A dinosaur’s reflection of 25 years of educational computing - past, present, future
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With ever changing technologies and environments beset by curriculum and political imperatives, how often in educational computing do we take stock of what has actually changed, what hasn’t but needs to for hopes to be realized, and what is not being addressed and why? This reflection of 25 years of involvement, hopes, dreams and experiences will hopefully help shed some light on scenarios for educational computing. T S Elliot summed it up well: ‘Between the idea / And the reality / Between the motion / And the act / Falls the Shadow’.

Introduction

Moore’s Law tells us that computer processing speeds have been doubling every eighteen months or so since the mid-1960s. It explains the rapid changes in hardware that have underpinned the digital revolution. In the light of the new digital age in which we all live, work and communicate, some have called for a re-evaluation of teaching and learning values within education and schools. Prevailing values tell us much about what we are willing to accept as educational objectives and structures. As someone who has been a small part of educational computing since the mid-1980s, and in the spirit of learning through sharing experiences, I recap some of the lessons I have learnt as a teacher of and with digital technologies. Finally I present a snapshot of some beliefs that have emanated from these experiences.

Lessons through the glass darkly

Historical perspectives that have shaped education and schools from earliest days remain strong influences. I started teaching in 1985, a halfway mark to my starting school as a student in 1961. 1961, a time of ink-nib pens, Cuisenaire rods, imperial weights and writing craftsmanship. Yet structurally little affected since with subject demarcations, bell-timed lessons and teachers judged as experts. In the prevailing years technological change has engulfed us. My school education included neither calculators (they replaced slide rules the year after I left in 1973) nor personal computers (I graduated from university in 1978, coinciding with the birth of the Apple II). Even 1985 came after the first wave of PCs in schools and the significant educational computer thinking that made 1984 a watershed year. I am therefore in no-way a “digital native”.

Which brings me to lesson one: a teacher needs to value being a lifelong learner. The more you seek to understand, the more learning there is still to be done. I was told on day one of my teaching career, which started as a Mathematics teacher, that after five or so years I would be able to plan and see my lesson as I walked to the classroom. This reflected the steadfastness of expectations and curriculum. I was also teaching a subject called Computer Studies to Years 7 to 10 boys. Treated as an add-on to allow the school’s Apple Ile computer room to be seen as used. But we managed a bit of word processing, spreadsheeting, and database work (all with Appleworks). Some multimedia animation with a package called Fantavision. Some programming with Logo. I noticed that when I was teaching Mathematics students would automatically start packing up two minutes before the bell. Yet in the Computer Studies class the same students were likely to keep working through the bell, even into break times. I knew then there was something in computers that can be used to enhance learning engagement. What Csikszentmihalyi termed ‘flow’ or what some call ‘in the zone’. In many ways it is this search for educational value within changing technologies that has driven what I try to do. (I appreciate the technology-related changes that have affected school Mathematics in the interim, but remain concerned at the traditional pull exerted on the subject and the tendency of many teachers to serve unquestioningly traditional structures and a constraining curriculum.)

I was also at that time completing a graduate diploma. I found that with access to a computer my grades improved markedly. In part because I found I was a reflective learner who needed to redraft extensively. (Have you ever tried this with a typewriter?) I also found teaching with computers, with tasks for students to take learning ownership, generate ideas, and work as peer learners much more rewarding than textbook, segmented, common test dominated Mathematics. Hence lesson two: computers suited my pedagogy and the way I learnt. There are many pedagogies applied by teachers and there is much we can learn from differing perspectives. A limitation is generated when one view puts down another, or a narrow view dictates to the detriment of others. This is one of the potential shortcomings in classrooms with a single teacher when set requirements fail to take into account the diversity of individuals. The best education comes from connecting people to a common purpose. A necessary first step is to be clear on what pedagogy you favour, where technology fits into this, and how you can go about becoming a better educator in both areas.
When my interest in computer education took over I could not get enough books to read. This reflects the connection that finding one’s passion in life has on personal education. In educational computing there are many significant books, which leads me to **lesson three: a digital educator should read widely in the traditional sense**. In my case the ten most influential books have been:

   The bible for computer-constructivist (later renamed constructionist) thinking. A philosophical thesis based on a decade of working with the Logo programming language as a medium for student learning, building on his prior experiences with Jean Piaget.

   An overview of competing theories on using computers to educate. Exploring Papert’s constructivism as ‘tutee’, the computer programmed to ‘tutor’ as expert (with links to the behaviouralism philosophies of B F Skinner), and subject use of computers as a ‘tool’ for particular functions. In many ways the debate of relative value continues to this day.

   Trolling through old bookshops can lead to books like this one that help explain how the essence of teaching, in many respects, has changed little since Ancient Greece. Not least in the lack of respect generally accorded to teachers and teaching down the ages. But also on how teachers can empower their students.

   An American research initiative that put together a comprehensive report on how people learn and how we can teach more effectively for modern times. Teacher learning, technology supported learning and effective subject teaching were just some of the areas examined. An eBook is available through http://www.nap.edu/.

   Senge applied his system management ideas to examine school systems.

   Fullan is a leading writer on educational change management.

   A former principal shows that wonderful schools are possible if school leaders, teachers, students, and parents work together openly and positively. An inspiring book.

   Stanford University’s Cuban has tracked the inadequacies of school use of computers.

   Supports ‘right-brain’ qualities – inventiveness, empathy, and meaning – to show how education could do more to support professional success and personal fulfilment.

    Neuroscience is shedding light on much that teachers have noticed on how student brains are changing under digital influences: from attention spans, multitasking, information processing, online communities, visual literacies to addictions.

I could have included others, but limited myself to ten. So apologies to Charles Handy, Alvin Toffler, Neil Postman, Daniel Goleman, John Dewey, Howard Gardner, George Siemens and others. I have also not included insights provided through the web such as the 2008 McKinsley report, Metiri or Cisco educational computing contributions, or the BECTA or FutureLab research.

Currently I am exploring cultural implications through *Cultures and Organizations: Software of the Mind. 2nd Ed* (Geert Hofstede and Gert Jan Hofstede 2005) and *Spirit Level: why more equal societies almost always do better* (Tim Wilkinson and Kate Pickett 2009). As well I am re-reading *Conslations of Philosophy* (Alain De Botton 2000) for his pointers on the influence Socrates had on not only our thinking but also how we can go about our lives as educators. What I have learnt is that formal education from time immemorial is about competing worldviews, willingness to seek better lives through understanding, and learning to live fruitful lives in an imperfect world.

What is of some concern is that pioneer, activist writing in educational computing and education seems to have been in decline since 2001. One has only to look at the demise of education as a bookshop classification and the lack of digital considerations in philosophy of education publications. Have we lost the energy, passion, activism, and leadership to question, challenge, and risk through engagement in constructive debate? Is it no longer worthwhile or cherished?

It is not only in books that knowledge resides. The influence of many people have moulded my beliefs. Not only all the teachers and students I have worked with, but also educators who have been willing to put out, engage and debate. People locally like Jenny Little, Anne McDougall, Gary Stager, Peter Dalman, Marg
Fallshaw, Solly Ellenberg, David Dimsey. People online such as Julie Lindsay and Twitter compatriots. And so to lesson four: to be an effective teacher/learner you need to be a connected learner. I have seen a lessoning of teacher connection. More retiring to their classrooms. Gaps opening up between groups. School leadership too often more about managing to external standards and expectations. In a connected world what future for disconnected school environments?

Meanwhile the march of technology has led to fundamental changes in the brain functioning of our young. The ‘digital natives’ as some refer to them. Neuroscience is confirming lesson five: digital technologies have changed the way our young learn and think. A practical example, twenty years ago I would teach teachers in much the same way as I taught my Year 10 Computer Studies elective. Fifteen years ago teaching teachers were comparable to teaching Year 7s. For the past five years teaching Year 7s has been fundamentally different to teaching adults. In part because of the increasing use of computers in primary schools (and in the home). Now, from day one of Year 7 we provide tasks for students to multi-task, reflect as learners, work cooperatively and generate creative multimedia products using software most adults would have trouble using efficiently. We expect this development trend to continue.

It is misleading to over-generalise, as there are students who struggle with technology. There is also a range of teacher capabilities. Most work with credentials forged prior to the digital age. However, from my experiences, I contend that; with an open mind, there is not a teacher who cannot teach effectively within the digital world. Providing the environment supports connection, a willingness to risk and a focus on quality learning. (And isn’t that what teaching is about?).

On to lesson six: that school as an industrially structured entity is not supportive of digital education potential. This is not to say I don’t have confidence in school. I still believe it is the place for formal education. It’s just that some issues left unaddressed limit us all. Timetable structures emanate from a time prior to digital technologies, when knowledge development was much slower and social considerations much narrower. These pressures on their own would make it harder for time to be found for new technologies, even if pedagogically inclined. On top of this increased bureaucratic burdens have eaten away at teacher commitment. A failure to address teacher learning requirements for a digital age has added to strong defensive responses. School as a system remains steadfast. From this my second contention: that if we took away all the technology away from the curriculum School could continue unaffected. That we could teach from the textbook (a limiting empire is the textbook industry). And assess in the same old way on controlled knowledge sets.

In the early 1990s I debated with a colleague from a laptop school on the merits of individual student laptops within schools. I argued that when laptops were available for under $500 then we should be questioning why they are not on every school’s booklist. Sub $500 laptops are now available. So why are they not a general stationery booklist item? The answer to this tells us a lot about the state of school education.

Central to school inertia is lesson seven: Schools lack the educational leadership needed for digital times. What started as ‘curriculum support’ by the educational bureaucracy in the mid 1960s, has transformed to centralised controls. A lack of meaningful debate and willingness to include. School decision-making about management over leadership. Political discussion centred on a national curriculum as solution is showing how dominated we have become of political self-serving and subject self-interests. Where are the fruitful discussions on modern learning requirements? The 1.1 billion dollar laptop for every student idea shows how far we have yet to go. The situation is not helped by a decline of university thinking and leadership to light the path for educational computing use in schools. Nor by the tendency of some computers for education advocates to work from ‘if only’ justifications. Or the exhortations of information technology companies and associates to embrace their worldview. It seems like it’s everyone for themselves in an age of classic individualism. With teachers a convenient scapegoat?

School’s response to ever-changing technologies? Lesson eight: each new digital ‘revolution´ is to often about fads. The educational computer revolution has been a series of developments, each of which has generates opportunities, counter-reactions and calls for re-evaluations. In my time I have worked with

1. Logo as a technology supporting constructivism through computer generated microworlds
2. PC Applications as meta-cognitive enhancing purposeful tools
3. Multimedia for developing visual literacies for creation and communication
4. The Web as an information source requiring new information literacies as knowledge access and processing is democratised
5. Mobile technologies such as laptops and now iPhone applications enabling learning opportunities to go with you
6. Web 2.0 where individual identities can embrace online; collaborative learning can go global, and
where communities of learners can be built on common interests and purpose
Will online gaming redefine education?

There are many wonderful examples of teacher leadership embracing new technologies to show educational worth. How many are still at the forefront five, ten or twenty years on? We have as a system not moved far beyond the stage of people being promoted on the basis of individual work with the latest ‘fad’, be it technology or educational innovation. Focusing on the technology over learning objectives and structural considerations. With the next fad just around the corner there is never time to do a worthwhile evaluation of true educational worth. Those who prosper from a ‘fad’ approach never have to be held accountable. Superficiency reigns; like the Vice-Principal who had no interest or support for Web 2 use until he was appointed Principal, in part because the school in which he was Vice-Principal was recognised as a leading classroom user of Web 2 technologies. Or the school decision maker appointed in part to focus on Web 2, VLE and IWB implementation, taken aback by the response questioning why the focus wasn’t teaching and learning. We remain too beholder to individual teacher efforts. Hence my third contention: that the true value of the use of digital technologies for learning should be measured in the extent worthwhile use continues after the proposing teacher moves on.

Education for a digital age

The world beyond school has made its own changes, none more importantly that for lesson nine: when computer power moved from school to the home in the early 2000s schools were left in another place. In the 1980s and 90s students chose computer subjects at school because this was the only access point for many. With power now residing in the home and in mobile technologies, students now have their own connected digital environment. The online world that the digitally minded young inhabit includes the impact of the computer as entertainment and personal connection machine. School’s approach to date has left us exposed to teaching students who are digitally so far in front of us that we struggle to add value. Curriculum failure to formally embed programming literacies to allow students to take greater control of digital technologies and create products and solutions of value for a digital age, is but one of our failures. VCE Information Technology student numbers point to what can happen if teacher credentialism and learning values are not adequately addressed for the digital age. Laptop schools suffer from the restrictions that have to be used to meet school responsibilities.

Student computer power is not a recent phenomenon. Bill Gates’ school experiences tell us a lot about how school can support his ilk (see Malcolm Gladwell’s 2008 Outliers. In my first year of teaching I had a Year 8 student whose father resigned to work for his son’s computer company. I learnt quickly how to try to add educational value through peer teaching, cooperative learning and personalised projects. What is different now is that we are talking about a generation that on average is cognitively better equipped when it comes to technology than their elders. Whose identity is tied in with their online interactions. The passing on of traditional wisdom takes on new meaning.

I have found my learning and work increasingly occurring online. This has included:

• Providing teacher learning support (through teachIT www.teachit.wikispaces.com)
• Contributing to Flat Classroom projects (flatclassrooms.ning.com) including the Flat Classroom 2009 conference (flatclassroomconference.wikispaces.com) and providing a keynote to Flat Classroom project No 1 of 2009 (http://flatclassroom09-1.flatclassroomproject.org/Keynote)
• Exploring digital age learning using ISTE criteria (see elearning.qataracademy.wikispaces.net/21stCLearning)
• Online communities for global learning that use Google Docs, Delicious, Twitter, WordPress and other Web 2 technologies
• Web 2 eportfolios.
• All as part of albeit disjointed online identity (jturner56.wikispaces.com).

Students value multitasking, visual stimuli, information sifting and online experiences. Lesson ten tells me that: neuroscience has much to show us about digital education. It also points to potential dangers in addiction, instant gratification and shorter attention spans for students when faced with tradition learning expectations. It’s a new game. The system is held together with traditional testing and controlled parcels of knowledge; united as a social selection system. A philosophy based on ‘if you play our game you might be granted entry’. On an inequitable playing field. For how long? And to what end?

Fashioned out of thoughts
The environment you fashion out of your thoughts, your beliefs, your ideals, your philosophy is the only climate you will ever live in. The key is in not spending time, but in investing it.

--Stephen R. Covey First Things First

From what I have learnt beliefs have taken root.

**Belief 1: In schools as participatory democratic institutions.** School should reflect the world and its expectations. It needs to be connected. I see people learning and valuing each other as the bedrock of educational value. A different direction to that provided by individualism and short-term political/bureaucratic expediency. Stakeholders working together, focused on students, then teaching (not the other way around).

**Belief 2: In all teachers as educational leaders, and vice versa.** How else can schools keep up with changing technologies, the demands and challenges that go with them, and ideas worth the risk other than through connected learning? Where a new idea (risk) is thought warranted, trialling and targeted contracts can be used. Teachers should be respected for the educational expertise, insights and commitment. Let’s face it, a teacher who is still teaching after three or so years is doing it for the kids. Otherwise the kids would know and respond accordingly.

**Belief 3: In teacher learning as a formally structured part of school.** Beyond the ad hoc, individualist, at times tokenistic approaches that characterise “professional development”. Learning is central to schools. So too it should be for teachers connected to each other and to the learning required to be able to create educational opportunities out of new technologies.

**Belief 4: In individual literacy support for those falling behind.** The evidence is clear from countries like Finland (An OECD high achiever). When a youngster (or adult) falls behind they require individual support or they will never catch-up. Digital-based tasks can cater for a range of student backgrounds, enabling individual teacher support to help students ‘catch-up’. Peer teaching can also be utilised. Supporting individual problem solving is demanding and team approaches crucial.

**Belief 5: In valuing student creative work (such as eportfolios).** Students have been able to create digital portfolios of subject work open to appreciative audiences since the mid-1990s. Our benchmark has been that if a learning task is of educational value then teachers should be in agreement that all relevant students be given this opportunity. Digital work should be at least as valued as alternative assessment approaches such as common standardising testing.

**Belief 6: In using neuroscience and other knowledge to reconstitute curriculum.** Curriculum overcrowding and self-serving territory wars limit us all. Learning should be opened up through making more use of libraries as information centres, specialist technology areas and other spaces where specialist support can be accessed by students geared to developing as responsible, purposeful learners.

**Belief 7: In global connections as part of curriculum.** Web digital technologies provide a window into and from the classroom. Having been involved in international online projects such as the FlatClassroom project I have seen the benefits of students from diverse cultures working together. Benefits for teacher learning through involvement are also apparent. The impact of global influences, from Indian engineers and Chinese technicians to free-wheeling phishers to ebusiness means increasingly we cannot progress unfettered in a cocooned province.

**Belief 8: In teacher apprenticeship with mentor support.** Not just for new teachers. I was told in my first year of teaching that teacher professional development with computers needn’t be a priority, as the next generation of teachers would bring with them the required skills. I am still waiting in a system begetting its own. Where teachers work together we are all better off. Having worked as a mentor for teachers from ages 21 through 64 I can attest to the value mentoring provides both ways. And in generating learning opportunities for students that satisfy digital learning and traditional subject learning criteria. Mentoring facilitates connection.

**Belief 9: In a Digital Learning framework for schools.** One that caters for the adaptability, creativeness, and personalised learning digital technologies can foster. Students should be allowed to participate in creating the future. Treating computers as an add-on remains beholden to ‘traditional’ structures, thinking, leadership, and priorities. There is a Digital World that our young have increasingly embraced while school continues to see it’s priority as hardware provision.
Belief 10: In school restructuring to focus on developing (and valuing) independent, responsible, connected, purposeful students. Examinations might be a necessary selection structure, but can too easily adversely affect motivation, responsibility, independence and sense of worth. Complementary systems need to be developed and valued.

I hope you noticed that most ideas had little to say directly about digital technologies. Rather, they reflect a belief that it is in school structures and relationships that we need to look if we want to better utilise digital technologies for learning.

Whither digital learning for schools?

The value of lessons and beliefs lies in the practical effect they can engender. I have seen many compatriots with much better ideas and game plans finish up disheartened and exhausted from trying to elicit debate and responses from a defensive educational system. I am only reflecting from one viewpoint and hold no claim to divinity. But I strongly believe that until we re-constitute how we go about educating we will continue to be straightjacketed and limited, susceptible to the next ‘fad’ development and ‘solution’.

Unlike Ilyich and others I am not advocating the complete dismantling of school as an institution. First, there is much in school that society relies on. Secondly, it is impractical to make changes without effective change management approaches that take into account the realities and practicalities of available resources and economics. Education, with its responsibility for passing on a society’s knowledge, is conservative by nature and intent. There needs to be short-term, medium-term and long-term objectives forged. Based on what future we want our young to take on and give meaning to. A longer-term view beyond the political cycle. Beyond justifications drawn from self-serving exceptions.

In my own case I ponder whether I’m a dinosaur waiting for the meteor to wipe my type out, or a dodo who cannot see the world’s fundamental changes that will starve me into extinction. Are schools to be like the 15th century monasteries, covering a narrow worldview by ignoring, attacking, or seeking to assimilate Guttenberg’s printing press?

I see school as continuing as a required social melting point, but remain apprehensive on the system’s capacity to adapt to the global, digital and social eddies swirling through and around our society. It is my hope we will agree on a solid learning base applicable for the digital age which includes empowered teachers able to constructively meet ongoing change and challenges. We must temper hopes with possibilities. The possibility that Moore’s Law could come to an end. That is not to say that the intellectually creative application of digital work will have to end.

If we look 25 years into the future what do we see for educational computing? Different scenarios are plausible and the unexpected always possible. But to create a future one must both dream and engage. What do you see? School continuing as is, assimilating external changes to meet traditional frameworks built on segmented subjects? A digital future with online learning interactions increasingly valued? School redefined, to what? And with what philosophical drivers?

The system cries out for a Socrates who can empower through questions and insights to better understand
the shadows. A Socrates for the digital age could corrupt the young by alerting them to the power available to create futures through digital technologies. If only they could learn to overcome their own ignorance. Socrates also shows us the power teachers have to corrupt through teaching to question. A new educational philosophy is warranted that can embrace the creative, personalised, information driven, connected aspects of the digital age. While educating about the limits, the dangers, the challenges, and the choices. That speaks to the identity, adaptability, purposefulness of learning in a digital environment. Here’s to the shadow. Good luck to us all.

Postscript

In response to what I have raised above I am launching the EdSoc wiki (at soced.wikispaces.com). Your contributions are welcomed.