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ENSE-MAKING AND SENSITIVITIES:
NEW PEDAGOGIES?
NEW PRACTICES?
NEW ACCEPTANCE OF
OLD WAYS OF LEARNING?

LIDDY NEVILE
Sunrise Research Laboratory
Royal Melbourne Institute of Technology

INTRODUCTIONS
I, as writer, would like to share with my reader some thought experiences I have had recently with respect to 'interactive multimedia'. The ideas which I recount have served to stimulate my questioning of some of the principles which are gaining form among those working on (with? in?) multimedia, and I invite my reader to experiment, as I have, with these ideas.

I start from the position that learning more about teaching and learning seems to mean discovering more about the infinite complexity and richness of these processes. The result seems to be that there are more and more questions to be asked and that the burning question changes as time goes on. In this paper, I am concerned with the forms of learning for which we as designers of interactive multimedia experiences, are producing computational environments.

TEACHING AND LEARNING
Imagine a wriggly little platypus swimming about on a computer screen. We can see as if it is in a large water tank — coming to the surface for a moment, digging into the creek bed, and then blowing a screen-full of bubbles at us. We just begin to enter the world inside the screen, wondering where the little creature has gone under the camouflage of bubbles when the screen changes.

Platypuses live in trees in mud under water?

Why are we asked such a question? Is it because this is educational software? What response does the software writer expect?

I have discovered in myself recently an ability to click until I get it right — click mindlessly, I mean. I know that one box will give the response required and I don't really care which, and I don't really care how many clicks are required. I have an image of children in classrooms clicking like this — no longer worried about what will happen if they get it 'wrong' and not particularly interested in getting it 'right' — just wanting to get to the next bit of action.

Playing with the little animated character described, I happily entered into the fantasy world offered, only to be jolted back out of it by the text and questions. I had been moving about the screen using the cursor and might soon have tried to 'dig' into the bank of the 'creek' to see if the platypus had gone into the mud, had it disappeared without explanation. I suspect that in real life kids would have done this.

The questions were probably designed to draw attention to the choice of places where the platypus might have gone, and to invite the software user to think about where to look for it. How much more inviting it would have been if I had clicked about on the screen for a while, seen some more bubbles, and been able to stay in the world of the platypus.

I suspect that if I had found the little creature in the mud under the tree roots, I would have remembered this and looked there for it the next time I entered its world. Seeing the creek-bed and the mud under the tree would have reminded me of where the platypus goes when it hides. I might not have been able to remember this fact in isolation from the computer, I might have needed to revisit the scene to get the appropriate stimulus, but would that matter?

Some Ideas
A number of ideas emerged from my experience, raising some difficult questions about pedagogy for me, and so also with respect to the use of interactive multimedia. When is it useful to draw the user out of the context in which intuitive activity is taking place to formalise what is being done? How engaging is it for users to have a sense of movement which is experienced through the body, the
hands? Those text questions shift the user's attention, but from what to what? I felt changes in media, in level of formality, in mode of interaction, in interest...

I was reminded of the many computer packages which are available for what is called flexible and open learning: computer programs which use graphics and video and sound to pose a context and then ask students to read and write, or at least click one box and avoid another. If students click the 'wrong' box there is usually some helpful response from the computer, often a formal explanation of why the student was 'wrong' — in text.

The issue for me is summarised by the word 'feedback'. What kind of feedback is useful to computer users and what is distracting, irrelevant, annoying? If I had clicked about the screen until I found the appropriate spot and was rewarded by finding the platypus in a nest, I would have felt very satisfied. All the feedback that I would have got in the process would have been useful to me too; it would have served to inform me that the platypus was not in those other places.

Had my experience been as described, I would have felt that the screen was soft, a place with which I could interact. It could have been made like this quite simply (in fact, using the very technique that is used to make the boxes work). Instead of the cursor position being used to register that I had got the yes/no choice right in the case of the right box, (six choices but with a maximum of three at one time), the cursor could have been designed to give me infinite freedom to move about the screen space, hundreds of choices, changing as it passed over 'sensitive' spots. I would have been able to maintain my feeling of being in that space.

Feedback

A colleague who teaches writing to journalist students recently told me about her 'low-tech' teaching. She was apologetic but said the technique she uses seems to be working. She uses audio tapes to describe to her students what she sees in their writing. She feels she wants to support them, to act as second-editor rather than teacher when she reads their work. She has something to say to them and says it. She says it seems to fit her students' lifestyle very well; they always have ear-phones in their ears and appear very willing to add her tapes to their selection.

My colleague's low-tech practice exemplifies appropriate feedback, really useful feedback for students. As I understand it, the journalist students stay in the world of author which they have created for themselves, in doing their work, but have added to that context the voice of experience, that of their teacher. Nothing gets between the student and their writing: they can read it as before, edit it, and yet have the additional input they may need for this process. Other senses are being brought into action to support their reading/writing. Another medium is being employed to maintain the intuitive interaction between the student and the work and simultaneously extend the richness of the context. I think of the input from the teacher as, in one sense, artificially improving the set of glasses through which the students read their words. I believe the students experience a richer reading of their work, the reading of an expert, and so are placed in the position of the expert, when making decisions about how to change the work. The students practise being experts, working with the feedback that experts use to alert them to the need for change, experiencing what it is like to be expert writers in an intuitive and contextually-rich environment.

What is the equivalent experience for the budding naturalist?

My colleague talks to her students about their writing, using the discourse of the domain, initiating them into the practices of the writing community, giving them opportunities to work with the formalisms of journalism. She is not merely reflecting what they have done, but adding to it by including it in the wider context into which they are being initiated, as students. She is extending the range of modes of interaction her students have with their work, drawing upon an extended range of media to achieve this.

In the case of the platypus, I suspect something as simple as an intelligent cursor would make a huge difference. Intelligent cursors know about where they are and can indicate possibilities, for instance by changing shape from a prohibition sign to an enter here sign. Intelligent cursors are not the same as error messages because they leave the choice of action to the user, only indicating if some action is possible or not. (Remember, virtual worlds are artificial and it is not necessarily the case that in a virtual world one cannot step through a brick wall! Nor is it necessarily clear to the user whether an object can be fragmented or not if the user is not already knowledgeable about that object.) Intelligent cursors are not the same as error (or correct answer) messages in that they let the user stay within the domain of activity, within the medium. Like my colleague, they feed users with information without breaking the flow of activity, without changing modes of expression and 'reading' (which is surely what we should start to call interpreting what appears on screens, whether it is text, or graphics, or video or even sounds associated with the screen?).

Michael Fagan recently challenged me to make sense of a comment Alan Kay made in 1976. Fagan was designing intelligent cursors. He was thinking about Kay's interest in Jerome Bruner's three ways of apprehending the world: the muscular and active stage, the iconic stage, and the symbolic stage. Fagan was challenged to make sense of this by working on cursors. I was reminded of Peter Fensham's excellent final address to the Australian Association for Research in Education's 1992 Conference in which he drew his audience's attention to how much their body knows, often about things that they, the intellectual they, don't seem to know. Most mouse-users' fingers know more about the mouse than the users do explicitly, and the three-button mouse users often have very smart
fingers. Mouse users gain enormous facility, as does the driver of a car. It was only when I got cruise control on my car that I realised how much work I normally do to `read' the road and keep the car moving smoothly despite the changes in road surface, incline, and other conditions. The significance of `busy' on the screen alerts the computer user, often imperceptibly, to the need for a pause in the issuing of commands from the mouse. Intelligent cursors can, I think, be seen as equivalent to the journalist students' tapes, adding another sensory output medium while maintaining consistency and continuity with the activity.

RETHINKING COMPUTATIONAL ENVIRONMENTS FOR LEARNING

But I have been wondering about that little creature on the screen, and real life, and asking what we can know, and in what forms knowing can be recognised, accredited, shared, even quantified. I think that I really would have liked to play on with the platypus, to have been able to follow little pathways through the screens offered, to go into its house, to where it eats, to meet its friends. I imagine walking along a creek bed with my grandson and having him dive under the roots of a big old tree, calling to me to come into the mud so I can see the worms being eaten, wishing he could shrunk and squeeze through a hole into some creature's nest. My grandson won't do this randomly, arbitrarily, erratically, but with purpose, concentration, drawing upon all he knows and using it to get closer to his goals, discarding as places to investigate those that have previously proved unrewarding. My grandson won't dig in the wrong place twice - he will naturally and efficiently be changed by the experience of making the mistake once. His subsequent actions will be cued by his previous experiences. In a sense, he will know that place and he will use the information from the place to remind himself of where he found the little animal.

I do not expect my grandson to be able to express in formal language all that he learns. I am not even convinced that he will have `knowing' that accumulates, like some material, but I am convinced that he will become increasingly good at knowing, asking better questions, attending to more useful cues, increasingly sensitive to the circumstances in which the `knowing' is to take place. At first I expect he will demonstrate his knowing by acting in ways which convince us that he must know something. Later I expect he will draw attention to sensory input which he uses in knowing. Even later I expect he will be able to describe what leads to his knowing, initially informally and finally in formal discourse, according to the domain in which he chooses to operate, the communities of practice in which he `knows'.

I am brought to think of the farmer who knows his cow is ill. It still has the same brown coat, still looks the same to the novice but the farmer knows there is something wrong. He often even knows what to do and sets about doing it. But the farmer (and the gardener) do not always have long wordy explanations for their actions. The brilliant footballer has kicked the ball long before he has found words to describe to what he was reacting when he took the action he took.

Video, graphics, sound and text can be used to cue knowing and they can be used to demonstrate it. They form a subset of the full range of sensory inputs that humans use everyday but they greatly extend the range which have been considered legitimate in the recent past in our schools and formal education institutions.

NEW WAYS OF KNOWING OR NEW RECOGNITION OF OLD WAYS OF KNOWING?

Gatfegno (1990) argued, and Mason and Davis (1987) have elaborated, a theory that learning is about awakening awarenesses, that being aware of awareness is what we have called knowing. I want to push this idea a little further. I suspect that it would be more inclusive and productive to think about knowing as being awareness of sensitivities. Learning can be about gaining sensitivities, becoming sensitive to. Then knowing is using these sensitivities, responding appropriately to the sensory inputs. How can it be recognised?

If knowing is an active process, it can only be discovered in process but it can be represented in what we have come to think of as formal ways. Academics argue about what form of text qualifies as sufficient evidence of knowing in particular circumstances - they are working on the representation of knowing as they cannot access the knowing process itself. Proof in mathematics is an example of a highly structured form of evidencing knowing that is employed by a particular community of practice.

Mathematicians who have good intuitions and discover new ways of working mathematically reduce their ideas to the mathematical form of proof in order to convince others of its worth. The proof is not the knowing, it evidences it. How else might we evidence our knowing? I have become increasingly aware of the practices of academic presenters. Often these people convince others they have something to offer by writing long papers about some topic in standard 'academic paper' form. But when it comes to convincing their peers, sharing their knowing with others, they stand up on front of them and have a ritualised conversation, supporting their talk with computer images, tape recordings, video images.

Is it possible that traditional scholarship is as it is because, given the forms of communication available to most people, it was appropriate? Text for some time now has allowed people to share the evidence of their knowing, to provide others with opportunities for knowing better. Shouldn't we be radically rethinking how we can use the new range of media and communications technologies to enrich the world's knowing?

Suppose the farmer chooses to document the cow's condition and its symptoms by making a video that he leaves for his wife when he is away? Suppose in the video he identifies symptomatic behaviour which leads him to suspect cows of a pathological condition. Suppose he captures the tell-tale broken moo which often alerts him to the presence of illness among his cows. Suppose his wife acts on hearing the moo, not realising that is what was familiar, what she got from the video, when he thinks she should be looking for a certain kind of staggering. Is the farmer articulating the problem without words? Is he no more taking advantage of what he gets for free, from the medium, than we do when we use words to trigger ideas we, as authors, did not have, or at least did not articulate? Is he not using multi-media just as we are claiming in the rarefied laboratories of education that it should be used?

Unfortunately I think not. I think he is using the mix of media far better than we do. I think he is using the medium to express something of which he has an awareness by identifying and publishing what he is sensitive to. He is not reducing the documentation to meaningless little pieces but conveying as full a story as he can, even more than he at first realises, allowing his wife to act on aspects he has not yet distinguished.

NEW TEACHING?

I have suggested something as simple as an intelligent cursor might help. In fact I think of the intelligent cursor as the means

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to achieve what feels like a soft screen. I mean a cursor that is sensitive to where it is. I wonder if this idea comes from thinking about the sensitivities of the child and the farmer. If they have awarenesses, for instance know some fact about the animal with which they are dealing, they will be able to recall and use that fact on some occasions, and most probably be reminded of it when it is drawn to their attention. For some time they may not distinguish that fact from its context. In time they may move from seeing it as part of the context to seeing it as the critical factor in the context. But when do they qualify as 'knowing'?

Paul Goldenberg (1993) told a story which for him forced the issue of constructivism. It was about a young child who was constructivist knowledgeable at dislike the f word, a personal experience the child did not enjoy. I have just found and re-read Paul's reflections on his story. Paul described himself early in the draft text as having to admit, reluctantly, that he is a constructivist. He went on:

But the bottom line is that what goes into your head is what you build yourself and put there. I can, by experience, improve my chances of helping you build what I want you to. I can provide you richer building materials and enough redundancy of information for you to find, somewhere, clear building instructions. But I cannot build the idea for you, nor can I put it in your head.

He argued that

...The idea of constructivist learning is at odds with a theme that pervades most of our educational strategies...the tendency to pre-digest information, package it in small, sugar-coated pills, expect students to swallow it without chewing, and expect them to digest it and incorporate it into their bodies (minds) without changing its form at all. The analogy breaks down even for a pill. A pill cannot become part of one without changing, and even the way it changes is quite dependent on an individual's own chemical make up. That's one reason you should not take someone else's pills!

The constructivist's theory of learning acknowledges this messiness. Students (all people) construct their knowledge. We don't just hear, we interpret what we hear (and that's why people can hear the same thing differently). We don't just see, we interpret what we see (and that's why people can see the same thing differently). And we construct all our knowledge at all times, just as surely when we sit (engaged or bored) in rows in lecture classrooms as when we perform experiments with computers or manipulatives, and just as surely when we are pained, scared, and angry as when we are happy and confident. The constructivist's theory is not, therefore, to be trivialized as in statements like — discovery is a best way for students to learn.' For the constructivist, there is no choice at all: self-construction is the only way that people learn.

I agree with Goldenberg. What I think is necessary is the recognition that learning and teaching often do not take place in the same time or space. Learning and teaching are messy exercises, unfortunately, and not susceptible to the kinds of automation sought by those who seek the perfect instructional design. But one thing is clear: much more learning happens outside formal education situations than within them. Children display high levels of expertise in fields which are beyond the formal curricula when they often display alarming incompetency in fields in which they have received a lot of formal instruction. And so I look to the informal, scholars for some clues.

INFORMAL AND CHANGING FORMS OF SCHOLARSHIP

In the presence of interactive multimedia and communications technologies, formal scholarship is being reviewed and there is growing awareness of the practices which are formally excluded despite their obvious efficacy. I wonder what it means to be a naive scholar in the sense that we now talk about children as naive scientists, recognising their participation in the community albeit with a different level of expertise.

Informal scholarship is gaining ground currently as forms of expression and communication vie with each other for recognition and status. The 'invisible' college has not yet established itself on the international network, but it appears to be growing as a response to the quantity of unqualified activity on the network. I am pleased that there is a moment in time when many 'informal' scholars are finding a place, as illustrated by the following example.

Charles' hobby is the study of medieval life. He investigates many aspects and activities of the period, and practises much of what he learns. He cooks delicious food following ancient recipes, knits chain-mail, and crafts cooking and fighting instruments. He studies ancient languages and literature formally at the university and informally on the net. He uses Internet naturally and frequently. Medieval scholars are not plentiful these days: they are far-flung across the globe but many of them are active participants of life on Internet. Recently Charles tried a newly discovered recipe. An English academic found the recipe but Charles realised it. The recipe was never printed in traditional form, as part of a book, but has now been published and so everyone can enjoy the original texts which will not be damaged, no matter how many times it is used.

Charles communicates with medieval scholars who respect and enjoy his participation in their activities. But is he a scholar? He is not 'schooled' in his hobby but undoubtedly knowledgeable. He joined his group of enthusiasts when they had informal notices of rowdy, fun meetings. He took writing the newsletter seriously; engaging in extensive research. Can it be considered authoritative? Is the world of scholarship changing so that informal scholars' contributions will be evaluated and recognised in ways that have not been possible before?

At RMIT there are many highly accomplished artists who would like to get, and surely deserve, formal recognition for their research and production of new technical/artistic developments. These people research their field, investigating and interpreting the past and present, pushing new ideas and developments into the future. They articulate their knowledge and document it in film, on stage, on canvass and in electronic media. They bring their work to life with sound. They are artists and technicians and their medium of expression includes all these forms naturally. They are aware of their sensitivities as traditional scholars have been aware of their awarenesses.

Conversely, it seems that many non-artistic, non-technical people, people who have traditionally been known as scholars, are finding that multi-media presentations of their work convey their intellectual activities more appropriately than the traditional academic forms. If, as many are arguing, one significant form of useful research in many areas is research based upon or verified by personal experience, and if those hypertext productions on the world wide web are to be recognised, including as integral the images, sounds, video clips that are embedded within them (no longer merely there to illustrate points which have already been argued in traditional text forms), then perhaps we should be re-thinking what currently constitutes formal academic achievement. And if we do this, I think we should also be asking ourselves about learning and teaching.

Or at least we might choose to work on making finer distinctions and connections between what is possible and what is traditional, conventional. Things
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are changing, so maybe there will be an opportunity for us to begin to embrace the challenges that are offered. Hopefully we can see more clearly some things to which we have been blind in the past.

RECOGNISING NEW WAYS OF LEARNING OR OLD WAYS IN NEW CONTEXTS?
I have just begun to think in terms of 'Internet technologies'. For me the implied IT has a set of meanings: interactive telecommunications, interactive multimedia and information technologies. It seems that Internet's attraction could be as much the access to interactive multimedia as anything else. Everyone can get access to free software that allows them to cut-and-paste images, sounds, text and video. The activity which was so exotic just a short time ago, available only to those who could afford the latest hardware and software, is fast becoming an everyday activity. And the alarms are activated!

Cut-and-paste
If cutting-and-pasting is a mindless activity in traditional primary schools, how much more stupid is it in a world of electronic media? Potentially more and potentially less seems the only answer. I visited an exhibition of children's art in the community gallery in Alice Springs recently. Children had been working on using the left side of their brains to draw, working from images which, when held upside down, did not distract them into misconstruing the image. At the end of this course, the children were asked to make a collage using printed material which they could only cut and paste. The products were stunning. I was surprised by the quality of the work and the choice of activity. I was reminded of the journalism students being lent their teachers' expertise. These children were borrowing graphic designers' and printers' expertise in the form of colour, shapes, and more. Their compositions revealed their ability to work at a heightened level of sophistication.

The children's work reminded me of the many times we learn by copying, deconstructing and reconstructing. At the postgraduate level we demand significant reworking of others' work. In kindergarten when we are trying to teach children to read and write we encourage them to copy and cut-and-paste. Why then is it that for some arbitrary number of years we consider such activity cheating and despicable? Learning by 'cheating' can be very effective learning (Adams & diSessa, 1991) and it draws upon a skill which we formally teach in our 'adoration of the technology' classes anyway. We have tools for doing it and we conduct classes in which we expect students to learn to cut-and-paste.

Isn't it time we reassessed our attitude to this activity, and many others like it? Pasting a new piece on to an emerging composition is a different activity from implementing a whole design. It draws upon sensitivities to the emerging forms in ways which differ significantly from the implementation of a grand design. I cannot help recalling the plea for recognition of a way of learning that was the subject of work by Levi-Strauss and others when 'bricolage' was fashionable (Turkle & Papert, 1991; Nevile, 1991). Students read books and re-present what they have read. They are usually rewarded for their work. The level of reward varies upon the original input, but the activity is not questioned. Indeed, senior students who do not read what others have done and base their new ideas firmly within that context are considered to have fallen short of the requirements. But if young students borrow the words of others (let alone pictures and videos) and uncritically paste them into their presentation, instead of rewriting them in their own words, they are cheating. What is the nature of the naive scholar's critique which would make this activity acceptable? Clearly just choosing to nominate some words as relevant is not acceptable and yet is that not the first step towards building upon and from others' work? Is that not an important learning strategy in many other circumstances?

Grazing The Internet world wide web is undoubtedly an environment for grazers, perhaps the people who have in the past wandered their way through joke books and conference proceedings. For web grazers, there are electronic conferences in which topics become hot for a few weeks, lurkers step out of the background, where they were just reading, and start to put in their 'two penneth worth'. Internet watchers are beginning to recognise the syndrome. People who have listened in the past are in many situations being reported to have started to engage in the new medium when most others have left them inactive, not managing to solicit contributions from them. I think the immediate challenge is to go beyond the acceptance of browsing as a legitimate activity, to establish a suitable classification for this familiar activity as the first step. Even this seems hard to do. Established scholars hunt and peck at ideas and ways of thinking. They build informal resource collections and intellectual networks. They are accomplished in the browsing game, knowing where to browse and what to attend to. How do students learn this?

Are we not ready to awaken to, or not prepared to accept the challenge of, the inadequacy of the traditional practices which we demand from our students (e.g. searching the formal bibliographies and reviewing them) without making sure that these sources are augmented by the informal, often more relevant and valuable new sources such as international conferencing lists offer? Are we sure the traditional systems are as accurate and useful as we convince ourselves they should be (Nevile & Mathews, 1994)? What are the entry qualifications for the hidden 'colleges' to which recognised academics belong? Don't academics work in communities of practice into which students have to be initiated and yet fail to notice the high walls which guard their hard-won status?

I think of myself at times as being behind walls which alienate me from much of what is happening in fresh, vital minds to which I cannot gain access in formal ways. What are good new sources? Is there a possibility that in the future education will be less reproductive? Probably not — already the pressures of overwhelming amounts of information are supporting the development of editorial practices, and these are sure to