LINKING HOME AND SCHOOL MATHEMATICS

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Abstract

In this paper I want to address what I believe to be a fundamental educational problem – namely, that there is an important difference between the kinds of learning in which children engage at school, and the kinds of learning in which they engage outside school, particularly at home. This problem is closely connected with the well-known difficulties that learners experience with the application of knowledge from one context to another, particularly in the area of mathematics. In this paper I will look at two main ways in which home and school learning might be brought together in the area of mathematics. First, I look at approaches which import 'authentic' out-of-school problems into the mathematics classroom, and secondly, at those which export school mathematics problems into the home. I conclude that neither approach is sufficient to break down the barriers between home and school learning, and that more radical solutions are needed.

Summary

There is growing evidence that there are fundamental differences between the kinds of learning in which children engage at school and the kinds of learning in which they engage outside school, particularly at home. School learning, for the most part, is shaped by the curriculum, regularly assessed, strictly timetabled, and focused around artificial problems. It usually takes place in large horizontal age groups, with adults as instructors, and provides few opportunities for children themselves to act as teachers. Home learning, in contrast, is shaped by interest and need, rarely assessed, usually spontaneous, and focused around authentic problems. It usually takes place in small vertical age groups, with adults as models or guides, and provides substantial opportunities for children themselves to act as teachers.

This distinction between home and school learning can usefully be related to other distinctions within different theoretical perspectives. We can, for example, see it as an instance of the well-known distinction between 'formal' and 'informal' learning (eg Coffield, 2000). We can relate it to the contrast that Donaldson (1978, 1990) makes between 'embedded' and 'disembedded' thinking. Or we can link it to the distinction between 'cognitive' and 'situated' theories of learning, widely discussed in recent issues of the AERA journal Educational Researcher, and to the metaphors of 'acquisition' and 'participation' underlying these two different theoretical approaches (eg Sfard, 1998).

Whatever theoretical perspective is adopted, I will argue that the difference between home and school learning is closely related to the widespread problem of application – namely, that knowledge acquired in one context is frequently not available or not used in another context. While this problem is widespread across many subjects, it seems to be particularly acute in mathematics. Here there is considerable evidence that mathematical knowledge acquired in school does not readily transfer to out-of-school contexts (eg Hughes, 1986). At the same time, there is also evidence that mathematics knowledge acquired out-of-school does not readily transfer to school type problems (eg Nunes, Schliemann and Carraher, 1993).

In the rest of my paper I will look at ways in which we might address this problem. I will argue that there are two main approaches to linking home and school mathematics, and illustrate these approaches, and the issues they raise, with examples and evidence from my own recent research.

One attempt to make connections between home and school mathematics is by importing examples of 'out-of-school' problems into the classroom. This of course is a well-known approach widely used by mathematics educators. However, while this approach can often increase students' motivation to engage with classroom mathematics, it does not necessarily help break down the barrier between school maths and out-of-school maths. In my paper I will illustrate this approach, and the issues it raises, with examples drawn from a recent project in which we worked closely with primary school teachers trying to develop their practice (Hughes, Desforges and Mitchell, 2000).

The other main attempt to make connections between home and school is by sending home aspects of school mathematics. In many countries, this is traditionally done through 'homework', where students are required to work at home on problems

related to the school curriculum. While homework provides opportunities for students to make links between school learning and out-of-school learning, our own research suggests that this does not often happen (Hughes and Greenhough, 2001). Instead homework becomes simply a piece of school work which happens to be done at home.

In the UK, there has been much interest in recent years in initiatives that attempt to go beyond traditional homework and involve parents more directly in their children's learning. One particularly well known scheme is IMPACT Maths (eg Merttens and Leather, 1993), whereby mathematical puzzles and games are sent home for children to carry out with their parents. In a recent study we looked systematically at what happens when children engage in a typical IMPACT activity with their parents, and compared this with what happens when children carry out the same activity with their teachers. Our findings suggest there are important differences between the ways in which parents and teachers help children, and that these may serve to accentuate rather than reduce the differences between home and school.

In the final section of my paper I will argue that the approaches described above, while not without merit, are not by themselves adequate to break down the barriers between home and school learning. A more radical approach is needed, one which gives greater recognition to the mathematical practices already occurring in children's homes and attempt to link these more directly with the practices of school.

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