

## Teaching and Learning Research Theme

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### Background

The socio-cultural approach which frames the project suggests that mental functioning of an individual has its origins in social life. This position stresses the role which communication through language and other semiotic systems plays in learning and points to the importance of creating classroom environments which support the communication and exchange of ideas. This view of learning focuses on the idea that students will become "engaged in learning by participating in communities where learning is valued" (Greeno et. al., 1996, p 26).

Another implication of socio-cultural theory is the claim that human action is mediated by 'technical' and 'cognitive tools'. The notion of 'tools' includes a wide range of artefacts and semiotic systems and 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). Perkins (1993) talks about the importance of considering the person plus the immediate physical and social resources outside the person, whereas Salomon (1993) argues that it is important to consider both the effects-with and the effects-of technology. In all, this suggests that both interaction and its contexts are central to understanding the conditions for human learning.

Students are active constructors of new knowledge and understanding based on what they already know and believe. These existing conceptions derive from experiences both outside and inside school. However, it is important here not to confuse this theory of knowing with a theory of teaching. Whereas it may be appropriate for teachers to use a range of strategies from telling to discovery, whatever strategy the teacher uses students will actively try to make sense of the classroom situation.

There are two contrasting ways of dealing with the notion of students as individual epistemic subjects. One is to attempt to individualise the curriculum and the other is to capitalise on the notion of distributed intelligence (Salomon, 1993) and work with the whole class in the overt co-construction of knowledge in which individual and collective knowledge is brought into the open and developed through collective enterprise. New technologies are being harnessed to support both ways of working; socio cultural theory would suggest that individualised learning packages can only be effective if they are incorporated into a more socially-shared discussion of knowledge between pupils and pupils, pupils and teachers and teachers and teachers (Wood et.al. 1999).

We are also concerned to support students to develop creative approaches to solving problems. The conditions which support creative work include focusing attention on a problematic area in a domain, knowledge of an interrelated set of concepts within a domain, and stimulation and feedback from peers (Csikszentmihalyi & Sawyer, 1995).

Given this background the aims related to this research theme focus on the process of teaching and learning as well as learning outcomes.

### Aims related to the links between teaching and learning with ICT are:

- to investigate the nature and extent of the dialogue between teachers and students in the learning settings;
- to investigate the relationship between the teacher's focus on what is to be learned through talk, gesture and the use of shared communication systems (such as the white-board);
- to investigate the ways in which teachers draw upon what students bring to the learning situation with respect to both knowledge about ICT and subject-related knowledge;
- to characterise the nature of the teaching and problem situations which engage students;
- to investigate the relationship between pedagogies and different students across subject areas and sectors.

### Aims related to learning outcomes are:

- to identify learning outcomes with respect to the implicit assumptions and explicit objectives of the designed teaching and learning initiatives;
- to investigate the effects - with (ie what students can achieve with technology) and the effects - of (ie the residue left after the experience of using technology) using digital technologies in the classroom;
- to investigate the capabilities learners need to develop in order to obtain the maximum benefit from ICT tools;
- to investigate the problem solving processes which students mobilise (to include a focus on creativity);
- to investigate students' competencies with literacy/communication and numeracy/application of number across subject domains;
- to relate the above to issues of gender, ethnicity and class.

### Methods

The research related to evaluating teaching and learning is based on the work of the participating teachers and students in their 'design' classes. The project is predicated on the successful realisation of subject design initiatives. All subject design teams started work in May/June 2001. The following table presents an overview of the number of researchers, research students and teacher/researchers in each team.

**Table 1**

Subject area	No. of researchers	No. of research students	No. of teachers		
			Pri-ary	Sec-ndary	FE Coll.
English	3		6	8	1
Geography	1			4	
History	1			5	
Mathematics	2	1	2	8	2
MFL	1			8	
Music	1	1	4	6	
Science	3	1		8	
SEN		1			

**Table 2**

Data related to learning and learning outcomes	All 'design' class students	Case-study students (6 in each design class)
Standard assessment measures (Key Stage Tests)	✓	✓
Diagnostic tests	✓	✓
Work produced by students for class and homework	✓	✓
Student projects and selected presentations of these projects.	✓	✓
Teacher's assessment of students.	✓	✓
Task-based structured interviews.		✓
InterActions with ICT.		✓

In order to capture the *dynamic interaction between teacher and students* a video camera will be placed in the corner of the classroom and left to record without interference. This technique captures classroom processes of interaction, including teacher's and students' talk. The video data will be viewed in real time and passages identified for more detailed analysis using categories which are developed from both theory and data. In order to explore the learning dimension of what students have been doing we will develop conjectures from our analysis and play back critical episodes of video data. The video and computer based textual record is therefore both a source of data and a stimulus for reflective discussion with teachers. We shall also edit excerpts of the video data (subject to ethical considerations) in order to produce teacher development videos. Members of the subject-based design teams (this could be researchers or teacher/researchers) will also carry out structured observations in participating teacher's classrooms. The framework for analysing this data will include focusing on: the dialogue between teacher and students; the teacher's use of the white-board and other mechanisms for drawing attention to particular ideas; and the engagement of students in the subject being learned. Attention will also be paid to the differences between students and how this relates to social class, gender and race.

In order to capture the *dynamic interaction between student/s and the computer* two forms of data capture will be used a) dynamic electronic recording of the computer using software such as Farallon Inc's 'Screen Recorder' utility b) video recording of social interactions and interactions with the computer using a video recorder. Selected excerpts of the video recording will be transcribed in detail (to include capturing of images etc). Our theoretical perspective implies that learning is closely related to activity and the cognitive and cultural tools which are harnessed within this activity (Wertsch, 1991). Thus our focus of analysis will be on the nature of the activity and the interactions between the students and the computer environment.

With respect to *learning and learning outcomes* we shall collect data for all students who are part of the 'design' classes. In addition we shall case study 6 students from each design class (chosen to represent a spread of ability, ethnicity and social class). Table 2 presents an overview of the data to be collected related to learning outcomes.

### Useful References

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