced as educational opportunities and that they become tools of the trade, rather than be considered contraband.

Many students are entering their school or college with multiple literacies that go beyond text, and this trend will strengthen over the coming years. Educators will need to acknowledge and recognise these new literacies, and build upon and extend them.

The success of such an approach will require that teachers/tutors have access to professional development opportunities to develop confidence in the use of educational technology, as well as informal support environments of peers.

Conversational writing kicks formal writing's ass

By Kathy Sierra

If you want people to learn and remember what you write, say it conversationally. This isn't just for short informal blog entries and articles, either. We're talking books. Assuming they're meant for learning, and not reference, books written in a conversational style are more likely to be retained and recalled than a book on the same topics written in a more formal tone. Most of us know this intuitively, but there are some studies to prove it.

Early film, early Internet, early days

By Leigh Blackall

Costly and unsustainable content development comes from the focus on computers and programs in education throughout the 80's and 90's and a lack of focus on the connectivity and collective learning offered by modem mediated communications. It seems to me that the content creation is very much tied to the process of learning, and that the connectivity offered by the Internet challenges everything about our traditional teacher / student / course / content methods. The content is created by learners as they learn, such as this blog post, what I'm typing and the links I am pointing to.

Open Technology Roadmap

By Jamais Cascio

Openness is at the heart of truly worldchanging systems. Transparency of process, connections and results make open systems more reliable, more accessible, and better able to be connected to other systems; it also encourages collaboration and the input of interested stakeholders. This is perhaps most tangible in the world of technology, particularly information and communication technology (ICT); open ICT systems are increasingly engines of innovation, and are clear catalysts for leapfrogging across the developing world, via reduced costs, potential for customization, and likely interoperability with both legacy and emerging technologies.

Harold Jarche's notes on Roadmap for Open ICT EcoSystems

By Harold Jarche

Summarising A Roadmap for ICT EcoSystems

The Problem = 'In the race to identify victims and assist survivors, Thailand's government hits its own wall. Responding agencies and non-governmental groups are unable to share information vital to the rescue effort. Each uses different data and document formats. Relief is slowed; coordination is complicated. The need for common, open standards for disaster management was never more stark or compelling. The Royal Government of Thailand responded by creating a common website for registering missing persons and making open file formats in particular an immediate national priority.'

The Solution = Open Standards

From Andragogy to Heutagogy

By Stewart Hase and Chris Kenyon

Our educational systems have traditionally been based on Lockean assumptions ... In this paradigm learning has to be organised by others who make the appropriate associations and generalisations on behalf of the learner. Thus, random individual experiences are taken to be totally inadequate as sources of knowledge, the educational process needs disciplined students, and literacy is seen to precede knowledge acquisition. Success is based on attending to narrow stimuli presented by a teacher, an ability to remember that which is not understood, and repeated rehearsal (Emery, 1974, p.2).

An alternate view is proposed by Heider and assumes that people can make sense of the world and generalise from their particular perceptions, can conceptualise, and can perceive invariance (Emery, 1974). Thus, people have the potential to learn continuously and in real time by interacting with their environment, they learn through their lifespan, can be lead to ideas rather than be force fed the wisdom of others, and thereby they enhance their creativity, and re-learn how to learn.

A Global Imperative: Report of the 21st Century Literacy A Global Imperative

By The New Media Consortium 2004

21st century literacy is the set of abilities and skills where aural, visual and digital literacy overlap. These include the ability to understand the power of images and sounds, to recognize and use that power, to manipulate and transform digital media, to distribute them pervasively, and to easily adapt them to new forms. (p2)

The strategic priorities for creating change (p13):

1. Develop a Strategic Research Agenda
2. Raise Awareness & Visibility of the Field
3. Make Tools for Creating & Experiencing New Media Broadly Available
4. Empower Teachers with 21st Century Literacy Skills
5. Work as a Community

Why Web2.0 Matters: Preparing for Glocalization

By Danah Boyd

Glocalized structures and networks are the backbone of Web2.0. Rather than conceptualizing the world in geographical terms, it is now necessary to use a networked model, to understand the interrelations between people and culture, to think about localizing in terms of social structures

not in terms of location. This is bloody tricky because the networks do not have clear boundaries or clusters; the complexity of society just went up an order of magnitude.

Small (Learning) Pieces Loosely Joined

By Harold Jarche

This is still a difficult message to get past many educational institutions and training organisations. You don't have to spend a lot on the technology. You need to focus on getting the people and processes aligned so that learning happens. Save the money that you would spend on an LCMS and put it into the time to let people develop processes that work for their unique contexts.

Literacy

By the Wikipedia community

For the contemporary world literacy now comes to mean more than just the ability to read, write and be numerate. It involves, at all levels, the ability to use and communicate in a diverse range of technologies. Since the computer became mainstream in the early 1990s, its importance and centrality in communication has become unassailable.

We should now, properly, speak of "literacies". These literacies always involve technology and the ability to use technology to negotiate the myriad of discourses that face us in the modern world. These literacies concern using information skillfully and appropriately, and are multi-faceted and involve a range of technologies and media.

In sum, today's students need to cope with a complex mix of visual, oral, and interactive media as well as traditional text. People of lesser education or older people may see themselves falling behind as the informational gap between them and the people literate in the new media and technologies widens.

Literacy in the Information Age: Final Report of the International Adult Literacy Survey

By OECD

Low literacy skills are evident among all adult groups in significant - albeit varying - proportions. Literacy proficiency varies considerably according to home background factors and educational attainment in most of the countries surveyed. However, the relationship between literacy skills and educational attainment is complex. Many adults have managed to attain high levels of literacy proficiency despite a low level of education; conversely, some have low literacy skills despite a high level of education. These differences matter both economically and socially: literacy affects, inter alia, labour quality and flexibility, employment, training opportunities, income from work and wider participation in civic society. Improving the literacy skills of the population remains a large challenge for policy makers. The results suggest that high-quality foundation learning in schools is important but insufficient as a sole means to that end. Policies directed at the workplace and family settings are also needed. The employers' role in promoting and rewarding literacy skills is particularly important for skills development.

Australian Bureau of Statistics - Aspects of Literacy: Assessed Literacy Skills

By ABS

The SAL did not define literacy in terms of a basic threshold, above which someone is 'literate' and below which someone is 'illiterate'. Rather it defined literacy as a continuum for each of the three types of literacy (consistent with international practice, these are also referred to as the prose, document and quantitative scales) denoting how well people used material printed in English. Progression along this continuum was characterised by increased ability to 'process' information (for example to locate, integrate, match and generate information) and to draw correct inferences based on the information being used.

Statistics based on level 1 - 5 where 1 is a low level in the literacy continuum:
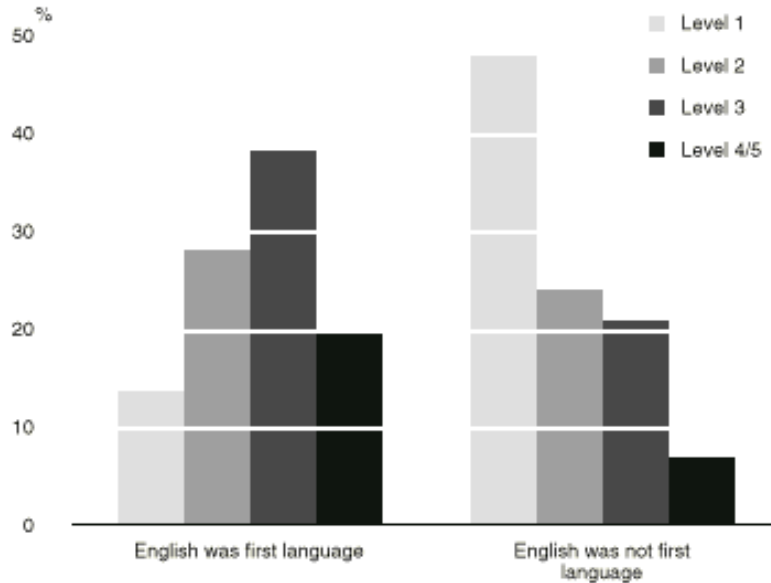
[Australian Bureau of Statistics - Internet Activity, Australia 2005](#)

By ABS

At the end of March 2005, total Internet subscribers in Australia numbered 5.98 million. While this was an increase of 239,000 (4%) from the end of September 2004, growth had slowed following a 10% increase recorded for the six months to the end of September 2004.

[Breaking the LMS wall](#)

By Michael Hotrum

> "All in all it was just a brick in the wall. All in all it was all just bricks in the wall."
> (Pink Floyd, November 30, 1979)

The Internet is independent of device (hardware or platform), distance, and time, and is well-suited for open, flexible, and distributed learning. Yet traditional online, distributed learning methods are anything but flexible, open, or dynamic. What went wrong? Parkin (2004a, b) believes that we failed to appreciate that the Internet is a vehicle for connecting people with each other. We implemented LMS methods that imposed bureaucratic control, diminished learner empowerment, and delivered static information. "In a world hurtling toward distributed internetworking, e-learning was still based on a library-like central-repository concept." Parkin suggests it is time to explore the true promise of e-learning, and to rework our ideas about how learning should be designed, delivered, and received. It is time to stop letting the LMS vendors tell us how to design learning. It is time to stop the tail from wagging the dog.

[The Cluetrain Manifesto](#)

By Chris Locke, Don Searls and David Weinbergner

Corporate firewalls have kept smart employees in and smart markets out. It's going to cause real pain to tear those walls down. But the result will be a new kind of conversation. And it will be the most exciting conversation business has ever engaged in.

Networked markets are beginning to self-organize faster than the companies that have traditionally served them. Thanks to the web, markets are becoming better informed, smarter, and more demanding of qualities missing from most business organizations.

Teaching as performance in the electronic classroom

By Doug Brent

One of the most useful concepts for understanding modern life is "residual orality." Ong pointed out that before the printing press stablized the effects of literacy, many aspects of society remained oral. Manuscripts were often read aloud, even by people reading them in private. Oral debates were a major way of producing knowledge. Witnesses were more important than documents. Now the printing press has made residual orality a much smaller part of everyday life. However, in many areas of life, oral performance has been remarkably resistant to being "textualized": that is, taken over by written or electronic texts. Teaching is one of these areas.

...I want only to use this phenomenal persistence of the performative, after 500 years of technologies that could in principle have replaced it with textualization, as a reason to reflect carefully on what now seems to be happening to notions of intellectual property as online technologies promise increasing textualization of teaching.

Connectivism: A learning theory for the digital age

By George Siemens

Connectivism is the integration of principles explored by chaos, network, and complexity and self-organization theories. Learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing.

Connectivism is driven by the understanding that decisions are based on rapidly altering foundations. New information is continually being acquired. The ability to draw distinctions between important and unimportant information is vital. The ability to recognize when new information alters the landscape based on decisions made yesterday is also critical.

Most scientific papers are probably wrong

By Kurt Kleiner for New Scientist

Most published scientific research papers are wrong, according to a new analysis. Assuming that the new paper is itself correct, problems with experimental and statistical methods mean that there is less than a 50% chance that the results of any randomly chosen scientific paper are true.

Comment by George Siemens: What I find interesting is not that the papers themselves are wrong, but that there are very limited opportunities for readers to correct and discuss the paper in its original context. Any format that is "set in stone" isn't going to work today. Blogs are particularly effective at enabling the inclusion of contrary viewpoints. Journals are still one-way, broadcast tools. Perhaps journal publishers should reflect on what's happening to TV, newspapers, and music. Two-way knowledge flow is critical.

New publishing paradigms and the 'free for education' license

By Phillip Crisp

Briefly examining the historical evolution of publishing models from relatively proprietary to the new paradigm described as 'open source / open content'

Explaining those fundamental structures and concepts underlying AEShareNet which are helpful in understanding the AEShareNet-FfE licence protocol.

Free/Open source software in education

By Tan Wooi Tong

FOSS [Free and Open Source Software] can lower the barriers to the access of ICTs by reducing the cost of software. The initial acquisition cost of FOSS is negligible. Indeed, it is usually possible to download FOSS without any cost. If there is limited bandwidth, it may be more convenient to get the software in a CD-ROM for a nominal fee. But there is no licensing fee for each user or computer and it can be freely distributed once a copy is downloaded or made available on a CD-ROM. Hence, the initial cost of acquiring FOSS is much lower than the cost of acquiring proprietary software for which license fees have to be paid for each user or computer. Upgrades of FOSS can usually be obtained in a similar way, making the upgrade costs negligible as well. In contrast, proprietary software upgrades normally have to be paid for even though the upgrade costs may be lower than the initial cost.

Using free and open source software to create free and open courseware

By Leigh Blackall

The freedom to acquire and use a range of free and open source software whenever and wherever I need them gives me a great deal of flexibility and increased professional capacity. In particular, I can work nomadically, which is to say, like our students, on many different computers, at home or at work, not restricted to one single computer and operating system, and not limited to the version of software being used.

The Buntine Oration: Learning Networks

By Stephen Downes - delivered to the Australian College of Educators and the Australian Council of Educational Leaders conference in Perth, Australia.

While I was thinking of what the educational system could become, the network of publishers and software developers and educational institutions that developed around the concept of learning objects had a very different idea.

Here's what it would be. Learning resources would be authored by instructors or (more likely) publishing companies, organized using sequencing or learning design, assigned digital rights and licenses, packaged, compressed, encrypted and stored in an institutional repository. They would be searched for, located, and retrieved through something called a federated search system, retrieved, and stored locally in something called a learning content management system. When needed, they would then be unpacked and displayed to the student, a student who, using a learning management system, would follow the directions set out by the learning designer, work his or her way through the material, maybe do a quiz, maybe participate in a course-based online discussion.

That's the picture. That's the brave new world of online learning. And honestly, it seems to me that at every point where they could have got it wrong, they did.

The Reusability Paradox

By The Reusability, Collaboration, and Learning Troupe at Utah State University, 2001.

The method learning object proponents have evangelized as facilitating reusability of instructional resources may in fact make them more expensive to use than traditional resources. We have demonstrated that the automated combination of certain types of learning objects can in fact be automated. However, it would appear that the least desirable relationship possible exists between the potential for learning object reuse and the ease with which that reuse can be automated: the

more reusable a learning object is, the harder its use is to automate. Identically, the less reusable a learning object is, the easier its use is to automate. This discovery is depressing, indeed.

Content is not king

By Andrew Odlyzko

"What would the Internet be without "content?" It would be a valueless collection of silent machines with gray screens. It would be the electronic equivalent of a marine desert - lovely elements, nice colors, no life. It would be nothing". [Bronfman]

The author of this claim is facing the possible collapse of his business model. Therefore it is natural for him to believe this claim, and to demand (in the rest of the speech [Bronfman]) that the Internet be designed to allow content producers to continue their current mode of operation. However, while one can admire the poetic language of this claim, all the evidence of this paper shows the claim itself is wrong. Content has never been king, it is not king now, and is unlikely to ever be king. The Internet has done quite well without content, and can continue to flourish without it. Content will have a place on the Internet, possibly a substantial place. However, its place will likely be subordinate to that of business and personal communication.

The Digital Disconnect: The widening gap between Internet-savvy students and their schools

By Doug Levin, Sousan Arafeh, Amanda Lenhart, Lee Rainie

Many schools and teachers have not yet recognized—much less responded to—the new ways students communicate and access information over the Internet. Students report that there is a substantial disconnect between how they use the Internet for school and how they use the Internet during the school day and under teacher direction. For the most part, students' educational use of the Internet occurs outside of the school day, outside of the school building, outside the direction of their teachers.

Noticeable how I have not come across research like this in Australia. Where are the interviews of Australian net savvy high school students?

About the Author

Leigh Blackall has a Bachelor of Arts and Diploma of Education from the University of Newcastle. His core interest is in education and networked learning. He teaches and consults for TAFE, maintains the Teach and Learn Online Web Log, facilitates the Teach and Learn Online eGroup, and designs and develops digital multi media educational resources.

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Editor's Note: Educational materials facilitate learning by providing content, structure, activities, and the opportunity for exploration, discovery, and interaction. For the trainer they convey knowledge, skills, and attitudes to the learner. For educators and scholars they stimulate thought to construct and scaffold higher levels of learning. Educational materials can be tested and revised for continuous quality improvement. They persist through time and across space to serve increasing numbers of new learners. Excellent materials are available on the Internet, but there are advantages to making your own….

Making Your Own Educational Materials for the Web

Bruce L. Mann

Introduction

Well-prepared educational materials can remove the need to "wing it" in the classroom, by keeping your students occupied and helping them learn. Whether you are new to teaching or have been at it a while, you will know of the huge repository of educational material on the Internet that may meet this need. But however tempting it may be to borrow from the Web, downloading educational materials may be found to be an infringement of copyright, a violation of the moral rights of the author, and even plagiarism if you are representing their work as your own.

Although special exceptions of intellectual property infringement have been made for educational institutions, these exceptions do not as yet cover Internet programs or educational materials. Although most of us already know about copyright infringement, what isn't so well known is that the Copyright Act also has a provision for moral rights, to enhance and protect the reputation of authors. The moral rights of the author of the web material or Internet program lasts as long as the copyrighted work itself and can only be vested in the author, regardless of who owns the copyright (Durette, 2000). Furthermore:

- The author's work cannot be distorted or mutilated so as to harm the reputation or honour of its author;

- The author's work should not be used in association with any product, service, cause or institution where such association would have a negative effect on the author's reputation;

- Even where copyright has been contracted away from them, the author has the right to be associated with a work by name or by pseudonym, or alternatively, the right to remain anonymous, at the author's option.

Add to this the fact that your academic institution takes a dim view of plagiarism, such as representing someone else's work as your own, including any part of their website. Without exception, you should never represent someone else's work as your own. Some professors today have access to software that can assess the likelihood of plagiarism off the web and reserve the right to use this software in their evaluation of student assignments. Under these conditions therefore, at least provide a proper and full citation about your sources, complete with the full URL to the web page, web text, graphic, audio or video clip.

Making Your Own Educational Materials

The better alternative to borrowing educational materials from the Internet that may be well be violating copyright law, the moral rights of the author, and rules of the university, would be to make your own materials. It'll be good for you and good for them - good for you because it'll be a testament to your hard work and determination to support your students' efforts, even at home.

It'll be good for your students as a constant resource for them to learn from at home. Besides you know your students better that any Internet site. Only you can provide your students with real help and guidance. Don't rely on the Internet to do your job for you. Most educational websites are either too advanced or too game-like anyway for your students and as such won't serve them well enough to meet your standards.

> *Building Web pages is among the most constructivist activities that learners can be engaged in, primarily because of the ownership that students feel about their products and the publishing effect (Jonassen, Peck & Wilson, 1999, p. 28).*

So let's get started. Let's assume that you'll want your materials to be available to your students on the web - an educational website, just for your students. So you'll first need to be able to distinguish an educational website from an informational one, and identify some of the key features of an educational website. And second, you'll need to know something about how to write a few codes in Notepad, display the web files in Internet Explorer, and manage them in Windows Explorer.

The Wrong Way: "Tell 'Em and Test 'Em

You should be able to distinguish an educational website from an informational website masquerading as an educational website. The impostor is easy to spot – mainly because they are technocentric, using a "tell 'em and test 'em" approach as they skip from one topic to the next without depth, opportunities to practice or meaningful feedback on that practice. Informational websites might have good design but aren't designed 'too good'. We have found that the use of a paper mock-up as a pre-computer activity can promote more instructionally relevant, less technocentric educational website (Brown & Mann, 2001).

The Right Way - DECL: Considering All the Factors

Educational websites, unlike their informational counterparts, are comprised of at least four factors that under certain conditions will affect student learning, Delivery, environment, content and learner, or DECL. Before you begin – think about *where* you will you be teaching – in a French immersion school, a military training college, a private school, a public school. DECL can help you identify all or at least the major factors we know affect to affect student learning. "DECL" was adapted for distributed learning environments (Mann, 2005a, 1995a, 1997a) from Richey's conceptual model of instructional design (Richey, 1986).

Table 1.

DECL factors of educational website management and associated variables.

Delivery	Environment	Content	Learner
Scope	Setting	Mental Operations Required	Attitude
Presentation	Climate	Task	Capacity
Strategy		Domain	Demographics
Sequencing			Competence

DECL stands for delivery, environment, content and learner factors that comprise student achievement. The "delivery factor" or "D" in DECL can be furthered sub-divided into the scope, sequence, strategies, and the presentation of the educational website. Two variables comprise the "environment factor". Three variables comprise the "content factor", and four more variables the

learner factor. Student achievement is the weighted sum of the delivery, environment, content and learner factors (DECL). For an explanation of the variables under each factor in DECL see Mann (2005a). The importance of each factor in DECL can be weighted under certain conditions. The size of the circles in figure 1 indicates their emphasis and subsequent impact on student achievement.

Figure 1. Graphical comparison of educational materials development by emphasis

The "Learner" emphasis (left) the "Environment" emphasis, and the "Balanced" emphasis right. In Mann, B. (2005a). Research styles and the Internet. In Bruce L. Mann (Ed.). Selected styles in web-based educational research. (pp. 1-11) Hershey, PA: Idea Group Publishing.

Notably the varying weights added to DECL can also be represented mathematically. The small "b" in subscript in the formula indicates the weighting that can be attributed to any of the DECL factors.

$$D_b + E_b + C_b + L_b = \text{Achievement} + \text{some error}$$

Generating Some Ideas

Now that you able to distinguish an educational website from an informational one, and have considered the DECL, your first step in developing educational material is to generate some ideas. A bonafide resource of ideas would be the Curriculum Guide within the jurisdiction in which you wish to teach. Consult the curriculum guide for the grade level you want to teach. Curriculum documents are written by experienced teachers and researchers with excellent ideas from which to develop an educational website. If for example you are intending to teach in a province in Canada, you can find information about education in each of the provinces and territories of Canada from Education@Canada. Education@Canada is an information resource sponsored by the Council of Ministers of Education in Canada (CMEC), as there is no federal or national department of education in Canada.

If you are intending to teach in United States, Education America has quickly grown to become the United States' largest educational e-recruitment service with over 900 employers posting thousands of jobs. In the US, there is the "No Child Left Behind Act" which education leaders at state and local have developed to effectively employ technology to enhance learning and increase student achievement. There are many American educational policy websites that may provide some good ideas for your educational website.

If you are headed to Australia, the Australian Council for Computers in Education consists of representatives from the state-based Computer Education Groups. It publishes the journal Australian Educational Computing and authorises the Australian Computing in Education Conferences - a good source of information for your educational website. See (Mann 2005b) for more information on educational technology policy in the United States, Australia, Canada and the European Union.

Developing a Paper Mock-Up

Once you have a short list of good ideas for an educational website, your next step in the process is to make a paper mock-up. Developing a paper mock-up means making a hand-drawn replica on paper with coloured pencils. The layout should be uncluttered and appropriate to the student's abilities and reading level. Your foreground font colours and shading should have plenty of contrast against the background. Bright red and bright yellow backgrounds can make reading for average readers very tiring over extended periods of time. Please note however, that very bright background colours can be perfectly appropriate for in special needs situations.

Title. Make your title important, catchy and curriculum related. Add a missing or curious photo or graphic. Don't be redundant with your title, such as a title "Whales" and showing a photo of a whale. And don't give the answer away. Below the photo, add a statement of the curricular rationale. Say something about the school climate (K-1, grade 2-3, 4-6, 7-8, 9-10). Below that, write one or more stated objectives, goals, missions or challenges - *behavioural component* in "A-B-C-D" form (discussed below). Colour coding can help separate examples from instruction, and instruction from program directions. It is most important that your font colour is designed by instructional event, the colour of the text on the webpage matches the instructional event. The colours don't matter *per se*, but once chosen, they must always be consistent across the entire educational website, to prevent distracting effect in student learning. Here for example, is a colour design rubric for an educational website:

INFORMATIONAL TEXT will always be presented in a blue font colour, usually under the photo or graphic(s) and above the scroll line. Informational text presents a brief, informal rationale about the

NAVIGATIONAL TEXT will always be presented in a black font colour.

INSTRUCTIONAL TEXT will always be presented in dark green font colour, usually under the brief informational statement as "Learning Objectives, "Missions" or "Challenges". Instructional text presents the behavioural components to the educational website, that is the audience (the learner characteristics), behaviour (add your verb "distinguish", "describe", "demonstrate", or "summarize in your own words"), conditions (how - using the art paper? the protractor? the atlas? in front of people?), degree (when? what criteria?).

QUESTIONING (i.e., procedural facilitation) will always be presented in dark brown font colour.

PARTIAL FEEDBACK will always be presented in a pink font colour.

HINTS will always be presented in olive green font colour. Hinting is presented before requesting responses from students, whereas partial answers require a statement from them followed by feedback.

Other considerations are that the figure/ground contrast is evident, all graphics are clear and representative, all multimedia are related to the topic, and that there are several links, for further study.

Similarly, the right way to apply audio to an educational website is to think of sound as having a purpose or function - to compliment formatted text, graphic or moving image and assist students in shifting their attention between the auditory and visual channels. When the primary intent of audio is to orient learners about a future event or give feedback about a past event between web pages, temporal speech prompts should be considered. Alternatively, point-of-view (POV) sound should be used to provide opposite sides of an issue, or as a function of character in objective, subjective points of view. There are a few of the sound design possibilities with the SSF Design Model (Mann, 1992, 1995b, 1997b). Research with the SSF Model (Mann, Newhouse, Pagram, Campbell & Schulz, 2002) suggests that we can expect good immediate results in student retention, and even better results following a latency period.

Domains of Learning. In developing your own educational materials it is helpful to keep separate the different domains of learning – behaviour, from cognitive, from affect, from social. Also within the cognitive domain, its good to keep separate declarative from procedural knowledge, and both of these from strategic knowledge. This makes it easier to articulate what you want your students to do with your educational materials.

Educational Objectives. Now that you know to keep separate the different domains of learning, as well as the types of knowledge in the cognitive domain, it's time to introduce "educational objectives". The field of Education has long been known for setting objectives. There are two basic types of educational objectives that we use all the time – behavioural and cognitive. Some educators say "learning objectives" to indicate intended performance or cognitive processes in their students. Others prefer to use the less rigid term "learning outcomes" to denote the consequence of instruction and practice. I'll continue to use "learning objective". You can use whichever term is most comfortable to you.

In any case, a learning objective can be defined as a statement written in "ABCD " format; that is to say, the audience (A), behaviour (B), condition (C) and degree (D). though they won't appear in this order in your statements. To maintain consistency between Gagné's conditions of learning (Gagné, Briggs, & Wager, 1992), constructivist learning as well as learner-centred theories (see Richey, 2000), let's attempt to write a broad, fairly high level educational objective (i.e., cognitive strategy) for developing educational materials on the web -

> After reading this article on developing your educational website (the condition), the teacher (the audience) will be able to develop an educational website (the behaviour) to support his/her students, by completing a paper mock-up showing learning objectives in ABCD format (the degree).

Similarly, your web-based educational material should contain a few *intellectual skill* objectives and should appear near the top of the first webpage on your educational website. The verbs for intellectual skills objectives are straightforward. First, the student is asked to distinguish between one thing and another, say bears and other creatures. They may be asked to do this by constructing a table with columns and listing the differences within each of the columns. This "distinguishing" activity is called discrimination learning and is a low-level activity. Now that the student has distinguished bears from other creatures, they are asked to identify the characteristics within the class of different bears, brown bears, grizzly bears and so on.

Try this now with one of your own ideas adapted from your local curriculum guide. On the first web page jot down a few objectives, with a verb:

- To distinguish between things natural or imagined: Procedural knowledge, discrimination learning, an intellectual skill.

- To describe the identifying characteristics of a concept: Procedural knowledge, concept-learning, an intellectual skill.

- To demonstrate a procedure step-by-step: Procedural knowledge, rule using, an intellectual skill.

- To generate a new procedure for problem solving: Procedural knowledge, higher-order rule using, an intellectual skill approach to problem solving.

- To summarize in their own words, recite exactly, or recall a fact: Declarative knowledge, verbal information learning.

- To devise a plan, predict an outcome, or figure-out a new way: Strategic or generic procedural knowledge, a cognitive strategy approach to problem solving.

Remember to include the "A-B-C-D" format for each learning objective you have written, that is -

- *Audience* (the learner characteristics),

- *Behaviour* (add your verb "distinguish", "describe", "demonstrate", or "summarize in your own words"),

- *Conditions* (how - using the art paper? the protractor? the atlas? in front of people?),

- *Degree* (when? what criteria?).

Finally add some associated links to websites. Below the links, add a "hint" if you want the student to construct something original on video or in PowerPoint, make a link to a page that tells them how to do that. Below that, add your email address with the note "If you have any questions, please email me at...". At the top of page 2 is your partial answer to the first objective, goal, mission or challenge stated on page 1. For example, if there are five things they must know, or five parts of a procedure to demonstrate, tell them two. And ask them for more.

Conclusion

In summation, this paper has suggested how you can you *can* make your own educational website, do it well, and as a consequence, avoid infringing copyright law, the moral rights of the author, and rules of the university. The recommended procedure has been to use a syntax-independent approach to educational website design, wherein you draw on paper before typing into a text editor, thereby keeping design and the coding decisions separate. The inclusion of paper mock-up as a pre-computer activity may improve teachers' educational websites, as it has done in previous educational research (Brown & Mann, 2001). Regarding the organization of your educational website, aim for a clear focus. Don't skip from one topic to the next. Provide lots of student guidance on one topic between webpages (i.e., multiple choice or constructed answers, full or partial answers, error-contingent or fault-free questions, elaborative interrogation). Learner factors (from DECL) should be students' attitudes toward the subject or topic, demographics (do all have computer access - if not it may have to be printed), their capacity to learn this content, and their competence with the language. Your language should be conversational and easy for students to engage in the tasks. Keep the sentences and paragraphs concise. Check your grammar, punctuation, and spelling. The next step involves the transformation of your paper mock-up into an off-line educational website by developing the HTML documents from your paper frames and displaying them in your Internet browser and then uploading web files to the schools or university server, which is beyond the scope of this paper.

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