Children and computers

Technology, Computer

Zemir Mevarech and colleagues (1991) chartered the progress of five classes of 12 year olds over a four-month period using arithmetic drill-and-practice software. A third of them worked alone on the computer, while the remainder worked together in pairs of similar ability in mathematics. These pairs were actively encouraged to share the keyboard, help each other and discuss and agree solutions to the problems. The results were unequivocal on both sets of tests those children who had worked in pairs made significantly greater achievement gains than those who had worked individually (Littleton, 1995, p. 89).

The comparison of children working alone and in pairs at the computer has also been explored with other tasks. For example, Blaye, Light, Joiner, & Sheldon (1991) asked 11-year-old children to work on a complex route-planning task on three successive occasions. The task was presented as an adventure game in which the children were required to find a way of transporting an object from one place to another, overcoming certain restrictions and avoiding obstacles along the way. They had three separate attempts at the task. On the first two, they either worked on their own or paired with a child of the same sex.

In the third post-test session all the children tackled the task on their own. Very few managed to complete the task on the first session. On the second occasion about 50 per cent of the pairs successfully completed the task while less than 20 per cent of those working individually experienced success. In the final individual session, more than 70 per cent of the children who had previously worked in pairs succeeded in solving the task while only approximately 30 per cent of those who had previously worked individually managed to do so (Littleton, 1995, p. 90). These studies indicate that children who have the experience of working in a pair are better at solving similar problems when they subsequently work alone.

However, this may not always be the case. The software used determines the interaction patterns of learners. Particular features of the computer software can be critical in determining whether what is known as 'peer facilitation' of learning occurs (Littleton, 1995, p. 91). An example of this is provided by Light, Foot, Colbourn, & McClelland (1987) who conducted a series of studies using a computerised version of the Towers of Hanoi problem. With certain restrictions, children were required to move a series of differently sized rings from one peg to another in as few moves as possible. In the Light et al. studies, 8-year-olds were randomly assigned to work on the task either in same-sex pairs or individually. A week later each child was individually tested on a slight variant of the task.

The study found that the children who had worked in pairs did not do significantly better than those who had worked individually. However, a close examination of the interaction between the pairs revealed that the children had adopted a non-interactive turn-taking pattern of working on the computer or else one child dominated the proceedings between the pair (Littleton, 1995, p. 92). In a subsequent study Light and colleagues adapted the computer program so that both children had to type a pre-determined command in order to make each move. The findings were that significantly more children in this group solved the problem in the optimal number of moves. This suggests that for peers to facilitate learning children have to engage actively both with the computer and with one another (Littleton, 1995, p. 92).

This hypothesis is further substantiated by research carried out by Blaye (1988) with 5 to 6 year olds working on a computer-based task where they had to complete a matrix-filling exercise. She found pair work did enhance individual progress, especially when the pair was working under conditions in which one child used a light pen to indicate the chosen move while their partner used the keyboard to affirm that choice (Littleton, 1995, p. 92). Consequently, the computer alone does not guarantee peer facilitation of learning. The environment must facilitate both interactions with the computer and between the users respectively.

Webb, Ender, & Lewis (1986) observed pairs of 11 to 15 year olds following a course in BASIC programming and measured their spontaneous verbal and interactive behaviours. On completion of the course, the children were each given a test designed to assess their individual programming competence. Analysis of the data showed that giving and receiving explanations, receiving responses to questions and talking aloud when using the keyboard were all associated with individual programming competence (Littleton, 1995, p. 94). Children had an opportunity to consider different and conflicting views and balance them against their own. By doing so, they might integrate these partial views into a new and more complete perspective, and this could be viewed as progress along the road towards higher level- operational - thinking (Littleton 1995, p. 94).

Doise and Mugny (1984) investigated this idea using Piaget's conservation task of transferring liquid from one container to another container of a different shape. They noted that if children worked on the conservation problem in pairs or small groups and found that there were differences in the solutions proposed, their attempts to resolve these differing points of view would more often than not result in decentring with all children going on to give higher-level, conserving solutions. They argued that these experiences of socio-cognitive conflict play a significant role in children's cognitive development (Littleton, 1995, p. 95).

Sylvia Barbieri and Paul Light investigated some of the interactions of pairs of children working together on a computer-based problem-solving task. They observed interactions where children talked about their plans for solving the problem and whether they negotiated with each other what the next move should be. The evidence was that these interactions thought to be co-constructions of knowledge did predict how successful the children would be, both as pairs and in their individual performance (Littleton, 1995, p. 96). Social processes in computer-based learning are a great deal more significant than Papert's emphasis on the individual activity of the child.

In conclusion, while Papert purports that computers have the ability to change the way that children think research would suggest otherwise. Rather, computers are powerful tools that when used correctly can aid in the learning process of the child. In order for children to experience the socio-cognitive conflict necessary to enhance the learning process it is essential to adopt the Vygotskian view whereby the role of the adult/teacher is to carefully structure the computer sessions for the child. In addition, this learning is increased further if children are shown how to effectively work co-operatively on the computer. The computer can be used as Cole and Griffin suggest as a 'medium', a socio-cognitive tool that shapes interaction in specific ways, ways that then emerge in distinctive forms of cognition (Littleton, 1995).

References

Littleton, K. (1995) 'Children and Computers', in Bancroft, D. & Carr, R. (ed) Influencing Children's Development, Oxford, Blackwell/The Open University.