What has not yet been fully understood is that computer-based technologies can be powerful pedagogical tools—not just rich sources of information, but extensions of human capabilities and contexts for social interactions supporting learning. The process of using technology to improve learning is never solely a technical matter, concerned only with properties of educational hardware and software. Like a textbook or any other cultural object, technology resources for education function in a social environment, mediated by learning conversations with peers and teachers (Bransford, Brown, & Cocking, 1999, p. 218).

1. The interActive education project

This paper explores the relationship between Information and Communication Technology (ICT) and learning in schools. It draws on the preliminary results of the InterActive Education Project, which is concerned with learning within the subject areas of English, history, geography, mathematics, music, modern foreign languages and science. Within the project teachers, teacher educators and researchers work together to develop and evaluate learning initiatives (called Subject Design Initiatives). These SDIs are concerned with learning about particular areas of the curriculum which students might normally find difficult and where a particular use of ICT could enhance learning. The idea is to use ICT which is readily available in schools and yet under-utilised, for example Word and drop-down menus in modern foreign languages, the Oxford English Dictionary on-line in English, and graph-plotting software in mathematics. One aspect of the project is to understand why, despite three decades of government initiatives and academic...
research, the use of ICT in teaching and learning remains only partially understood by educationalists and inconsistently practised in schools.

The InterActive Education project is predicated on the view that ICT alone does not enhance learning. How ICT is incorporated into learning activities is what is important. Here the role of the teacher is crucial and a focus on design within the InterActive Education project foregrounds the teacher’s responsibility to craft a learning situation. Feedback on student learning is provided by digital video recordings of classroom interactions, together with students’ work and interviews with students. This data is used by the teacher–researcher team to investigate the relationship between teaching and feeds back into a re-design process. In this sense teachers and researchers are engaged in learning throughout the project.

Within this paper I interleave a consideration of the theoretical ideas which inform the project with preliminary results from analysis of teaching and learning within the Subject Design Initiatives. A particular aim of the paper is to describe and theorise the links between teaching and learning in ICT-rich settings.

2. Learning and mediated activity

A fundamental assumption in a socio-cultural understanding of human learning is precisely this: learning is always learning to do something with cultural tools (be they intellectual and/or theoretical). This has the important implication that when understanding learning we have to consider that the unit we are studying is people in action using tools of some kind (Säljo, 1999, p. 147).

When considering learning in schools it is important to take into account the fact that all human action is mediated by tools (Cole & Engestrom, 1993; Säljo, 1999; Wertsch, 1991). The idea of ‘tool’ includes a wide range of artefacts and semiotic systems, where cultural artefacts are both material and symbolic; they regulate interactions with one’s environment and oneself. In this respect they are ‘tools’ broadly conceived and the master tool is language” (Cole & Engestrom, 1993, p. 9). Tools could be digital, such as a word-processor, dynamic geometry software, music composition software, e-mail or an interactive whiteboard. They could be non-digital tools, such as a book, paper and pencil or a dictionary. A ‘tool’ could also be another person who is supporting human action. This foregrounding of the tool using aspect of human action is of particular importance when considering the role which digital technologies can play in learning.

Linked to this perspective is the idea that the use of a tool qualitatively changes the flow and structure of an activity, not simply facilitating activity which might have taken place without the use of such a tool. In this sense tools both enhance and constrain activity. For example if I use PowerPoint to prepare a presentation I am likely to structure the preparation work differently from if I were using a word processor. Using PowerPoint I am likely to make use of images to represent my thinking. Using PowerPoint I am likely to focus on sub-sections and associated headings. Using PowerPoint I am likely to simplify my thinking. On the other hand if I were to write a full-text in a word-processor, in preparation for a presentation, I would be more likely to engage with the complexities and inconsistencies in my thinking. It is useful here to consider the idea of affordance of a tool (Gibson, 1979; Norman, 2002). What would using PowerPoint afford
the preparation activity? What would using paper and pencil afford the preparation activity? This idea of affordance cannot be separated from the context of use and the person’s perception of what a particular tool can be used for. It could be argued that a resourceful learner would be aware of the potential affordances of a range of tools and choose them accordingly. This awareness would involve knowing when to use digital tools, when to use non-digital tools and knowing when to draw on the resources of other people.

The idea of affordance is important when deciding which software to use in the classroom. Dance eJay™ enabled primary pupils to enter the world of music composition (Gall & Breeze, 2002). One of the ways in which it was made accessible to them was through drawing upon popular music culture with which English primary students are familiar. This affordance, relates to a particular branch of popular music of the late 20th and early 21st centuries. However, the affordances of Dance eJay™ for these particular pupils are different from the affordances of other music composition software. Dance eJay™ tends to constrain the compositional possibilities for some students through its provision of pre-recorded musical building blocks or samples within a single style. The ability to add additional material and to change the existing samples is possible but pupils rarely engaged with this in the study owing to lack of equipment, the constraints of working within a typical primary school computer room and time pressures.

Within the InterActive project we are interested in the ways in which the use of a particular tool transforms a young person’s activity. We are also interested in the possible residue left when the tool is no longer being used (Salomon, 1993). Does a person continue ‘to think with a tool’ even when this tool is not materially present? Consider, for example, the work of Eloise who when attempting to solve a mathematical problem on paper, after having solved similar problems with a spreadsheet, represented the spreadsheet on paper in order to support her problem solving processes (see Fig. 1).

This example powerfully suggests that a new tool can become internalised as an available resource for future activity whether or not this tool is materially available.

3. Resourceful learners

An issue for teachers to consider is whether it is important within a particular domain of activity for young people to be able to work with both digital and non digital tools. Is it important to be able to compose with a digital composition package as well as by traditional means? Is it

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Chocolates problem:
100 chocolates were distributed between three groups of children. The second group received 4 times the chocolates given to the first group. The third group received 10 chocolates more than the second group. How many chocolates did the first, the second and the third group receive?

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2 Dance eJay, Superpack version, FastTrack Software Publishing: www.fasttrack.co.uk
important to write with paper as well as with a wordprocessor? Is it important to do geometry on paper as well as with a dynamic geometry package? Is it important to carry out science experiments in the lab, as well as within a digital simulation.

In some situations it does not make sense to consider what is being produced separately from the use of a particular digital tool. This is the case when the use of an ICT tool makes the production of something possible which would have been impossible without the use of such a tool. For example within the InterActive Project we are using digital tools to produce video papers of classroom work. Video papers incorporate excerpts of classroom video, text, sound and images (see for example Olivero, Sutherland, & John, 2004). Such papers could not have been produced without digital technology. In other situations digital tools democratise an activity, that is make it accessible to groups of people who would not previously have had access to such an activity, although the activity could be carried out without the use of a digital tool. This is the case when students use composition software to compose music. However there are also situations where a person would be more resourceful if they could use a range of digital and non-digital tools for similar activities. For example a paper-based algorithm for long multiplication can still be a valuable resource in a range of situations. Writing on paper, as opposed to a word processor is likely to continue to be important for certain types of literacy activities, for example sketching out ideas!

What is becoming increasingly clear within the InterActive Education Project is that within any learning situation in which ICT is to be used, it is important to analyse the interrelationship between the knowledge domain and the proposed use of digital and non digital tools, together with a consideration of the culture and context of learning, the students’ previous history of learning and the ways in which the teacher will interact with students throughout the learning

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process. In some senses there is no difference here between an analysis which would take place even if ICT were not being used. What ICT has done is draw our attention to both the tool-using aspect of human endeavour and to appropriate theories of learning. In this way the use of ICT itself can become a tool for enhanced theorising of teaching and learning, whether or not ICT is being used in the learning process. The following examples give a flavour of the different ways in which ICT is being used by teachers within the InterActive Education project.

- In Ruth Coles and Elisabeth Lazarus’s German classroom students are using drop-down menus in word to support their writing in a foreign language. There is strong evidence that this type of template use supports students to both write more in the foreign language and take more risks with grammar. The aim, in this case, is that students will eventually write without the support of a drop-down-menu-system. Here ICT is being used as a scaffold for learning and this scaffolding will ultimately be removed. The research shows that students’ writing on paper is enhanced after the digital experience (Taylor & Cole, 2002).

- Secondary English teachers, Adrian Blight and Chris Davies have been working with students using PowerPoint and Word 2000 to produce multimedia presentations and web pages. The development of multimedia texts arises out of digital technology and so it does not make sense to expect students to produce multimedia texts without digital tools. In this situation students are learning about new textual paradigms and multimodal communication within the new digital landscape.

- In Chas Blacker’s A-level English Language classroom, students are using the Oxford English Dictionary on-line in conjunction with the Infotrac newspaper data-base to investigate ‘lexical diffusion’, or the ways in which new words come into the language. In doing this they are emulating recent ICT-enabled practices in dictionary-making and language study. They check the official record of the word in the dictionary against the evidence of language in actual use in newspapers. Digital technology has changed the whole field of Applied Linguistics: in some sense what these students are doing reflects the changing practices in the field because it gives them instantaneous access to vast searchable text data-sets. They can hypothesise and test hypotheses rapidly in ways not feasible with book and paper technologies.

- In Dan Sutch’s primary English classroom students are using WordRoot and PowerPoint as a means to analyse the structure and etymology of the spelling of ‘hard words’. Such English words are hard for learners because they appear long and complex and also show a low level of regular sound/spelling correspondence (phonic regularity). The key to understanding these words is through their high level of semantic, morphological and etymological system. By working with multi-modal re-representations of these words, the students are able to see the underlying structures and patterns across this type of vocabulary. Through these activities their spelling has improved as evidenced by paper and pencil tests. More importantly their whole understanding of language has been enhanced. They have moved from rote learning to learning based on properties and system. They have acquired a cultural code or toolkit to enable them to cope with the complex vocabulary which will intensify in their secondary school years. They have also developed a curiosity and interest in English spelling. Throughout life these students will be expected to spell words correctly whether working with digital or non digital technologies (Sutch, Shortis, & John, 2003).

- In Rachel Zewde’s secondary mathematics classroom students have been using graphic calculators to learn about the properties of functions and graphs. Functions and graphs exist outside
digital technologies and so, as in the case of Dan Sutch’s class, it makes sense for students to work with both digital and paper-based graphs (Godwin & Sutherland, 2004).

- In Emma Scott–Cook’s inner city primary classroom eight and nine year olds used email as part of a history project on the Vikings. The invitation to interact with fictional Vikings, Freya and Thor, was designed to provide both a source of information and an authentic communicative experience through which the children would develop their understanding of purpose and audience as factors which shape writing. There is evidence that, within the sustained interaction that email as a channel afforded and scaffolded by the conventional format and the models provided by the “Viking” correspondent, children were adjusting the form and style of their writing as their awareness of the reader increased. The exchanges show a clear sense of equality and reciprocity between participants and the motivating force of authentic communication is evident in those children who sustained the correspondence long after the History project was completed (Triggs & Scott Cook, 2002).

- In Simon Mills’s primary mathematics classroom students have been using the spreadsheet Excel and a publishing package to support their investigation of the distribution of the colours of Smarties in a tube of Smarties. This wider investigational activity is about learning how to represent and manipulate data. Bar charts, pie charts and pictograms exist outside the world of digital technology and so it makes sense for these students to use both digital and non-digital tools to represent the data they are collecting.

- In Sven Rees’s music classroom students composed with the Cubasis VST audio sequencing software. Although musicians can use a range of tools to support the composition process (for example, a musical instrument, conventional music notation, manuscript paper, tablature, chord and lyric sheets) the use of digital software arguably democratises the process, making composition accessible to students who cannot play a musical instrument or do not necessarily engage with formal music theoretical skills. This inclusive affordance of sequencing software mirrors compositional practices adopted by professional composers, often associated with contemporary popular music production.

- In a science classroom students are using science simulation software to learn about the scientific method of experimentation. The simulation software has become a substitute for the ‘real thing’ in a way that is different from all of the above examples. There are some situations where a simulated science experiment is the only viability in a science classroom and there are other situations in which a simulated experiment is a sanitisation of the ‘real thing’.

Whereas a superficial analysis of work in the project classrooms might lead to an interpretation that teachers who ask students to work on both paper and the computer are doing this because of a preoccupation with the assessment system, a more detailed analysis suggests that teachers might have an almost implicit awareness of the role of digital and non-digital tools in worlds outside school. If both non digital and digital tools have potential within the same type of activity (as, for example, in many situations in mathematics) then expecting students to work with both types of tools is a sound educational practice.

What I am arguing for here is an analysis of the aims of a particular learning situation and a consideration of the affordances of a range of tools to fit with these aims. To do this a teacher has

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4 Cubasis VST (version 2.0 for MAC) Steinberg: [www.steinberg.net](http://www.steinberg.net)
to have experienced the use of these tools for themselves, where this experience involves working within a ‘subject’ world, whether mathematics, English, modern foreign languages, history, geography, music or science.

4. Learning and available designs

As mentioned above language is the master mediating tool in any activity and language is clearly central to learning in the classroom (Mercer, Wegerif, & Dawes, 1999). Wertsch, Tulfiste, and Hagstron (2003) suggest that in school successful students incorporate the pattern of teacher–student (inter-mental) interaction into their own (intra-mental) functioning. They also suggest that less successful students may not be able to do this if they have only participated in classroom talk in a relatively passive way. They use this argument to explain the success of Brown and Palincsar’s (1987) reciprocal teaching experiments for reading comprehension, which involved students in externalising activities which were designed to monitor their reading comprehension, within a repetitive structure which scaffolded student discourse.

With normal classroom discourse, unless pupils spontaneously begin to pose the same questions to themselves that are posed by the teacher, they are left in a position where passive responses are all that is required. It is this situation that indeed appeared to have occurred in the case of the poor readers studied by Palincsar and Brown. In contrast, the procedures employed with reciprocal teaching challenge the basic authority structure of the classroom discourse. Instead of leaving the teacher in the position of ultimate ‘cognitive authority’, pupils are required to appropriate this social language (Wertsch et al., 2003, p. 349).

Drawing on the work of Bahktin, Wertsch emphasises the role which ventriloquism plays in learning. In the case of the reciprocal teaching experiments initially students mimic (or ventriloquate) the words of the teacher, but gradually they populate these words with their own words. As Wertsch et al. (2003) argue this process of taking on responsibility for a task by actively appropriating others’ mediational means is basic to the formation of mediated agency. In this way students can become re-equipped with new linguistic mediational means. This act of linguistic ventriloquism is an important learning mechanism.

Bahktin (1981) distinguishes between two types of discourse, ‘authoritative’ discourse and ‘internally persuasive discourse’. Within ‘authoritative’ discourse there is no room for another voice to come into contact with and inter-animate with the authoritative voice. Authoritative discourse does not function as a tool for others to think with and is relatively static and closed. In contrast the structure of ‘internally persuasive discourse’ is open, it allows the possibility for new meaning making. It allows the voice of others to come in. Analysis of the video data from the InterActive Education project shows that some teachers predominantly use an authoritative discourse whereas others predominantly use an ‘internally persuasive discourse’.

In working with teachers on the subject design initiatives we did not explicitly draw attention to this aspect of language use, but our ongoing analysis of video data investigates the relationship between the students’ and the teacher’s discourse. Interestingly it seems that some teachers become more authoritative in their use of language when they work with ICT (particular in spaces such as ICT suites with which they are unfamiliar). This finding, which is consistent with what many young people told us in the Screen Play Project (Facer, Furlong, Furlong, & Sutherland, 2003) is at odds
with the policy rhetoric about ICT and teaching. Here ICT is supposed to provoke teachers to work in more open and inquiry-based ways. But as we have emphasised above it is not possible to consider the use of a tool in isolation from the cultural and social context of use. Within schools there are many factors which impinge on how a particular tool is used and pressure-of-time is one characteristic which seriously constrains the use of ICT in the classroom (Facer et al., 2003).

In our ongoing analysis of data we are also investigating whether a teacher’s language is predominantly focused on subject discourse or predominantly focused on technical ICT issues. If mimicry and ventriloquism are important mechanisms for entering the discourse of a new world, then ‘what a student talks about’ is likely to reflect ‘what a teacher talks about’. Or to put it more bluntly, it is not likely that students will enter the world of history if the teacher’s talk is focused on ICT skills, such as how to save work or how to change fonts. There is evidence from the InterActive Project that for some teachers the use of ICT does disrupt their normal subject-focused language. As they enter the ICT suite they start to emphasise ICT discourse at the expense of subject discourse. The video data provides evidence of such practices and is also an important tool for teachers to reflect on their own practice when using ICT in subject teaching. One possible explanation for this phenomena is that a teacher may not have integrated their knowledge of ICT with their subject knowledge (for further discussion of this see Robertson, Shortis, Todman, John, & Dale, 2003).

Mimicry as a mediating process of learning, or entering a new world, also operates with a whole range of semiotic forms. Alistair (age 9) used a process of copying to enter the world of computer programming.

Alistair: Well I was sort of fiddling around with it. I was trying to figure out how it worked but I never succeeded until I got this one book out of the library and at the beginning it gave a small list of a Basic program.

Interviewer: And you put it in did you?

Alistair: Yeah, it sort of told you to write some text to the screen and to ask for input from the user. That’s what I’d been searching for ages. And I just knew that then I could probably do other things. And from that I could read a bit more in the book, how to use maths in my programming.

(Facer et al., 2003, p. 195).

In this sense he was using the available designs and transforming them for his own purpose The New London Group (1996) view all semiotic activity as a creative application and combination of ‘available designs’. With these available designs a person begins a design process, which involves re-presentation and re-contextualisation. The outcome of this design process is what they call the ‘Redesigned’ “the Redesigned may be variously creative or reproductive in relation to the resources for meaning-making available in Available Designs. But it is neither a simple reproduction (as the myth of standards and transmission pedagogy would have us believe) nor is it simply creative (as the myths of individual originality and personal voice would have us believe)” (New London Group, 1996, p. 75).

I argue that this design process is a powerful tool which allows young people to enter worlds with which they are unfamiliar. I also suggest that teachers are not always aware of the impor-
tance of the mimetic aspect of design as a learning tool. They are more likely to criticise and suppress any act which they view as copying. In so doing they may be inhibiting an important learning resource, which is widely used by young people out of school (Facer et al., 2003). This contrasts with software designers who in their incorporation of a wide range of templates into software, explicitly recognise the importance of copying from ‘Available Designs’ as a starting point in the production of a new work.

5. The classroom as a community of learners

Whatever tools are being used in the classroom, students bring to any new learning situation their previous history and experiences of learning, some of which will derive from out of school. For example some of the students in Jo Heppistall and Natalie Heysham’s music composition class had used the software Dance-eJay out of school and brought this expertise to the classroom. These primary teachers organised the classroom learning in such a way that this experience was shared around the classroom. Other students brought their experience of playing a musical instrument to the classroom and again this added to the distributed knowledge of the class. Gall and Breeze (2002) suggests that this openness to the previous musical experience of students may have substantially contributed to the musical nature of this particular Subject Design Initiative, because the primary teachers were not particularly experienced as musicians or with the use of composition software.

When Simon Mills developed an SDI to introduce his year 4 (age 8–9) class to data handling within the context of a project to investigate the distribution of colours of Smarties, he decided to take the risk of using the spreadsheet Excel, even though within school (at least) these students had never previously used a spreadsheet. He anticipated (as it turned out correctly) that his students’ experience and confidence in using other ICT packages, would enable them to rapidly learn how to present tables and graphs in a spreadsheet. When the students were producing their first table to represent the distribution of colours in a Smartie tube one pair, without any prompting from the teacher, immediately produced a bar chart from this table of data. It was as if this student’s confidence at playing with such software packages had enabled him to discover how to do this. And this confidence is likely to come as much from out-of-school uses of ICT as from in-school uses. The idea of presenting the data as a bar graph began to spread around the class, because of the visible nature of the computer screens. Simon the teacher, also explicitly encouraged this spreading of ideas and invited the student to present to the whole class at the beginning of the next lesson.

Within Simon’s primary mathematics class and within Jo and Natalie’s primary music class the whole class was working as a community of learners. If we rethink the classroom as a community of learners then it is possible to see how a group of students is a powerful and dynamic force for learning (Scardamalia, Bereter, & Lamon, 1995; Brown & Palincsar, 1987; Rogoff, 1998). If a classroom is conceived of as a community of learners then a teacher can draw on the distributed expertise of the students. We have seen this potential in some of the teachers’ subject design initiatives. Here the class (teacher and students) becomes very much more than the sum of the parts. I would argue that young people’s experience of using ICT out of school makes no other way forward possible. Interestingly our ongoing analysis of data suggests that this way of working happened more often in the project primary teachers’ classrooms than in the secondary teachers’ classrooms.
It is as if some secondary teachers (particularly in science, history and geography) are not so used to working with an inquiry approach and their normal practice has been disrupted by individual and group work at the computer. These teachers seem to have devolved the responsibility for learning to the computer and have not worked with the class as a collective. These teachers do not seem experienced at making interventions which are contingent upon student’s ongoing work.

When we study the video recordings of the classrooms which we have characterised as communities of inquiry it would appear that the teacher is taking somewhat of risk in working in this way, in that students are relatively noisy as they move about the classroom communicating their ideas with other students. Also students can take what seems like a relatively long time to develop an idea, which contrasts with the superficial pace of a lesson when the teacher is more in control. In these lessons the pre-planned work may spill over into the next lesson. But amidst such organised chaos it is clear from our analysis of the data that students are engaged in the purpose of the lesson, that is they are beginning to work as linguists, as mathematicians and as musicians.

One important aspect of school education is to teach students to view knowledge worlds in new ways, the world of history, the world of science, the world of music. “Formal efforts to educate have to do with prompting learners to notice certain aspects of their worlds and to interpret those elements in particular ways” (Davis, Dennis, & Luce-Kapler, 2000, p. 4). This involves entering into the discursive practices of these new worlds. There is a particular language and set of tools associated with thinking like a historian, a particular language and set of tools associated with thinking like a mathematician. The video data from the InterActive project enables us to analyse the ways in which the teacher is inducting students into this use of such language and tools.

6. Some concluding remarks

Learning to teach and transforming one's teaching practices, then, are not simply matters of deliberately selecting and enacting particular pedagogical strategies. They are, rather, complex matters of embodying different habits of perception, of speaking, of theorising, and of acting (Davis et al., 2000, p. 23).

I have emphasised throughout this paper that learning within a subject discipline means learning about the discourses, practices and tools which relate to the particular subject world. Students can only enter this world if they have the opportunity to work alongside others who know how to participate in this world. This is one of the main aims of schooling, supporting students to enter new subject worlds that are inaccessible to them out of school. This is not to deny the importance of their informal experiences of learning outside school. We know that students develop informal ideas about science from interacting in the physical and social world as no doubt they do about geography and history. There is a debate about whether students can move seamlessly from these informal worlds into the more formal worlds of school knowledge. It may be the case for some domains, but for others it is almost certainly not the case. For example students are unlikely spontaneously to develop ideas about mathematical proof from their ideas of every day reasoning, although every day reasoning will influence their first attempts at mathematical proof. They are unlikely spontaneously to develop their ideas about the Italian Renaissance from their ideas about popular culture. They are unlikely spontaneously to develop ideas about the etymology of the English language from their everyday experiences of speaking
and writing English. What I am arguing for here is the crucial role of the teacher in organising the social and cultural milieu so that students can begin to use the discourses, practices and tools which relate to a particular subject area. ICT alone cannot do this work and it is very unlikely that students will be able to organise for themselves the social networks which relate to learning about mathematical proof, the Italian Renaissance and the etymology of the English language. And it is even less likely that the more socially disadvantaged students will be able to do this for themselves. This is why much of the hype around e-learning is fundamentally flawed in that it fails to take into account the social, cultural and historical aspects of learning. It is also seriously misleads teachers who often think that they can devolve the responsibility for learning to ICT alone.

Within the InterActive Education Project video data of lessons provide evidence of the discourses and practices with which students are engaging within a lesson. If in watching such a video recording a teacher asks “where is the science?”, “where is the music?”, “where is the mathematics”, then it is not likely that much learning of science, music or mathematics is going on. If the language of the teacher focuses on ICT skills then it is not likely that much subject-related learning is going on. Digital video recordings are a valuable tool for teachers and researchers to develop their awareness of students’ learning. Digital video recordings are also a valuable tool for researchers and teachers to develop theories about teaching and learning.

Within this paper I have predominantly focused on teaching and learning at the level of the classroom. However as Triggs 5 has pointed out the teaching/learning event is positioned within a nexus of contextual factors, immediate, local, national, global. Other members of the InterActive Project team are focusing on the nested levels of influence on classroom activity, drawing on Bernstein’s theory of pedagogy as a cultural relay (Robertson et al., 2003). However as Cole and Engestrom have pointed out cultural mediation has a “recursive, bidirectional effect: mediated activity simultaneously modifies both the environment and the subject” 1993, p. 9. This rather biological model suggests that a system can cause its own behaviour and so within schools the leader’s task is to draw on available tools and resources to develop understanding of the constrains which prevent teachers from using ICT to enhance learning.

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5 Personal communication with Pat Triggs.


