




# language, classrooms & computers

edited by  
**Peter Scrimshaw**



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# Language, classrooms and computers

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As computers become more widely used in schools, it is clear that they have the potential not just to support the achievement of conventional goals, but also to redefine what we mean by reading, writing and discussion. The contributors here, all with experience of teaching about language and computers for the Open University, use teachers' accounts, together with their own research, to examine how the use of computers in schools can affect the ways in which children learn and teachers teach. The first section looks at some generic aspects of computer use, focusing particularly on class management: individual and group learning, the role of the teacher as facilitator and co-learner and the problems of limited access. The second section examines the contribution of specific sorts of software package: word processing, e-mail, hypertext and so on to language learning. This is a book for everyone who wants IT to add a new dimension to their teaching.

**Peter Scrimshaw** is Lecturer in Education at the Centre for Language and Communications, the Open University.



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Part I

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# Computers in context

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# Teachers, learners and computers

*Peter Scrimshaw*

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*I have come increasingly to recognise that most learning in most settings is a communal activity, a sharing of the culture. It is not just that the child must make his knowledge his own, but that he must make it his own in a community of those who share his sense of culture. It is this that leads me to emphasise not only discovery and invention but the importance of negotiation and sharing.*

(Bruner, 1986, p. 127)

Part I of this book explores a set of related questions about the role of computers in learning, and the implications of this for classroom activities and the teacher's role. The questions we are concerned with are these:

- What theory of computer supported learning would best help teachers to understand how best to promote learning in their classrooms?
- What practical research methods does such a theory require?
- What classroom roles does it suggest for the individual pupil, his or her classmates, the teacher and the computer, if learning is to be encouraged?
- How is access to computer supported learning distributed, and how might it be distributed more equitably?

Not all of these questions are addressed in every chapter, and we are by no means entirely of one mind as to the way in which they should be answered. Chapters 2 to 6 explore these questions, and the interrelationships between them in some depth, while this chapter gives an overview of the account that they provide, and some of the problems that this account presents.

## **THEORIES OF LEARNING AND THEIR IMPLICATIONS**

In Chapter 2 Ann Jones and Neil Mercer begin by arguing that any teaching is based upon a model of learning, either consciously or not. Educational software, therefore, being a resource designed to support teaching and learning, will likewise incorporate such models. They then look critically at

three theories of learning, and trace out some of the ways each can be identified in educational software.

Taking B.F. Skinner as a key exponent they first discuss behaviourism. The emphasis in this approach upon observable and measurable behaviour, and the systematic reinforcement of desired responses they see partially reflected both in the old teaching machines that predated the use of computers in education, and in many of the drill and practice programs that are still widely available and used. They argue that Skinner's picture of behaviour as a series of discrete fixed responses does not fully reflect the reality. In language use, for instance, people often have to produce quite novel sentences, the construction of which implies that speakers are using general rules and principles rather than selecting from a fixed repertoire of specific responses.

If Skinner's position is inadequate as a universal explanatory account of learning, it does not follow that there are not some kinds of learning for which it is both adequate and pedagogically informative. The learning of low level (but still important) specific facts and motor skills are the obvious examples. If this is accepted, it could be that software based upon the theory would in fact be of value, provided it was used only to develop those capacities. Perhaps the problem here is not that there are not such uses, but that by endorsing the use of computers for such purposes we may inadvertently encourage a view of education in which such an approach is taken to endorse an atomistic and inadequate conception of higher order capacities too.

If learning theory has to explain the capacity to employ higher order principles, it must also imply an active view of learning, for the learner is now not seen as making automatic responses to external stimuli but as actively reviewing experiences and interpreting them in terms of more general ideas or categories. Jones and Mercer take the work of Seymour Papert as an exemplar of this kind of constructivist perspective. His ideas may be seen as part of the line of development that runs from Piaget through Bruner. Papert not only extended Piaget's ideas in a distinctive way, but also applied his theories systematically to educational computing. He accepts Piaget's emphasis upon the importance of children working through concrete experience to develop conceptual understanding, and his most famous contributions to educational software have been the Logo programming language and the floor turtle, which together provide young learners with tools with which to construct new understandings in areas such as mathematics and physics.

Jones and Mercer consider this version of constructivism as being not so much wrong as incomplete. They observe that what Papert provides is a theory of learning but not a theory of teaching. This perhaps arises naturally from the highly active conception of learning that constructivism embodies, together with the perhaps over optimistic expectations that Papert initially

had for the capacity of suitable software to provide whatever structuring and support the learner might need. If the capabilities of at least current software is seen as more limited, then a gap opens up for the teacher to fulfil a mediating role between learner and program. Indeed much of the evolving debate and research about Logo has been concerned to identify what that role might be.

Finally Jones and Mercer turn to communicative theories of learning, taking the work of Lev Vygotsky as their exemplar. They argue that any individualistic theory of learning, whether constructivist or behaviourist, will be inadequate. One reason for this is that nearly all learning with computers involves other people, either directly as co-learners or teachers, or indirectly as the authors of the program or the supporting documentation. Thus to understand what is learned and how we must take this social context into account; what is required is a theory of teaching-and-learning, not just of learning alone.

Vygotsky's communicative theory of learning has this social dimension. He emphasises the role of language in cognitive development as a tool for teaching and learning, and as language is a socially constructed tool its use requires the learner to interact with others. The authors (following Griffin and Cole) argue that this means that the teacher must be seen as an active communicative participant in learning, with the computer acting as a medium that creates new possibilities for learning and communication between teachers and learners. This they contrast with an approach that sees the computer as a surrogate teacher, itself entering into dialogue with the (usually individual) learner, and eventually perhaps replacing the teacher entirely.

Why Jones and Mercer support this view of the computer's role is unclear. If, as they argue earlier, the computer or other curriculum resources are themselves social constructs, why does the social nature of learning require the direct presence of another person, rather than just contact with the sorts of social artifacts from which, as a matter of observable fact, people sometimes can learn independently? We will return to this problem later.

## **TEACHING AND THE CONCEPTUALISATION OF INFORMATION TECHNOLOGY ACTIVITIES IN THE CLASSROOM**

In this chapter Neil Mercer further develops the case for using a communicative theory of learning and teaching when dealing with the educational role of computers. He favours observational research methods rather than experimental ones, and in particular the detailed qualitative study of videotaped and directly observed lessons, backed up by interviews with the teachers and learners observed, to find out how they perceived the activities that took place, and the reasons they give for what they did. The reason for favouring such an approach emerges naturally from a commitment to a communicative theory. This requires the detailed study of the communications that take place, but also requires that these be set within the pattern of perceptions and intentions

that the various actors bring to the situation, for it is these which give the talk and the other actions the meanings they have. A concern with communication also requires that the researcher looks at more than speech, for there are other non verbal kinds of communication taking place which only direct observation or videotaping can pick up. In short, the talk that takes place has a crucial role in promoting (or preventing) learning, but to understand what that role is we need to interpret the talk both within the context of the total setting in which it occurs, and within the context of the prior experiences and intentions of all the actors involved.

Mercer suggests that when this notion of context is given its full weight, it has three important implications for how we view computers and learning. One is that it implies that the process of learning about or through computers is about the context within which the computer is being used. It is not therefore primarily about the relationship between learner and machine, or even between learner and the software being used. Another is that to understand what children are learning through using a computer we may need to understand the history of the teaching-and-learning relationship within which that use took place. Finally, an emphasis upon context emphasises the potential role of the physical outputs of the computer, such as the screen display or print-outs, as concrete representations of thought and action that can be used by teachers and learners to help develop the sort of shared understanding that a communicative theory sees as being at the heart of the learning process.

Mercer then goes on to consider the implications of accepting a Vygotskian stance for the account one might give of the role of the teacher. He sees the teacher as a potentially crucial support to learners, although not, of course, one that is always successful. The teacher's task is to provide that level of support that will enable the learner to internalise the external knowledge that is being presented, and to convert it into a tool to be used to gain increased control of his or her situation. In this sense, the teacher's task is to increase progressively the learner's autonomy, not (as in radically child-centred approaches) to assume its prior existence, or (as in unreflective teacher-directed approaches) to stifle it through excessive levels of social control. On this view, teachers who wish to respect their pupil's freedom do so not by refusing to intervene in the learning process, but by continually trying to reduce their intervention to the minimum that is compatible with promoting the long-term goal of complete autonomy for the pupil.

Central to Mercer's development of Vygotsky's position is a distinction between what one might call adult knowledge and classroom or educational knowledge. The latter is a version of the former, but reinterpreted by teachers and by curriculum resource designers, in ways that it is hoped will make it more accessible to pupils. The problem is that this attempt may inadvertently produce instead a misconception in pupils' minds about what acquiring real knowledge actually involves. This implies that the aim should be to make pedagogy and the technological equipment as transparent as possible, thus

enabling pupils to master adult forms of enquiry and learning as directly as they can manage at any given time.

## **COLLABORATIVE LEARNING WITH COMPUTERS**

In Chapter 4 Paul Light discusses another aspect of computer supported learning. If learning is a social activity in Mercer's sense, then it does not, of course, follow automatically that the people involved must be a teacher and a learner. Collaborative learning, in which pupils help each other to learn, offers another possibility. What then might the computer have to offer in those situations?

Light reviews a range of research that indicates that groups working with computers can be assisted in their learning. He considers the possibility that this may be because individuals can often see different aspects of a problem, and so between them come to a more comprehensive view of it. The act of having to verbalise one's ideas for others in a group too may actually help the speaker to crystallise his or her thoughts. He points out that quite what counts as collaboration is not self-evident, and that factors such as levels of provision and the sort of ground rules set for collaborating may have some effect on outcomes.

In considering such possibilities Light refers both to observational studies of broadly the kind recommended by Mercer, and also controlled experiments. The research he draws upon also includes both qualitative and quantitative studies. This raises an interesting problem, for the assumption behind a pragmatic approach of this sort might be taken to be that all these different kinds of research can produce results that can in some sense be aggregated to enable us to reach an overall conclusion. This would stand in strong contrast to Mercer's view that it is really only the qualitative, observationally centred methods that can produce significant understanding. In fact Light's position is not simply that these results can all be aggregated into a single account that is stronger than its individual parts; rather he argues that all of these results should be treated by teachers as indications of possibilities, and as stimuli to re-evaluate their own work. Such re-evaluations could, of course, take the form of conducting the sort of qualitative observation and analysis that Mercer supports. This suggests a distinctive methodological position, different from both the pure action research model, and from the classical quantitative approach in which qualitative observation forms the informal pilot stage from which clear and testable hypotheses are derived for explicit testing using experimental or other structured methods. The model offered is one where the quantitative research uncovers surprising patterns that are themselves the spur to qualitative study directed towards revealing their real significance, if any.

Another theme of the chapter is the importance of computer supported collaborative learning as a way of delivering the learning outcomes emphasised by more traditional views of education but by methods that embody some of

the socially oriented process values of groupwork and cooperation emphasised by progressives. Computers, in short, offer a way of making the aspirations of progressive education a practicable reality for far more teachers and pupils than they at present are, and at the same time producing clear learning results. For different reasons this would be a strategy that would help resolve some of the dilemmas and conflicts that face progressive teachers in both the States and Britain today. In particular, it may offer the beginnings of an acceptable way out of what Mercer calls the 'Teacher's Dilemma'; namely how teachers both achieve externally set goals and do so by learner-centred methods.

### **THE TEACHER'S ROLE: LEADER OR FACILITATOR?**

In the early chapters, especially Chapter 3, the role of the teacher in computer supported learning has been mentioned, but only in fairly general terms. In Chapter 5 Eunice Fisher considers the matter in more detail, exploring in effect the Teacher's Dilemma to which we have already referred.

She argues that the arrival of the computer is likely to change the teacher's approach to managing learning, and in particular the degree of control the teacher exercises over lesson content. She points out that the teacher's role is changed when computers are used, and that this often involves a move towards a more facilitative and less controlling style of working. Some of the evidence for this is discussed, ranging from the teacher self-reports that have emerged from the PALM Project, to systematic observations carried out by Rosemary Fraser and her colleagues. She concludes that if it is the case that truly effective learning takes place within a genuine sharing of experience without input from a more knowledgeable source, then teachers can either stand back and leave children to explore situations that allow them some degree of freedom, or seek to cultivate situations in which teacher and pupils are genuinely fellow learners. She points out that while computers are not essential for either of these two roles to be taken up, the computer can help by providing some of the structuring needed, rather than this being done by the teacher. Also, of course, many computer programs present tasks to which the teacher does not know the answer, thus enabling him or her to become a genuine co-learner, at least for some part of the activity. Again, computer networks that link pupils with others outside their school or even their country expose the pupils to the views of others who may be potentially powerful counterweights to the authority of their own teacher's interpretations. For the teacher wishing to promote independence, this situation can be exploited to encourage both individual and collaborative learning.

A question which arises here is whether effective learning really does require avoiding input from a more knowledgeable source. Presumably one form of collaborative learning is really not much different from teacher led problem solving, for an expert pupil may take on the teacher role instead. If this is not the case, where does the knowledge come from within

the pupil group to solve the problem, and how do pupils establish that they have achieved an adequate solution without some form of reference to someone or something outside the group? One answer to those questions might be that this is precisely the contribution of the computer, namely to supply facts or evidence against which the group can test their assumptions or hypotheses. Indeed that is how simulations, databases and spelling checkers, for instance, can be, and often are, used. But what then has become of the group's independence if they take the computer's answer as definitive? Is this not just replacing one form of dependence by another?

### **EXTENDING THE THEORY: ACCESS TO LEARNING AS AN ILLUSTRATIVE ISSUE**

All the psychological theories of learning discussed so far concern themselves with how learning (and at least by implication, teaching) are best promoted. This question of the efficiency of learning and teaching is a very important one, but it is not the only aspect of classroom activities that a practice focused theory must address. How teachers teach involves questions that extend beyond simply maximising learning. A full theory of computer supported teaching and learning would have to include, for instance, a moral assessment of possible teaching and learning activities and a philosophical consideration of the conceptions of knowledge that underpin each approach. Some analysis of the influences beyond the classroom and their effects upon what takes place would also be needed.

In a single book no such comprehensive treatment is possible. What can be done is to lay down an illustrative marker for future work by demonstrating the importance of some of these additional factors in understanding some major classroom problem. The one chosen for discussion is what influences the distribution of computer supported learning opportunities within classrooms. If teachers are to make considered decisions on matters of equitable access, they need first to be aware of how such access is at present distributed, and what the reasons for, and effects of, that distribution might be. In Chapter 6 Eunice Fisher addresses these matters.

As she points out, the first (but not the last) obstacle to gaining such learning is to have limited access to computers at all. She presents evidence from both Britain and the United States which shows that schools vary greatly in their pupil-computer ratios. These differences, at least in the United States, are correlated with school size, the wealth of the locality and the ratio of black to white pupils. In the UK the picture seems to be fairly similar, in so far as evidence is available to judge.

However there is also the issue of inequalities of access within schools. Here there is some evidence that boys get more use of computers than girls, despite increasing efforts by many teachers to find ways of avoiding this. A less easily visible factor (in the United States at least) is that when

computers are given to schools where poorer children are in the majority they tend to be used more for rote drill and practice activities than for cognitive enrichment, presumably because it is assumed that poorer children will be less likely to be able to use more open-ended software.

Gender differences affect not only how much time children may get at the computer; Fisher points out that what boys and girls are likely to gain from the computer depends in part upon the style of working adopted; with girls in particular likely to gain more from collaborative working than from individual use. Children with special needs too may find computers a great help in the classroom, especially where specifically designed hardware and software is available to them. The level of basic skills in computer use is another potential obstacle to learning, but Fisher indicates that this varies greatly from program to program, as they do not all require the same level of competence at the keyboard.

### **SOFTWARE: AN UNDERESTIMATED VARIABLE?**

There is also a more general problem about the contribution of the computer that is not really addressed in Part I. Mercer points out that when pupils use a computer program they are interacting with a hidden teacher, namely the program designer. But not all programs are the same, just as not all teachers are. Indeed, different programs may well be based, as is made clear in Chapter 2, upon quite different conceptions of education and learning. If so, what software is being used must make rather a lot of difference to all these issues about the teacher's role, the possibilities for collaboration and so forth. Yet throughout Part I the effect of 'the computer' on a classroom activity or an experimental situation is, for all practical purposes, treated as being generic, rather than program specific. While the program used cannot dictate the learning and teaching that takes place, it can certainly affect it in various ways. If the teacher-proof program is a chimera, so too is the program-proof computer user, whether the user be pupil or teacher. This raises the important possibility that many of the effects of computer use described in Part I may be effects only obtainable with particular kinds of software. If so, the overall interpretations given in Chapters 3, 4, and 5, aggregating as they do research results based upon the use of a variety of programs, may be less secure and generally applicable than they seem. More radically still, a communicative theory of computer-supported learning may look less than universally applicable when explicitly assessed against a wide range of situations and software. To check these possibilities, therefore, Part II reworks many of the topics explored in Part I, but treats the nature of the software used as a potential major variable.

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