

Towards effective learning with new technology resources: the role of teacher education in reconceptualising the relationship between task setting and student learning in technology-rich classrooms

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Abstract

The purpose of this paper is twofold: first, to explore the reasons why it is inherently difficult to use resources - including new technology resources - to generate and support learning in classrooms; and second, to put forward suggestions for an approach to teacher education which might enable new technology resources to be used to much better effect. The paper begins with an analysis of the reasons why it is difficult to make good use of resources such as books in the classroom context, and relates this to difficulties for teachers in setting learning tasks for students. It goes on to argue that although these problems can be overcome by adopting an approach to teaching as reflective practice, these benefits are often lost because the focus of teachers' reflection is upon classroom organisation rather than student learning. The paper ends by suggesting that new technology resources provide an opportunity for teacher educators to redirect the focus of reflective practice towards the teacher's role in setting effective learning tasks.

Keywords

Teacher education, classroom practice, cognition, learning models, pedagogy, resources

1 INTRODUCTION

New technologies, like books, are a tool and a resource for a wide range of human endeavours, including teaching and learning in a range of contexts. In this paper the

focus is on only one of these contexts - the classroom. There is evidence that it is not easy to make good use of books in classrooms, so it would not be surprising to find that the same is true of new technologies. Until now the assumption in teacher education has been that new technologies present special challenges and opportunities, and that teachers need extensive support to give them the competence and confidence to use these new resources effectively. While there is no doubt that this is true insofar as managing the technology itself is concerned, we have perhaps neglected the more fundamental problem that all resources are difficult to use effectively in classrooms. In this paper I want to look specifically at the inter-relationship between classroom context, resources, the teachers' role in task-setting and students' learning. This may give some clues to ways in which new technology resources might begin to live up to their promise of generating new opportunities for learning.

2 TRADITIONAL RESOURCES AND THE CLASSROOM CONTEXT

Let us look first at the use made of books as a resource. The Bullock Report (1975) showed that in classrooms in England and Wales students spent very little time reading and, by contrast, an inordinate amount of their time writing. This curious imbalance can better be understood in the light of Tabberer's research into students' use of learning resources (1987) which showed that schools do not appear to require students to develop the wide range of skills necessary to become proactive learners. He describes how the classroom is isolated and lacks relevance to the wider world: 'School frequently appears to ... rely on the habitual exercise of a different combination of skills from those expected elsewhere.' He comments: 'There is .. something unacceptable about education's ability to .. create such dependent learners' (p. 194) and adds, significantly, '(There is) a problem of over-teaching .. a tendency for some teachers to overcome pupil difficulties by failing to set them.' These are highly disturbing findings, describing an outcome of teaching practice so profoundly anti-educational that it is of the greatest importance to understand the contextual factors which bring it about.

3 WHAT ARE THE FACTORS, THEN, WHICH SHAPE THE WAY IN WHICH RESOURCES SUCH AS BOOKS OR NEW TECHNOLOGY ARE USED IN CLASSROOMS?

First, the classroom is a confined space in which a group of around thirty people need to be organised to work in a purposeful way. It is very often a site of struggle for power, between the legitimate authority of the teacher who carries ultimate responsibility for well-ordered teaching and learning, and the multitude of informal trade-offs for status which operate on a micro-political level between student and student. The latter nearly always include challenges to the teacher's authority as a means of demonstrating inter-peer status. A prime aim of the teacher, therefore, must always be to remain in control and ensure the orderly behaviour of all the students (Davis et al, 1992). Jackson (1968) in his classic work on classrooms found that

teachers are likely to be engaged in 'as many as 1000 interpersonal interchanges each day', and that in classrooms students learn above all else how to cope with denial, interruption, distraction and frustration.

Second, there is always variation (often very considerable variation) between the prior knowledge and understanding of the students. This makes it very difficult to meet the learning needs of individuals. Teachers normally cope with this by setting tasks to be undertaken by groups - either the whole class group, or smaller groups. Alternatively, tasks may be set individually, often with the aid of resources. Once the tasks are set the teacher has the job of interacting with the students to scaffold the learning process, but the large number of students makes this difficult in practice, particularly as their learning needs are so diverse.

Third, the classroom is normally pervaded by an ethos of assessment, and, to a greater or lesser extent, competition. Those with less formal power - the students - are assessed by the one with more formal power - the teacher. What is assessed is intended to be students' learning, but learning takes place in the head and it is difficult to find evidence for it. So what is assessed in reality is usually each student's performance at a given task. Assessment, however, always takes place within the context of the struggle for power outlined above - so that, depending upon the values of peer culture, individual students may not necessarily wish to be seen by their peers to succeed.

4 THE TEACHER'S ROLE IN SETTING CLASSROOM TASKS

Given the complexity of the classroom context, it may be over-simplistic to assume that the teacher's first concern is to enable learning to take place. When student teachers complain that their training at the university has been of little relevance to their needs when they first stand in front of a class of students, they are probably referring to this mismatch of assumptions and experienced reality. Control, the maintenance of good order and personal survival often become the new teacher's paramount concerns. In practice, the complex and difficult business of teaching and learning has to be undertaken within the constraints of these basic needs imposed on the new teacher by the classroom context. Moreover, behaviours established in these early days soon begin to develop into habits and patterns of practice which can remain unquestioned throughout the whole of a teaching career (Somekh, 1993).

The everyday business of teaching within this classroom context, and then in attempting to carry out the plans in practice and monitor their outcomes. (It is worth noting in passing that much of the stress teachers experience results from the inevitable mismatch between these plans and their enactment.)

Planning students' learning requires teachers to transform learning goals into practical activities for the students to engage in. The organisational demands of the classroom require that students are busily occupied in activity; the learning goals demand that their minds are concentrated on the curriculum content or matter. If learning is assumed to be - as it is not! - an unproblematic business of transferring factual information from the teacher to the pupil, both sets of demands can be addressed by traditional tasks, such as copying out notes which the teacher first writes on the blackboard. This is why this task is such a perennial favourite. When the

learning process is more fully understood, the nature of the teaching problem still remains the same. Learners need to conceptualise what they are learning and the teacher's role is to set a task which will frame and enable this conceptualisation. There are two reasons why it will probably not be enough to say, 'Open your book, read the chapter on X and think about it': first because this is unlikely to motivate the students, and second because it will be impossible to monitor whether they remain on task. Teachers are faced with the problem of designing classroom tasks which make it possible to infer what is going on inside students' heads. In the classroom context, because of the need to maintain order and control, this task needs both to motivate the students and also to organise them into an activity which can be monitored and assessed.

Learning is an invisible process inside the learner's head and it is important to be able to infer that it has taken place. Tasks which can be monitored and assessed, provide some evidence at least. However, Doyle (1979) has shown that in classrooms this integration of assessment with task-setting can seriously undermine the quality of students' learning. At worst it may mean that scarcely any learning occurs at all. In a detailed analysis of classroom tasks Doyle showed that only when tasks place students in some degree of what he calls 'ambiguity' and 'risk' do they make the kind of cognitive demands that result in learning. Ambiguity exists when the student has to take decisions and solve problems: risk occurs when the student is not sure at the outset of being able to complete the task successfully. This kind of cognitive dissonance and exploration is essential for learning to take place. Doyle's research shows that there are many other tasks in classrooms which keep students busily occupied without them actually learning anything. Frequently they occur when the teacher has clarified and/or structured the task to the point where the student has little or no thinking to do. Desforges and Cockburn (1987) note that many tasks in mathematics classrooms involve no more than practise - either in something which the student knows well or, more seriously, where the student simply 'practises' mistakes. Doyle goes further and tracks the process whereby students regularly negotiate classroom tasks with their teachers in order to reduce any elements of ambiguity or risk. Through a process of 'exchanging performance for grades' Doyle's work suggests that students and teachers regularly collude in reducing the quality and range of learning in classrooms. This explains very well Tabberer's perception that 'some teachers overcome pupil difficulties by failing to set them.' However, it seems likely that students are the more devious of the two and regularly persuade teachers that they are less capable than they actually are. Hence, in an early piece of research of my own a thirteen year old girl told me that she was pleased when she had negotiated to carry out a simple copying task rather than the original more challenging task suggested by the teacher: 'because it didn't need any brains' (Somekh, 1980).

5 THE CONCEPT AND ENACTMENT OF REFLECTIVE PRACTICE IN TEACHER EDUCATION

If teaching is to be effective, it is essential that teachers understand the complex relationship between students' learning and their own role as teachers in setting classroom tasks. In response to this need, teacher education in the UK over the past decade has placed considerable emphasis upon approaches which develop the capacity

for reflective practice in beginning (and experienced) teachers. However, I suggest that this important work has not made as much impact as it might have done upon the quality of students' learning. I believe that this is because too much emphasis has been placed upon classroom organisation and teacher-student interaction and too little upon the inter-relationship between the teacher's role in task-setting, the use made of resources and students' learning; and that this has been the inevitable result of pressures upon teachers (emanating from school culture and peer expectations) to demonstrate their effectiveness primarily in terms of their skills in classroom organisation.

Many researchers have provided evidence that reflexivity is an essential element of effective professional practice. Elliott (1976) developed the concept of the 'self-monitoring teacher' who adopted a researcher's stance to his or her own practice in order to make it increasingly effective. Dreyfus (1981) developed a model of professional development from novice to expert through a series of stages, and identified 'situational understanding' as the key component of expert performance - i.e. 'situational understanding' is the capacity to analyse and respond to all the complexities of a social situation, holistically, with in-depth understanding (acting apparently instinctively but in reality on the basis of understanding gained through prior experience). Schön (1983) gives a detailed account of 'reflective practice' as the professional's capacity to act effectively in a context of ambiguity and uncertainty, through a process of reflection-in-action which he describes as 'responding to the situation's talk-back.' Elliott (1993) builds upon the work of all these writers in his concept of the good teacher's 'practical wisdom' which develops from reflexive self-monitoring in the light of both overt and tacit professional knowledge, and integrates situational understanding with practical action.

When these ideas are translated into the planning and implementation of teacher training programmes, we run into the same problem as before: i.e. the need to transform learning goals into practical activities that students can engage in. As in schools, so in teacher education, a process of negotiation takes place between the teacher's and the students' perception of students' needs. Hence, learning tasks are developed which will motivate students (in this case beginning or experienced teachers) and ensure that they are willingly and usefully employed on worthwhile activities. Assessment methods are designed to monitor the effectiveness of the activities, but ultimately, the problem of whether or not learning has occurred is simplified by inferring that successful performance on the task set by the teacher (and negotiated by the students) equates to learning.

The nub of the problem is that beginning teachers (through a perceived urgent need), and experienced teachers (through established habits of custom and practice), are more concerned with matters of classroom management and the organisation of learning than they are with learning itself. Thus, when teachers engage in research into their own practice they almost invariably identify research questions which focus upon the complex processes of social interaction in the classroom. This has led, in initial teacher education, to the major focus of tasks designed by teacher educators to engender the capacity for reflective practice in new teachers being upon teacher-student and student-student interaction, and not upon students' learning. Even if the tasks are not framed in this way by the teacher educator they are very frequently renegotiated by beginning teachers to enable them to focus more directly upon their perceived need for classroom organisational skills. There have been some exceptions in funded projects which involved teachers working with the project team to research

students' learning (for example, the TIQL project, see Ebbutt and Elliott, 1985; and the PALM project, see Somekh 1991; 1994) but even in these projects considerable effort has been needed to maintain the focus upon learning. This was particularly difficult in the PALM project when teachers faced the added demands of learning how to integrate new technology tools into classroom tasks. Initially, most teachers had insufficient understanding of the learning process and tended to make generalised assumptions about students' learning which often proved untrue when they were challenged as part of the research (for example, that students whose behaviour in groups was passive rather than active were not engaged in learning).

6 USING NEW TECHNOLOGY RESOURCES EFFECTIVELY: A NEW FOCUS UPON STUDENT LEARNING

In recent years a considerable amount of research has contributed to developing a cognitive model which explains the learning process in a helpful way and makes it possible to design more effective learning tasks. In a previous paper I explored ways in which it might be possible to take these theories and use them to develop software which enables and supports learning more effectively (Somekh, 1994). Here, I want to suggest how these theories might be used to refocus the reflective practice approach in teacher education on student learning rather than classroom organisation. I start with the assumption that software resources (and other resources such as books) need to be understood by teachers as an integral part of a three-way process of task-setting. At best, the development of classroom tasks should be shared between teachers and students who should take joint responsibility for students' learning - rather than engaging in the traditional process of exchanging performance for grades. And, at best, when resources offer a significant input to the setting of classroom tasks (for example, interactive software which either sets tasks of itself or provides a tool for creative teachers to set new kinds of tasks) they should be used as an integral part of this task-setting.

Since students' learning should be the central concern of teaching, I am suggesting that teacher education courses should focus on presenting a cognitive model of learning capable of being investigated in the classroom context; and that reflective practice should be presented to both beginning and experienced teachers as a tool for continuously investigating their role in enabling learning through task-setting.

The process of task-setting - i.e. transforming learning objectives into practical activities - should make integral use of new technology resources and traditional resources, such as books. The teacher's role in task-setting is always of crucial importance. Even if software sets tasks for students (devised by software designers), teachers need to integrate these with other classroom activities by setting 'framing tasks' (Somekh and Davies, 1991).

There is space here to give only the briefest outline of the cognitive model of learning which would underpin teachers' continuing investigation of the effectiveness of their practice in setting tasks. The model includes the following elements, each of which has implications for the possible contribution of new technology resources:

- The Vygotskian theory of supporting learners to enable them to move into their zone of proximal development (Vygotsky, 1986).

Interactive software can greatly supplement and extend the teacher's ability to scaffold students' learning, and the greater the number of students the greater the significance of this contribution.

- The theory that learning is a process of developing an ever-increasing set of mental schema to make sense of experience (Bruner, 1966).
Learning needs to be individualised to enable students to develop new schema which integrate meaningfully with their existing schema. New technology resources can be used by teachers to provide more individualised tasks.
- The central role of discussion in the development of mental schema (Prawat, 1991).
New technology resources can often be used as a stimulus for a wide range of discussion away from the computer.
- The importance of learning being 'situated' in 'authentic' contexts (Brown et al, 1989).
Software and multi-media resources can provide 'virtual' experiences which are 'situated' in the sense that they simulate authentic situations; and they can give access to resources used in the authentic social contexts of work and society.
- One key problem in learning is the need to transform ideas and concepts from one symbol system, such as language, to another such as number (Bruner, 1966; Kozma, 1991).
A range of software now exists which models transformations from one symbol system to another dynamically (for example, talking books which support the teaching of reading).
- The importance of 'proceduralisation' in the learning of complex concepts (Kozma, 1991).
A range of software and programming languages, such as LOGO, models the process of proceduralising problem solving.
- The importance of metacognition (De Corte, 1990) in developing cognitive engagement of the learners (Kozma, 1991) - what Salaman (1992) calls 'mindfulness' or AIME ('amount of invested mental effort').
New technology which provides interactive feedback to the learner can be used to develop metacognitive skills which, in turn, develop the capacity for mindfulness/cognitive engagement.

7 REFERENCES

- Brown, J.S., Collins, A. and Duguid, P. (1989) Situated Cognition and the Culture of Learning. *Educational Researcher*, **18**, 1, 32-42.
- Bruner, J.S. (1966). *Toward a Theory of Instruction*. Harvard University Press, Cambridge.
- Bullock (1975) *A Language for Life*. HMSO, London.
- Davis, N., Desforges, C., Jessel, J., Somekh, B., Taylor, C. and Vaughan, G. (1992) Quality Teaching and Learning with Information Technology. *Developing Information Technology in Teacher Education*, no. 5, May 1992.
- De Corte, E. (1990) Learning with new information technologies in schools: perspectives from the psychology of learning and instruction. *Journal of Computer Assisted Learning*, **6**, 69-87.

- Desforges, C. and Cockburn, A. (1987) *Understanding the Mathematics Teacher: a Study of Practice in First School*. Falmer Press, London, New York and Philadelphia.
- Doyle, W. (1979) Classroom tasks and student abilities, in P.L. Peterson and H.J. Walberg (eds.) *Research on Teaching: concepts, findings and implications*, National Society for the Study of Education. McCutchan, Berkeley, CA.
- Dreyfus, S.E. (1981) Formal models vs human situational understanding: inherent limitations on the modelling of business enterprise, *mimeo*, International Institute for Applied Systems Analysis. Schloss Laxenburg, Austria.
- Ebbutt, D. and Elliott, J. (eds.) (1985) *Issues in Teaching for Understanding*. Longman for the SCDC, London.
- Elliott, J. (1976) *Developing Hypotheses About Classrooms from Teachers Practical Constructs*. North Dakota Study Group on Evaluation, University of N.D., Grand Forks ND 58202.
- Elliott, J. (1993) *Reconstructing Teacher Education*. Falmer Press, London and Washington.
- Jackson, P.W. (1968) *Life in Classrooms*. Holt, Rinehart and Winston, New York.
- Prawat, R.S. (1991) The Value of Ideas: The Immersion Approach to the Development of Thinking. *Educational Researcher*, **20**, 2, 3-10.
- Salamon, G. (1992) *Computer's First Decade: Golem, Camelot, or the Promised Land?* Invited Address to Division C, AERA Conference, San-Francisco, April 1992.
- Schön, D.A. (1983) *The Reflective Practitioner*. Basic Books, New York.
- Somekh, B. (1980) An Examination of Pupils' Use of Reading Material in a Classroom Situation, in J. Elliott and D. Whitehead (eds.) *The Theory and Practice of Educational Action Research*. Classroom Action Research Network, Cambridge Institute of Education.
- Somekh, B. (1991) Pupil Autonomy in Learning with Microcomputers: rhetoric or reality? An Action Research Study. *Cambridge Journal of Education*, **21**, 1, 47-64.
- Somekh, B. (1993) Quality in Education Research - the contribution of classroom teachers, in J. Edge and K. Richards (eds.) *Teachers Develop Teachers Research*. Heinemann, London.
- Somekh, B. (1994) *Designing Software to Maximise Learning: what can we learn from the literature?* Paper presented at the conference of the Association for Learning Technologies at the University of Hull, September 1994.
- Somekh, B. (1994) Inhabiting Each Other's Castles: towards knowledge and mutual growth through collaboration. *Educational Action Research*, **2**, 3, 357-382.
- Somekh, B. and Davies, R. (1991) Towards a Pedagogy for Information Technology. *The Curriculum Journal*, **2**, 2, 153-170.
- Tabberer, R. (1987) *Study and Information Skills in Schools*. NFER-Nelson, London.
- Vygotsky, L.S. (1986) *Thought and Language*. The MIT Press, Cambridge, Cambridge MA.

8 BIOGRAPHY

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