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Beliefs and ICT: what can we learn from experienced educators?

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Abstract

This paper contributes to a special edition of Technology Pedagogy and Education by looking at beliefs about knowing and learning held by 15 teacher educators with long standing involvement in the Association for Information Technology in Teacher Education (ITTE). Beliefs were challenging to identify but were ascribed to participants through examining accounts of practice on the basis of 'what they held true' about teaching and learning. The study uncovered a widely held core belief in knowing as constructivist and a more peripheral belief in learner centred, or social constructivist, pedagogy. The influence of beliefs on everyday practice was not taken for granted but identifying participants' beliefs helped to understand the frameworks in which judgements about teaching and learning with ICT were made. The study discusses the importance of beliefs as a stable point of reference in teaching and learning; tensions in categorising beliefs; and the particular role of beliefs in relation to engagement with ICT.

Introduction

This paper contributes to the twentieth anniversary edition of Technology Pedagogy and Education (TPE) by presenting evidence of teacher educators' beliefs and the relationship of beliefs to technology. In doing so it is addressing three overarching questions: what are beliefs about teaching and learning?; how can beliefs about teaching and learning be categorised? what is the relationship between beliefs in teaching and learning and engagement with ICT?. The paper provides a review of literature; a background to the study; findings from the study; and discussion of the three overarching questions.

Literature review

Beliefs about teaching and learning have been tackled in a wide range of writing across education sectors (eg Bullough, 1997; Fox, 1983; Roberts, 2003; Sammons et al, 2007; Samuelowicz and Bain, 1992, 2001; Savasci-Acikalin, 2009; Trigwell, Prosser and Taylor, 1994). The literature offers a range of typologies but there is an underlying distinction between, at one end, a belief in a transmission / transfer / teacher centred model of teaching and, at the other, a more learner centred approach with the teacher supporting the student in achieving a personal understanding of a body of knowledge. It is widely recognised that while beliefs are not straightforward to define (Pajares, 1992) they concern 'what is held to be true' - beliefs have tacit, emotional and subjective qualities, as against *knowledge* which seeks impersonal, rational validation, even if, in practice, this might not be an attainable goal. However beliefs and knowledge are often entwined, for Alexander (1991) knowledge takes in 'all a person knows or believes to be true, whether or not it is verified as true in some sort of objective or external way' (Alexander et al., 1991, p. 371).

What teachers believe about teaching and learning has obvious application in understanding practice, for example why teachers may or may not be resistant to proposals for change (e.g. Fullan, 1983; Handal, 2003) and why two teachers, trained in the same methods, may teach in radically different ways (Pajares, 1982; Sammons et al, 2007). However the assumptions underlying the research into beliefs have not been without criticism (Kane, Sandretto, and Heath, 2002). As with the literature on learning styles, the inventories used to categorise beliefs may be seen as lacking 'ecological

validity’ - teachers may be categorised out of the classroom as ‘transmitters’ or ‘co-explorers’ of knowledge but in the classroom they are pragmatists and adapt to the contexts in which they work. Beliefs, in some of the literature, appear to be ‘constitutional’ and fixed rather than constructed through social engagement and it is perhaps with this in mind Johannesen and Habibb (2010) prefer to discuss pedagogical belief in the context of negotiation of professional identity within a community of practice, rather than as internal constructs.

Beliefs about teaching and learning are regularly seen as important in explaining the take-up of ICT. Ertmer (2005) sees beliefs as the last barrier in the adoption of ICT, but this is overstated given that lack of training and classroom support, restricted access and the traditional nature of assessment are all well reported constraints. However, beliefs are important, in particular they do provide the lens through which teaching with ICT is viewed (Levin and Wadmany 2005; Webb and Cox 2004). There has often been a supposed association between a belief in a ‘social constructivist’ approach to teaching and a readiness to engage with ICT (e.g. Becker 2000; Ertmer, 2005; Gobbo and Girardi, 2001; Van Driel, Bulte and Verloop, 2007) and, for some, an engagement with ICT may be seen as strengthening a belief in social constructivist pedagogy (Windschitl and Sahl, 2002). Some go further and see exposure to ICT as a catalyst for a change in pedagogic belief, but this is viewed sceptically by Dexter, Anderson and Becker (1999), Levin and Wadmany (2005) and Olson (2005). The relationship between pedagogical beliefs and practice is complicated (Higgins and Mosely, 2005) and at times unhelpful for those seeing the use of ICT as a vehicle for curriculum change (Drenoyianni and Selwood, 1998). Studying beliefs may divert attention away from other factors which are influential in the adoption of ICT, at the individual teacher level, such as a disposition to engage in CPD and a general willingness to accept change (Vanetta and Fordham, 2004).

In short, we know that teacher beliefs are important, and offer some explanatory power in terms of engagement with ICT, but this is a contested field in which further investigation is helpful.

Background to the study

A project was carried out from 2007 – 2009 to ‘give voice’ to the experiences of educators who had had all taken part in the Association of Information Technology for Teacher Education (ITTE) from which TPE originated, in 1991, under the title of the

Journal of Information Technology for Teacher Education. ITTE is a professional association, formed in 1986, to support, and more generally help network, colleagues with professional and academic interests in pre-service and in-service teachers' use of ICT. Seven women (identified as participants A – G) and eight men (H – O), all aged over 50, took part in in-depth interviews. All but two spent most of their professional lives working in HE institutions, the other two (A and G) had extended experiences of teacher support agencies. Twelve had taught in school or Further Education Colleges for several years. Participants developed an interest in all phases of education but three (A, G, N) had more involvement in early years and primary (ages 5 - 11) education and four (B, H, I, O) in secondary (11 - 18) education. Five became professors in HEIs. All were based for all or most of their professional lives in England. Each participant took part in long wide ranging interviews, carried out in 2007 and 2008, and loosely structured around their career in general and in computers in education in particular. All had used ICT in their own teaching, carried out research into ICT and supported others in using ICT.

Participants represented an opportunity sample (n=15), albeit one designed to be broadly representative of this age 'cohort' within ITTE community in England. In fact there turned out to be a high degree of consistency in participant views. In addition, through wider presentations and discussion at ITTE conferences (including *ITTE Research Conference*, University of Cambridge, February 2007) it was found that participants' views were representative of a wider strand of thinking about technology and learning. However the participants were not representing ITTE nor were they proposing pedagogic guidelines for the association. Their contributions to ITTE were important but not necessarily more noteworthy than those of others within the association.

Data were analysed through constructing a long list of inductively generated initial codes which were condensed into six overarching categories namely: Biography; Technology; Application; Philosophy; Policy; Community with beliefs about teaching and learning contained within the categories of Application and Philosophy. Each category was broken down into sub categories through comparison of data (cf Samuelowicz and Bain, 2001). This enabled descriptive reporting which was later extended by exploring relationships between categories in more detail and comparing and contrasting to wider literature. The *trustworthiness* of the reporting was assessed through internal consistency and participant validation. A type of triangulation was achieved through comparison of participants' accounts with their publications and contributions to conferences. However,

it is always possible in this kind of study that, in looking back, participants may have invested decisions made during their careers with an overall coherence which was not so apparent at the time.

In this study beliefs covered ‘what was held true about teaching and learning’ and were ascribed to participants through analysing their accounts of their careers and the various teaching and research roles they had undertaken. The focus was on what they espoused about teaching and learning with technology rather than their performance in the classroom, for which a very different type of study would be needed.

The section that follows considers participants’ beliefs and normal desirable states in teaching. Quotes have been selected sparingly to illustrate particular points; fuller data are available within an earlier descriptive reporting of the study (Hammond et al, 2009).

Findings: What do these teacher educators believe about knowing and learning?

A common theme among participants was that to learn something was to strive to make sense of it. This was consistently held across contexts: classroom teaching; the CPD they offered; their practitioner and academic reporting; and their own professional learning. As one put it in relation to her own career, ‘finding things out needs to be driven by some sense of curiosity and passion’. Learning was about setting challenges and ‘expending intellectual energy’ in trying to meet those challenges. This had implications for both learners and teachers. Learners needed, if not to be ‘passionate’, at least to take some of the responsibility for making choices and taking the next step. It was not enough, for example, for learners to take on trust something that had been given to them. 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 be misunderstood tomorrow. This was a general principle – there was more to know and teachers as learners should keep experimenting and trying out new things.

Learners needed to make personal meaning of new information and this meant teachers needed to provide opportunities for learners to take responsibility and make explicit the importance of doing so. The teacher could not do this without setting up dialogue with the learner and seeking to fit the curriculum around the learner. One participant [O] recalled designing a new course for which funding had been given:

So what we tried to do there was to look at how the curriculum could be constructed differently and how 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 interested them, using the technology to record it, but also using technology to connect with kids in other schools.

While participants believed strongly in the importance of learning by doing, activity needed to be designed and needed to be followed by reflection. Sometimes this reflection was almost spontaneous or at least a natural outcome of activity. For example, some felt that in working with the programming language *Logo* children were drawn into reflection, say, by de-bugging errors, 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. An example given by several respondents was the use of online forums which, even when intended for fellow professionals, could, without moderation, be repetitive in the topics covered and subject to aggressive and unsupportive comments.

Participants can be seen as holding a broadly constructivist view of learning in which knowledge was acquired through engagement with the world. The world was, of course, subject to multiple interpretations but shared meanings could be negotiated through collaborative activity, dialogue and reflection. In particular, and to borrow from Crotty (2003, p44), learners are seen as *constructing* rather than creating meaning - they have something tangible to work on. Knowledge, however, was seen as unbounded and could not 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 was about making new associations which cross boundaries. For example, one participant [L] explained his own learning in these terms:

I mean, 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 and a view of knowledge as 'profane' (compare with John, 2005) in the sense that 'bodies of

knowledge' were open to contestation and to change. Many participants had a commitment to cross-curricular working, where this was possible. In discussing boundaries most talked about the tension between school knowledge which was bounded by the text book as against the unlimited resources offered through the Internet. Some made a more general point that teachers and children should not feel bounded by the physical classroom.

Beyond this belief in knowledge as 'constructed', and learning as striving for personal meaning through reflection on activity, participants held beliefs about teaching and learning which were much more dependent on contextual factors. For example while all agreed that teachers needed to supply learners with a rationale behind a task, and be clear in their own mind about what they were hoping would be achieved by setting such a task, teachers could take on different roles depending on learners and subject content. They might, say, take the position of a co-learner, particularly in relation to CPD work; at other times they might be guiding learners in assessing; or they may have an explicit role in instructing, explaining, directing and challenging pupils on top of their responsibility for everyday classroom management. The contextual nature of these beliefs was clear and all were acutely aware of the constraints, including particular subcultures, within which technology was expected to be used. While these participants could be easily placed at the learner centred end of this continuum much their practice in the classroom needed to be negotiated according to circumstance. However, beliefs remained important in the evaluation of practice, in particular in contributing to mental models of 'normal desirable states' of teaching and learning.

Normal desirable states

Brown and MacIntyre (1993) suggested that teachers carry a sense of a 'normal desirable state' (NDS) in the classroom which they try hard to achieve and maintain. An NDS provides a sense of what pupil activity and progress should look like and it is a concept that has been adapted in relation to teachers' use of ICT (e.g. Kennewell, 1997, Ruthvern, 2009). It proved helpful here, too, in explaining the judgements participants made about teaching and learning.

Accounts of practice seemed to be aligned with NDSs when learners were involved actively in making meaning. For example Participant F describes with enthusiasm her early use of the text revelation package *Developing Tray* as:

With those sorts of programs the answers aren't there, you've really got to work them out. And that seemed to me to be....and I saw in the children, you could almost hear the wheels going round in their brains because they really had to work hard at doing it but they were really motivated to do it as well, it set a challenge for them.

And here another participant [B] recalls her early use of word processors:

We would put a poem in a particular genre and then they would go away to the word processor and come up with their own and try it out on each other. And those sessions you had to beat them off with a stick to go away at the end. They would have stayed there for hours if you let them.....Those are the kinds of things that ICT gives you that are very difficult to do otherwise.

NDSs were informed by beliefs in learning but also took in knowledge of the curriculum, craft and practitioner know-how and an awareness of context. In this example participant [G] draws on considerable personal knowledge of teaching to fit the computer, quite literally, around the child when using *Logo* with young children in her early teaching career:

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..... 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.

If NDSs provided a frame of reference to evaluate successful use of ICT they were also a means for judging what was 'going wrong'. Here, for example, participant [C] describes her work with a group of young learners when first using word processors:

I found myselfteaching Information Technology to the children - in fact only a week's training ahead of them. I was given a word processing manual, no computer mind you, and told you teach them word processing on Monday. I spent the whole weekend doing flash cards with 'Save' and 'Edit' things like that and then of course on the Monday the children whooped past me and started to

use the keyboards. And I said 'Stop, stop I don't know what you are doing'. And it was in that period that I saw a complete change in what children actually do when left to their own devices and when the teacher actually knows less than the children. Eventually after about four weeks of this one of them said 'I am bored' and I said 'I am bored as well but at least you have a computer but I don't have one, what do you suggest?'. And they said 'before we did this, we were doing a magazine with you and wasn't this what all this (the computers) were for?'. At that moment I got into that idea of publishing and all this business of teaching skills went out the window.

This learner may well have been 'bored' but this could have been quite acceptable within a different frame of reference. For example the teacher could respond by suggesting that acquiring a difficult skill required focus and any disciplined activity is 'boring'. Indeed the definition of 'boring' is subject to endless 'interpersonal negotiation' between teachers and young people. However, in this case, the pupil's response triggered a judgement, on the part of the teacher, that her practice with ICT was not aligned with a NDS in which learners should be engaged with meaning making. She sought realignment by providing more authentic activity in which pupils were able to progress in their learning by creating personalised products for a defined audience. In other words teaching was to be refashioned to involve purposeful activity and feedback.

Many of the examples offered by participants to show alignment of teaching with NDSs involved communication. This might take place within learner teams (for example through working together on a simulation package); between teachers and learners; and across schools (as in developing short films and uploading them onto a web site). In NDSs learners were typically given an element of control (cf Wishart 1997), for example if they were directed to web sites they were also encouraged to locate and assess new sources of information for themselves. They should have choices to make and should see for themselves consequences of those choices.

NDSs provided a stable, pre-existing frame of reference within which to evaluate teaching and learning. However, participants were also aware that the use of technology allowed changes in the nature of teaching and learning (cf Kennewell, 1997) by providing a pragmatic extension and enhancement of existing practice. Extension at its simplest could mean, say, offering the teacher different media for explaining concepts to learners, and giving pupils greater control and more enjoyment through the use of simulation and

general purpose packages. Enhancement came about when an activity could not be easily done otherwise and they pointed, for example, to the possibilities opened up by digital storage and the speed of processing. A common theme was that technology enabled the closing of distance. Several spoke about the ways in which technology enabled different patterns of communication' including Internet supported online discussion and participation in social networks such as My Space, Bebo and Facebook. 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'.

Over time participants became used to looking for opportunities to develop, say, communication and creativity through their use of technology and this became easier as their skills, their vocabulary and their sense of efficacy developed. This led to increasing dissatisfaction among many about the nature of 'schooling' and the constraints on teachers and teaching. Many could imagine a very different, less bounded, more experiential learning curriculum enriched by pervasive use of ICT.

Discussion

The discussion considers the findings in relation to the three questions asked at the start of the paper: what are beliefs about teaching and learning?; how can beliefs about teaching and learning be categorised? what is the relationship between beliefs in teaching and learning and engagement with ICT?

What are beliefs about teaching and learning?

As reported in this study, beliefs are ascribable internal constructs concerning what is held to be true about teaching and learning. They appear stable and held across time and context; beliefs are 'like possessions' (Abelson, 1986), we carry them around with us. Beliefs do not determine or predict teacher behaviour but they set out the 'terms of reference' for evaluation of teaching and learning and they illustrate that judgements made about teaching are reflexive and necessarily 'bend back' to internal systems of meaning (Gilroy and Wilcox, 1997; Winter, 1989). Beliefs are subjective and need not seek logical validation but they are not easily differentiated from 'knowledge', in particular they are enmeshed with the kind of personal knowledge described by Polanyi

(1969) and by Eraut (1998) to cover ‘what individuals bring to situations that enables them to think, interact and perform.’

Beliefs vary in nature and scope. As in the Brownlee, Boulton-Lewis and Purdie (2002) study of learners, beliefs in this study about *knowing* appeared *core* in that they were strongly connected to other beliefs. As with Nias (1984), in her work on perceptions of the role of primary teachers, core beliefs seemed to carry a strong sense of emotional attachment, moral purpose and are important for self-identity. Beliefs about *learning*, on the other hand, were more likely to be ‘peripheral’ in that they were affected by contextual factors. Differences between core and ‘peripheral’ beliefs were matters of degree not of kind but do provide an alternating ‘lens’ through which to interpret judgements about teaching. For example, participants were clear that learning required active engagement. This was a peripheral belief about learning in that learners more actively involved in activity may be more likely to acquire and internalise knowledge. However, this belief in active engagement was also a core belief about knowing in that the very definition of the word ‘learning’ implied personal commitment; the struggle to make meaning was an end in itself. To emphasise the point, there were others ways that one might seek transfer knowledge, on the face of it ‘behavioural conditioning’ and indoctrination may do this successfully, but this would not be ‘learning’. Hence it could be seen that participants’ objections to cruder forms of programmed instruction were not simply contextual or peripheral concerns but clashed with a core belief in the nature, and definition of, learning itself.

Beliefs are stable sets of references but they are not innate. For reasons of space the genesis of these educators’ beliefs are not discussed, but biographic data suggest that higher education in particular was an important formative experience. This suggests that core beliefs are stable but not immutable.

Categorising beliefs about teaching and learning

The distinction made by Brownlee, Boulton-Lewis and Purdie (2002) and others between beliefs about knowing and beliefs about learning is an important one. In regard to *knowing* participants in this study could be categorised as broadly constructivist, belonging to a tradition that sees knowledge as emerging from an interaction between human beings and their world and developed and handed down within a social context. This arguably represents a dominant paradigm in how we now think about knowing (Crotty,

2009), at least within educational theory, and contrasts with a more 'naïve' belief that there are objective truths and 'sacred' bodies of knowledge. In regard to *learning*, participants' commitment to meaning making, dialogue and collaboration puts them at the learner-centred rather than the transmission / transfer / teacher centred model end of the teaching and learning spectrum described earlier. Such a learner-centred position can, and often is, described as 'social constructivist pedagogy' defined, for example, by Windschitl and Sahl (2002) in terms of a commitment to: collaborative group projects; designing activities around teacher and student interests; focusing instruction on students' understandings; teaching students to assess their own understandings; collaborating in learning rather than seeing the teacher as the final arbiter of knowledge.

There is understandable confusion between constructivism as an ontological orientation (a belief about knowing) and social constructivism as an instructional strategy (a belief about learning), but they are not the same thing. The pedagogical implications of constructivism are open to interpretation but if knowledge is provisional, unbounded and personal this would suggest a more reflexive teaching practice, a willingness to hold pedagogical principles up for critical review and open-ended negotiation with learners (cf Goodson and Mangana, 1995). This would also be consistent with seeing ICT as multi-dimensional, ie capable of varied interpretation and application. The role of the educator in this context might become one of peering inside, and helping others to peer inside, the 'black box' of technology (Johannesen and Habibb, 2010). In contrast, a belief in social constructivist pedagogy implies greater certainty about particular teaching practices and a stable set of associations of technology with learner centred, and even, emancipatory pedagogy. This tension between beliefs about knowing and beliefs about learning is carried over into the professional roles that these educators carry out as they have a responsibility both to explore teaching and learning and to communicate 'desirable practices'. An example of this is when participant [A] feels she has successfully communicated, within an in-service course for teachers, a pedagogy for teaching and learning with ICT only to find that she has not provided opportunities for personal meaning making:

On one of the courses that we'd been running one of the teachers on the course said that she'd really like to do some work on databases with her children but that it was going to be difficult to do so could she arrange to bring them into the centre and use all our equipment. And we said 'yes, no problem'. I was shocked

when this teacher brought her class in to find that she did as a lesson with them exactly what she had done in one of the training sessions. And I was thinking ‘well this isn’t right because we didn’t design that with children in mind.

Beliefs in teaching and learning and engagement with ICT

Beliefs loom large in understanding engagement and non-engagement with technology because, in the context of limited resources and curriculum constraints, the use, or not, of ICT is very often optional for the practitioner. This is confirmed throughout the biographical data in this study in which participants notice opportunities to take part in in-service training, to trial materials or resources, to attend courses, to move jobs; while encouragement was offered, taking advantage of these opportunities was very much a question of personal choice. In contrast, in many schools at the present time, teachers use the interactive whiteboard (IWB) because there is ready access to one and there is a cultural expectation to do so. The *decision to use* the IWB is triggered by the context, and not personal belief, albeit the nature of IWB use will be affected by what the teacher believes about teaching and learning.

While beliefs frame the way in which technology is viewed the relationship between belief and technology is not a simple one; participants in this study are not simply projecting their beliefs on to the technology. There is a two-way relationship which is difficult to capture but can be best understood if technology is seen both as a means for carrying out pre-specified actions *and* an object of enquiry in its own right. For example, participant [I] describes that, in his early use of ICT, he:

loved the bits of software that created things, graph plotting, graphics, spreadsheets, writing basic programmes that did calculations or did things or drew things and I just immediately saw as a mathematician what a great tool this was. For things that previously you’d had to hack out on the back of an envelope for hours, the machine would immediately show you the answer. I remember an epiphany when I first saw a 3D image plotted of things that I’d only ever seen pictures of in books, you have a fabulous power to do that kind of stuff.

This shows an appreciation of the potential of ICT for carrying out operations which would take a great deal of time and effort otherwise, but there is something more, an epiphany when he realises that the subject was not going to be the same again. It is

tempting to generalise from this and other examples to see technology as a catalyst for pedagogical change – even pedagogical enlightenment - but this is not helpful.

Participant [I] is bringing his beliefs and knowledge to the technology; exposure to technology cannot suggest modes of activity for which there is not the pedagogical belief and understanding in the first place (Olson, 2005). To emphasise the point, neither he, nor others in the study, found that exposure to programmed learning triggered a passion for a transmission model of teaching and like others this participant could imagine a parallel teaching career, not involving technology, in which he could have given expression to his beliefs about teaching and learning.

Summary

At the start of this paper it was suggested that beliefs were a contested concept and there was no agreement on the relationship of beliefs in teaching and learning to engagement with technology. In this study it was found that beliefs are challenging to identify and describe but can be ascribed through examining accounts of practice. Beliefs are not predictive of behaviour but they do help explain the framework in which judgements about teaching and learning are made. Beliefs differ in nature and scope. Here a core belief in knowing as constructivist and a more peripheral belief in learner centred or social constructivist pedagogy were uncovered. Technology is viewed through a framework of belief and personal knowledge but the relationship is a two way one, beliefs are not projected on technology and technology is not a catalyst for a change in pedagogical belief.

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