

5 Philosophy: a coming together of technology, application and learning

The previous two chapters have looked at developments in technology and what these developments seem to offer for teaching and learning. Technology in school had changed dramatically in nature and scope but this had not had the expected impact. This chapter brings together ideas about learning, about teaching and about technology. We begin by exploring participants' ideas about teaching and learning in more depth, we look again at desirable application, and, finally, ask 'where do the computers come into this?'

What is learning, how do we learn?

Underlying ideas of desirable application are three big ideas about learning: it requires active engagement, it is unbounded; and it requires reflection.

The active engagement of the learner

To learn something is to strive to make sense of it. As one put it in relation to her own learning 'finding things out needs to be driven by some sense of curiosity and passion'. Learning is about setting yourself challenges and 'expending intellectual energy' in trying to meet those challenges. This has implications for both learners and teachers.

Clearly as a learner you need, if not to be driven and passionate about knowing, at least to take some of the responsibility for making choices and taking the next step. It is not enough to take on trust something that has been given to you. For example, in the previous chapter we looked at the case of the teacher who had replicated in the classroom what she had seen on an in-service course. This was a criticism of the in-service course but it also exposed the teacher's own shortcomings as a learner. In a similar way learners had to be critical of information they accessed via the WWW, they needed to enquire further: who was saying what; what grounds do they have for saying it; how does this apply to me?

While all participants expressed a commitment to meaning making they also recognised that the meanings they made were provisional: what was known today might prove to have been misunderstood tomorrow. This was a general principle for learners – there was more to know and, for example, teachers should not stop experimenting and trying out new things. Participants had a heightened sense of the provisional nature of knowledge through their engagement with computing, which was continually changing in nature and scope, but as a general principle many took it as a given that they may have got it 'wrong':

That's something that is personal and I might need to revisit this. On a deep level, what drives me is a fear of I keep getting it wrong. I keep getting the script of life

wrong. I mean even though I know on another level this is the script, you know its complexity theory, it's a complex system, this is the script. But somewhere what's driven me in my life and my career is the sense that I'm not doing it well enough, I'm getting it wrong, I have to keep on trying.

Learners need to make personal meaning of new information and this meant as a teacher you needed to provide opportunities for learners to take responsibility and make explicit the importance of doing so. This often meant framing activities so that learners should transform what they find out for particular audiences or particular circumstances. For example, one powerful way to support professional learning was to invite learners to apply what they were learning to a work setting and communicate outcomes to peers. These principles underlay a course for teaching assistants designed by one of the participants:

Module one would be a factual description of the work setting. The second is being critical of the work setting, reflecting. The introduction to action enquiry would be to improve something in their work setting et cetera. The second year of the course would be more of the same, more action enquiry, more reflective practice, but a higher level, looking more in depth. In the third year, doing even more action enquiry, but this year looking even more at undergraduate level, creating an exhibition of their work, identifying an audience for that exhibition, they would expect to gather evidence from that set of stakeholders and evaluate what happened at the end. So they would be expected to be very outward as well as inward with their studies.

An implication here is that if the learner is having to take an active part in learning then the teacher needs to provide a context for enquiry that will be found meaningful or simply playful and engaging. The teacher cannot do this without setting up dialogue with the learner. Already we have seen how important this principle is in designing materials, courses, software or activities. We see it again here as one participant recalls designing a TVEI funded course:

So what we tried to do there, was to look at how the curriculum could be constructed differently and the children could really work on things that interested them. And we used the money to construct a curriculum which was very open, very shaped by young people, following our own nose, and developing the projects that interest them, using the technology to record it, but also using technology to connect with kids in other schools. You have seven or eight schools that were networked up, an early version of the internet.

As seen when looking at the desirable application of computers, it is the teacher who has the vision for an activity and the imagination to frame an activity for learners. This requires planning not just 'hoping for the best'. This is a point illustrated by this participant in relation to an integrated humanities course his team had organised:

The idea was that you would choose your area of content, your topic if you like, and you then would infuse into it the learning experiences that you would identify as being the development of particular skills, or the exploration of certain attitudes, or the development of certain conceptual understandings. So that was how the model

worked, and that was how we worked. We worked in this way very explicitly. I can't remember, but I think that a local authority advisor suggested this to us. Certainly we found that a very useful way of working, because what it meant was that our choice of topics always had a deeper justification, it meant that we couldn't just capriciously say 'oh we'll do something on x, or y, let's do something about the Egyptians, that would be fun'- I mean we didn't actually do anything on the Egyptians as far as I can remember but had we chosen that as a topic area we would have had to base our justification within the skills, knowledge, concepts and attitudes that we wanted to develop through that. So actually it was quite a rigorous and fine-grained approach to curriculum planning.

But beyond this general principle there were variations in the kinds of roles ascribed to teachers. Much depended on context. For example, at times, as a teacher, you could take the position of a co-learner, particularly in relation to CPD work. At other times you might be guiding learners to know how to assess their learning for themselves. On other occasions teachers had a much wider pedagogic role in the class room instructing, explaining, directing and challenging pupils on top of their responsibilities for everyday classroom management. However, all were agreed that the teacher needed to supply learners with a rationale behind a task, and be clear in their own mind about what they are hoping will be achieved. All recognised the value of well timed questioning to develop learners' thinking.

Learning as unbounded

A second idea about learning is that it cannot be easily confined to a subject, to one way of delivery, or to one physical environment. Of course, there might be all sorts of pragmatic reasons why boundaries exist but as far as possible learning is about making new associations which cross boundaries. For example, here is one participant explaining his own learning in these terms:

I mean if, what drives me on in everything I do is trying to find a new angle. It's making connections and finding a new configuration from those connections. I think that summarises everything I do. All of the papers I write, I like bringing ideas together and finding where the connections are and what new emerges from them. It was the same with the technology.

This led most to feel that subject boundaries were artificial and often outdated. Many had a commitment to cross curricular working, where this was possible, and a few felt particularly strongly that subject boundaries were out of date, as offered by this participant below:

The model of knowledge basically that is still replicated in teacher training colleges across the nation is out of date. We still teach knowledge, we still teach subjects, we still teach students that there is something called English. And English is taught in this way or that way. But the subject cultures that exist in departments in teacher training and that replicate an epistemological model across the profession is completely out of step within important aspects of how knowledge works in the world we now live in. There is much less boundary maintenance, so for example, the whole thing we

grappled with in the 60s and 70s of topic teaching of breaking down curriculum boundaries which was one of the hallmarks of the so called progressive educators, always challenge this notion that knowledge can be segmented, well now we have a technology that intrinsically breaks down that segmentation. It doesn't easily allow you to build walls between geography and history. But that particular potential of the tools of learning is almost deliberately ignored, because nobody wants to deal with the fact that the school curriculum can no longer go on being divided into geography, history and English, mathematics we know that's true, we don't know what to replace it with.

In discussing boundaries most talked about the tension between school knowledge which was bounded by the text book, and organised in one principle format - that of text - as against the unlimited resources offered through the Internet. Some made a more general point that even with Internet access teachers and children should not feel bounded by the physical classroom:

Yes, that's right, not through actually going out and running round the streets like we used to, that's true. But with responsible parenting that expands, look at what museums are offering and galleries, countryside centres. You think of all the educational facilities there are in the non and informal sectors and I think they make formal education look like the poor relative. So for me, that's the way it's going. And it's always been the same, the real learning happens out of school, doesn't it?

Knowing comes through reflection

While participants believed strongly in the importance of learning by doing (you learnt to teach by teaching; you designed good software by trying it out; you learnt to write by writing) activity needed to be designed and activity needed to be followed by reflection. Sometimes this reflection was almost spontaneous. For example, some felt that in working with *Logo* children were drawn into reflection, say, on where they had gone wrong, without the intervention of a teacher. However in general it was felt that reflection needed supporting by a more knowledgeable other – this could be a co-learner or teacher. Several made the point, as below, that, say, it was not enough to have an on line discussion, it was important to have a framework for the discussion and prompts for reflection:

There is all this hype is it's fabulous to have these discussions but it only works when you've got a fairly sophisticated group who are having the discussion. So I think teachers need to think about how do you alert your pupils to use the discussion and how do you get them to engage in discussion? And there is more than one kind of discussion, we need to get into that, what kind of discussions there are, how do you run this kind of discussion and what's the benefit of the discussion. So it isn't inherent in the fact that having a discussion forum produces outcomes because they don't just happen, there needs to be moderation.

Knowledge, learning and desirable application of computers

Summing up, most participants in the study could be said to hold a broad view of learning in which knowledge is acquired through 'scaffolded' reflection on purposeful activity. Not

surprisingly when talking about the application of computers they have highlighted activity which very closely supports these principles (table 5.1).

Desirable application involves;	This is because:
a challenge, going beyond the routine, giving an element of control	knowledge is personal, it is about making personal meaning
doing something the learner would find purposeful.	making meaning requires purposeful activity
going beyond what is generally taught and how it is taught	knowledge is unbounded
communication	knowledge is not acquired spontaneously it requires reflection

Table 5.1: desirable application and view of knowledge

Table 5.1 provides a tidy way of linking application to theories of learning but these are general principles which apply to many contexts in which teaching and learning take place, they are not confined to a discussion of technology. This is not surprising as participants had wide interests, for example participation in networks of action researchers or initial teacher educators which did not have a particular focus on technology. However, they also spoke about many special, if not unique, features of computers which seemed to contribute to their vision of teaching and learning. The most frequently mentioned of these are described below.

Computers support creativity

Creativity was often bound up with the idea of ‘creating original products with personal meaning’. Creativity involved authenticity and control. Creativity was explicitly discussed by some in relation to programming and putting the learner in control to plan and implement their own products. As one put it:

If you give it symbolic instructions you can make the computer do anything. And that anything can include not just making pictures on screens, which is brilliant, So that the computer can be made to do things and the limit is more or less your imagination.

Often creativity was associated with the transformation of artefacts, texts, sound or as below pictures, all of which could be easily achieved at the computer:

Learners have such cheap technology that allows them to do things like take pictures, video and dictate things and whatever. And having it very swiftly beamed back to your website and having that kind of digital artefacts to play with. That’s very exciting. The kind of questions that allows you to ask is, take a picture of what we’re looking that will encapsulate what we want to get a picture of. So you’ve got to do lots of high level stuff, very quickly you’ve got think about what’s this picture telling me, why am I taking that picture and not that picture, why should I do this to this.

Computers allowed creativity because computer plus person was more powerful than person alone:

The growth in power continues to provide tools that are ever more powerful and more useful because of the way then can deal with real things. Such as digital cameras. I can store my life in order in my computer. I'm diarizing my life with the media and the tool is allowing me to do that. The pictures the sounds etc. is carried around and is there for me to remember and enjoy in the way that somebody could have a diary habit. The augmentation of my creativity that has come about from the tools that allows me to design. Creating things that please my eye that I could not do by hand. I think children benefit from that enormously.

From my own point of view ICT is in some way a liberator in as much as I have become a far better writer since having access to a word processor, so I do the draft and re draft. I have become a far better mathematical modeller through the use of spreadsheets, it enables and, the thing I have not really mastered myself, I could become a far better designer, I have the technical know how to do that but I actually need someone to give me the artistic skills. No doubt there are other people who have been liberated in musical terms who cannot write notes but who compose and other people who are now budding film directors who can do things with the digital camera which they could never do in the past, in that respect it is liberating.

Computers support talk and communication

Communication was discussed in several contexts, including more recently, Internet supported online discussion between learners and participation in social networks such as *My Space*, *Bebo* and *Face Book*, which offered hybrid forms of communication, part web publishing, part discussion. The web, according to one, provided a 'symbol of the horizontal layering of communication, anybody can talk to anybody, releasing this concept of anyone can publish anything they like'. Going back further in time, many could recall the talk generated among pupils when working on *Developing Tray*, simulations, carrying out joint enquiries of data files. Here one participant recalls pupils working on a simulation programme at a BBC computer and:

watching a group of teenagers sitting in front of a screen which has got a calendar on it, with a teacher sitting beside them, imagine 13 year olds being told about the menstrual cycle and being asked to see if they could help this woman to become pregnant. So telling them when the woman ovulated and, sorry, when she started menstruating and then saying now when do you think would be a good idea for her to have intercourse so she can get pregnant, And what date shall we do this on. And then they'd put the 'I' on that date and then the teacher would track through each day and little messages would come up, the woman felt a bit sick today, and then sometimes there would be a miscarriage and the kids were really upset. And I think that was the magic thing, because you could see that they were all looking at the screen and therefore all the embarrassment of talking about all these embarrassing things was no longer an embarrassment because in some senses, it's like the interactive whiteboard now really, it's a shared space.

Cooperation and collaboration

Talk almost inevitably implies possibilities for cooperation and collaboration. (An association is often made between cooperation as working together on individual products and collaboration working together on a shared product or outcome but this is not applied consistently in the interviews or in the literature at large). The simulation above provided an example of collaborative decision making and participants offered further examples including a snooker game in which pupils started 'to estimate angle and size of force, arguing with each other about that because they were always working in pairs or threes.' More recently, others had seen pupils collaborating to make products, for example short films in which 'they took on roles: interviewer, camera operator and director'. Working together was not necessarily planned, for example ease of editing made it natural to seek comments from peers as these could be immediately acted upon. One felt:

when children are working in a group, and the computer's involved, they are working collaboratively as part of a team. Whereas a lot of group work in schools where the computer isn't used, children may be sitting in groups doing the same activity but doing it individually. So you might have the red group on this table who are all doing number bonds to twenty or something like that and blue group over there who are doing a different aspect of maths but it doesn't mean that they're working collaboratively. So that what they're gaining from working with the computer is that they're working much more collaboratively and developing team skills.

The computer supports a shift towards higher order thinking

Participants discussed the way in which computers could carry out routine procedures to enable pupils to focus on higher order skills of synthesis and analysis. For example, pupils could search data files on the BBC computer and comment on what they found out, and today pupils could locate information very quickly via the WWW. One participant discussed how literary analysis could be transformed if you had electronic texts, for example pupils could quickly search out how Dickens tells us about the changing character of, say, Uriah Heep in *David Copperfield*, something that would be extremely time consuming without electronic text. This idea of freeing up time re-emerged when discussing analysis of numerical data. Examples included using spreadsheets for automatic processing of data and producing 2 D and 3 D displays. The simulation programme recalled earlier about throwing a stone from a mountain top could not be done without the computer. Another participant recalls *Eureka*, a small programme mentioned in the introduction:

Eureka, how lovely that was, do I need to explain that..... We did it on screen we also did physically and visually around the classroom. We did *Eureka*, we then drew our own stories and made graphs of our stories and they were up around the classroom as well.

The computer provided alternative ways to support explanation

The multi media capability of the computer was discussed in relation to both teacher and pupils use. The general point was that podcasting, video clips, images, text based communication had all changed the context in which teaching and learning took place and there were opportunities for engaging learners in more ways than in the past. One recalls working with interactive video:

You sit there, you watch it, you engage with it at some sort of personal level. The question was how can we use that same set of images for different educational outcomes? How can we actually chop it up if you like, that was a term we used at that time, and interface the images with very simple graphics, mainly text screens, to break it up, to carve it up into bits that could be used for different educational purposes?

A catalyst for changing the roles of teacher and pupils

Finally, the computer often led to teachers to re think their roles. For teachers it did this by freeing teachers up as:

it takes responsibility away from the teacher of having to keep everything going. You no longer have to run around spinning plates. You can give kids much more freedom knowing that their interactions with the technology will sort of keep them on task better, so then the job becomes, still inspiring them ... but having a different kind of context where you really can teach in different ways and you really can change the roles radically of students.

Computers, application and learning

In table 5.1 there was shown to be an association between application and ideas about learning but no mention made of computers. It can be seen now that that the computer appears to participants as a tool for supporting creativity; for talk and for collaboration; for focusing on higher order skills; for offering alternative formats and offering alternative approaches to teaching and learning. These 'affordances' mean that computers are integrated into a vision of learning: computer, pedagogical application and theory of learning each reinforcing the other (table 5.2).

ICT offers:	And supports desirable application which involves:	This is because:
support for creativity; a focus on higher order thinking	a challenge, going beyond the routine, giving an element of control	knowledge is personal, it is about making personal meaning
support for creativity	doing something the learner would find purposeful.	making meaning requires purposeful activity
changing the teacher role and providing alternative means for explaining and clarifying	going beyond what is generally taught and how it is taught	knowledge is unbounded
a focus on higher order thinking; support for talk and collaboration	communication	knowledge is not acquired spontaneously, it requires reflection

Table 5.2: the relationship between computer, application and theory of learning

Thinking about practice

Participants were asked about examples of teaching which had particularly impressed them or activities they had enjoyed in their earlier teaching. Examples included field trips in which pupils were using mobile technology to help in their exploration of an area and to communicate with others; young children making short films, using *Digi Blue* cameras, about the windmills they had made and posting these to the WWW; and some referred back to *Logo* as in this example:

We had the one 380Z in the corner...it was fun, it was fun, we had a huge turtle that we made out of papier mache stuff?. Yes, we made this big turtle that we put on the wall. It was a glittery one, we made it out of silver foil and colour foil, a mosaic for its shell. So we had this coloured turtle with left and right on its paws that could spin. So that was slapped on the wall, by the computer. And then we had corrugated cardboard, you know tall cardboard, I am waving my arms around for the benefit of the tape, around the computer, so there was a snug little space for two children to go in. And then pinned to all this corrugated card were lots of instructions about try this, and do this and switch on this and have you thought of, so there were lots of visual props around. And I remember doing a little flowchart of doing switch this, if this happens then put that and if that doesn't work do this, etc. So it was a lively visual space. We did a lot of *Logo*, physical *Logo* so they programmed each other around what we did and then displayed their ideas of, this is what I wanted to do, I thought it would be a lorry and it ended up as a firework and all of that. So there was a play with the *Logo* I think.

This activity rests on the idea that learning should be a search for meaning; it should be purposeful and fun. In this instance learning is confined to the classroom but the classroom is transformed into a lively visual space. Pupils are asked to reflect by working with each others,

for example, explaining why ‘I thought it was going to be a lorry but ended up as a firework’. It is desirable application in that it offers an activity beyond the routine. It involves collaboration and gives an element of control to the pupil. The computer offers a support for creativity and collaboration. Hence it integrates ideas about computers; about teaching; and about knowledge creation. However it is impossible to track what came first: for example, did the teacher adapt the use of the computer to fit an existing philosophy of teaching or did *Logo* in some way open possibilities for handing over responsibility to pupils?

Summary

This chapter set out to join up desirable application of technology with perspective on teaching and identification of affordances of computers. It outlines core beliefs about knowing as meaning making; about activity as purposeful and technology as a tool for creativity and as a support for reflection.

The key question was ‘how do beliefs about teaching affect the use of technology?’.

The chapter suggests that beliefs about teaching and learning need to match the affordances of the technology. Examples of classroom teaching seem to integrate the two very well.