Cite as: Edwards, J-A., & Jones, K. (2000). Co-learning about the role of pupil-pupil talk in developing mathematical reasoning in the classroom. *Occasional Papers in Science, Technology, Environmental and Mathematics Education* (pp.11-12). Southampton: University of Southampton.

Co-learning about the Role of Pupil-pupil Talk
in Developing Mathematical Reasoning in the Classroom

Julie-Ann Edwards and Keith Jones

Pupil-pupil Talk

Involving pupils in discussion and in explaining, justifying and reasoning in words is widely recognised as being beneficial to learning (Edwards and Westgate 1987). Yet not all forms of pupil talk necessarily contribute to learning. A vital issue is to distinguish between various forms of talk and identify ones that contribute directly to learning.

Barnes (1975) suggests one useful distinction between what he called presentational talk, which is concerned more with getting the right answer to a teacher's question, and exploratory talk which serves the purposes of building understanding. Building on this work, Mercer (1995) suggests three types of pupil-pupil talk:

Disputational talk

talk that can involve disagreements and that usually involve individual rather than collective decision-making. Exchanges are usually brief and consist of assertions or counter-assertions.

Cumulative talk

a building of ideas based on each other's suggestions aimed at providing a common consensus. Exchanges in this type of talk are usually repetitions, confirmations and elaborations

Exploratory talk

characterised by critical but constructive engagement with each other's ideas. Challenges are justified and alternatives suggested. Joint agreement in decision-making is the end result. (adapted from Mercer, 1995 p104)

Mercer argues that learning in situations involving sequences of 'exploratory talk' helps reasoning become visible.

Research Questions

Is this model useful in the mathematics classroom?
Is it possible to identify exploratory mathematical talk?
What features of the classroom mean that there is exploratory mathematical talk?
Are there any problems with applying the model to the mathematics classroom?

Research as Co-learning

There have been a number of recent critiques of education research (see, for example, Hillage 1998, Tooley 1998). Such critiques suggest the following:
without the active participation of teachers, education research cannot generate findings that are useful to improving schools
traditional forms of education research reflect asymmetries of power and knowledge
To enhance educational research, Wagner proposes developing co-learning agreements:
"In co-learning agreements, researchers and practitioners are both participants in processes of education and systems of schooling. Both are engaged in action and reflection. By working together each might learn something more about the world of the other. Of equal importance, however, each may learn something about his or her own world and its connection to institutions of schooling." Wagner, J (1997)
Such a co-learning agreement was developed for this study.

Classroom Evidence

The evidence below comes from a Year 9 top set working in groups on an open mathematical problem involving the use of the logarithmic scale to provide a solution to the relationship between a sets of number. Five groups of pupils were audio-recorded and their talking transcribed. The following dialogue illustrates cumulative talk:

pupil	K	Shall we split it up?
	S	Don't be bothered doing C1 cos we know that
	K	How can we gonna split it up?
	C	Well one person could do C1 plus everything, then C2 plus everything.
	J	I'll do C2
	P	I'll do C3

In the following sequence of exploratory talk, the group is developing their ideas about the role of prime numbers.

Pupil	P	That's a prime number
	S	It's a prime number ... C33 .. no ... 34 ...
	K	Why not C33?
	P	It's odd, no, it's a multiple of 11, but ...
	S	We haven't got 11, so ...
	K	No, any multiple of a prime number, you cannot find ...cos if you haven't got the base, then you can't go further than that
	S	So C35 is the next one, yeah? I've got that, which is ... 530

The Role of Pupil-pupil Talk in Developing Mathematical Reasoning

Evidence from this exploratory study is that the model of pupil-pupil talk proposed by Mercer is useful in the mathematics classroom. It is possible to identify these forms of talk in the mathematics classroom. Certain features of the classroom appeared to contribute to the occurrence of exploratory mathematical talk, particularly the teacher's efforts to create a mathematical community in the class and the selecting of appropriate mathematical tasks.
What might limit the model in terms of mathematics classrooms is the lack of distinction between the process of working on a particular task and various forms of mathematical reasoning such as conjecturing, explaining in mathematical terms, and proving.

Final Comments

There were distinct benefits of developing a co-learning agreement. For the class teacher it meant:

- being more confident about maintaining objectivity, particularly in the analysis of data phase, by working with a critical 'other'
- being able to engage with research such as that by Mercer rather than rejecting it as not being consistent with the lived classroom experience
- gaining new research skills to add to those of a successful classroom action researcher

For the University-based researcher it meant:

- being a partner in developing and working on a research problem that had clear practical, theoretical and policy level aspects
- gaining a better and more insightful understanding of classroom approaches and interactions through the collaborative design, data collection and analysis.

References

Barnes, D (1975) From Communication to Curriculum, Harmondsworth, Penguin Books.
Edwards, A D and Westgate, D P G (1987), Investigating Classroom Talk. London: Falmer.
Hillage, J (1998), Excellence in Research on Schools. London: DfEE.
Mercer, N (1995) The Guided Construction of Knowledge: Talk amongst teachers and learners, Clevedon, Multilingual Matters Ltd
Tooley, J (1998), Educational Research: a critique. London: Ofsted.
Wagner, J (1997), The Unavoidable Intervention of Educational Research: a framework for reconsidering researcher-practitioner co-operation. Educational Researcher, 26(7), 13-22.
Julie-Ann Edwards and Keith Jones
University of Southampton Centre for Research in Mathematics Education