

## **USING DISCURSIVE PSYCHOLOGY IN RESEARCH IN MATHEMATICS CLASSROOMS: WHAT CAN BE SEEN AND WHAT IS OBSCURED?**

Richard Barwell, University of Bristol

*Discursive psychology has emerged as an anti-cognitivist, anti-realist, anti-structuralist perspective on cognition. This approach includes both a theorisation of the role of discursive practice in thinking, and a methodological approach to the investigation of psychological questions. Discursive psychology has informed much of my research into the role of multilingualism in the teaching and learning of mathematics. In this paper, I reflect on what the adoption of this perspective has allowed me to see, as well as what it may have obscured.*

### **INTRODUCTION**

There has been a long-standing interest in the role of language and discourse in mathematics classrooms, from considerations of the nature of mathematical language, to the role of talk and interaction in teaching and learning. Despite this interest, mathematics educators have been slow to work with the various established approaches to the theory and analysis of discourse found in applied linguistics or sociology (with the exception of work based on systemic linguistics). My own research is based on one such approach: discursive psychology (Edwards and Potter, 1992; Edwards, 1997). In this paper, I will consider what discursive psychology has enabled me to see, as well as what it has obscured, with the aim of highlighting its potential usefulness for research in mathematics education.

### **DISCURSIVE PSYCHOLOGY**

Discursive psychology, which develops ideas in ethnomethodology and conversation analysis, has been described as offering an anti-cognitivist, anti-realist, anti-structuralist account of the relationship between discourse and psychological process, such as thinking, meaning or remembering [1]. In the context of mathematics classrooms, these points might have the following implications.

- *Anti-cognitivist*: entails a shift from a focus on ‘what happens in the mind’ (as an individual mental process) to how ‘what happens in the mind’ is done through discursive practice (as a socially organised process); thus, mathematical thinking and meaning are jointly produced through interaction. Organisation of this interaction is primarily social, and only secondarily based on individual mathematical thinking.
- *Anti-realist*: reality is seen as being reflexively constituted through interaction. Thus mathematics is not pre-given, but is brought about through talk. Rather than mathematical meaning being pre-determined by words, symbols or diagrams, participants ‘give sense’ to these things through their interaction.

- *Anti-structuralist*: following the preceding point, mathematical meaning and the organisation of mathematical interaction are situated, emerging from preceding interaction, rather than in simplistically predictable ways.

Consider the following exchange between a pre-service teacher and a 7-year old girl, reported by Sfard (2001, p. 19):

- Teacher: What is the biggest number you can think of?  
 Noa: Million.  
 Teacher: What happens when we add one to million?  
 Noa: Million and one.  
 Teacher: Is it bigger than million?  
 Noa: Yes.  
 Teacher: So what is the biggest number?  
 Noa: Two millions.  
 Teacher: And if we add one to two millions?  
 Noa: It's more than two millions.  
 Teacher: So can one arrive at the biggest number?  
 Noa: Yes.  
 Teacher: Let's assume that *googol* is the biggest number. Can we add one to googol?  
 Noa: Yes. There are numbers bigger than googol.  
 Teacher: So what is the biggest number?  
 Noa: There is no such number!  
 Teacher: Why there is no biggest number?  
 Noa: Because there is always a number which is bigger than that?

In discussing this exchange, Sfard argues:

Clearly, for Noa, this very brief conversation becomes an opportunity for learning. The girl begins the dialogue convinced that there is a number that can be called 'the biggest' and she ends by emphatically stating the opposite: 'There is no such number!'. The question is whether this learning may be regarded as learning-with-understanding, and whether it is therefore the desirable kind of learning (p. 19).

From the perspective I have outlined above, however, this reading is in some ways problematic, largely because it does not take sufficient account of the situatedness of interaction and the joint nature of what is produced. It is hard to say, for example, that Noa is 'convinced' that there is a biggest number. Rather, the teacher's questions invite her to offer big numbers. It would be interactionally awkward for Noa to respond to the first question 'there is no such thing', since this would be to challenge the understanding and authority of a perhaps unfamiliar teacher. Furthermore, the

teacher elides the categories ‘the biggest number you can think of’ and ‘the biggest number’, so that Noa’s responses can be seen as belonging to the former, rather than the latter. This elision is partly brought about by the patterned nature of the teacher’s questions. This patterning also leads to Noa’s statement ‘There is no such number!’ since by repeatedly returning to the same question ‘So what is the biggest number?’, the teacher signals a problem with Noa’s responses. Providing or saying that there is a biggest number is ‘troubled’ by this revisiting. Noa must come up with an alternative.

A discursive psychology perspective, then, rather than being concerned with what Noa knows, is convinced about, thinks or learns is interested in how discursive practice is used to construct these things. From this perspective, Noa’s ‘conviction’ that there is a biggest number is an interpretation based on her participation in a patterned series of questions. Similarly Noa’s eventual formulation of a mathematically more acceptable response cannot be seen as an isolated epiphany; it emerges from several features of the exchange, including the cycles of questions and the repeated troubling of the key question. ‘Noa’s’ thinking is jointly produced with the teacher. Whilst this position is in some way similar to Sfard’s (pp. 46-49), who seeks to understand the relationship between the discursive and the cognitive, it goes further, in seeing (joint) cognition itself as discursive.

## **DISCURSIVE PSYCHOLOGY IN MY OWN RESEARCH**

The broad principles of discursive psychology lead to a methodological approach that involves looking at how ‘what happens in the mind’ is done in specific situations. This approach entails detailed examination of extended sequences of naturally occurring interaction – naturally occurring because cognition is seen as situated; extended sequences because preceding talk provides a big part of the context of current interaction. Analysis seeks to uncover how participants use talk to do remembering, knowing, meaning etc. One strand of work, for example, has looked at how narratives are produced in particular ways to suit particular circumstances – to undercut potential criticism, for example (see, for example, Edwards, 1997). These ideas offer the basis for an approach to data collection and analysis, although in any particular piece of research, the approach must be developed to suit the specific needs of the project.

I have adopted a discursive psychology perspective in response to issues arising from my research in multilingual, multicultural classrooms. In many cases, the participants with whom I was working were still developing proficiency in English and were from cultural backgrounds with which I was not familiar. This situation makes it difficult to simply ‘read off’ what students mean from the words they use. By shifting to a focus on how mathematical thinking or learning is jointly produced through interaction, rather than a focus on *what* students were thinking, interpretation becomes less problematic (although still interpretation).

In my research so far, I have looked, for example, at primary school students' interaction as they work on a task of jointly writing arithmetic word problems (Barwell, 2003, 2005). My analyses have, amongst other things, explored how students draw on discursive practices relating to genre, narrative, formal mathematics and written English. I have analysed in some detail, for example, how narrative accounts are used to give sense to the rather stilted situations depicted in word problems. In the following exchange, two Year 5 monolingual students, Vicky and Emily, are writing a problem about supermarkets (for transcription conventions, see [2]):

- V           um/ two/ chil-/  
E           -dren  
V           go to the supermarket  
E           huh?/ I'm going to a market on sunday to get some new shoes and some  
              steak  
V           where?  
E           Eastern market/ to get some new shoes and/ no/ I mean/  
              [ to get some steak  
V           [ two children go/ to/ the  
E           and I'm going to the market on sunday to get some steak and then I go to  
              **town** to get some new shoes/  
V           twen-/ twenty five pound  
E           gosh/ you must be rich/ fifty p. (*laughs*)  
V           my mum spends/ three hundred and seven pounds at Tesco's  
E           oh my gosh/ my mum spent/ my mum spent four hundred in Tesco's  
              before/  
V           but the thing is my mum keeps doin' it  
E           **I know**/ they goes to the/ supermarket/ like **every day**/ to get **munchies**/  
              sweets/ (*tuts*)  
V           anyway/ two children go to the supermarket with twenty five pounds  
E           yeah  
E           yeah  
V           and  
E           fifty p. (*laughs*)  
V           buy/ washing up liquid  
E           (*laughs*) costing/ hang on

This extract depicts an interleaved discussion in which the two students (a) begin to put together a word problem about two children going to the supermarket with twenty-five pounds to spend (b) construct narrative accounts about supermarkets involving their mums. These two strands form an interesting contrast. The stories about their mums are authoritative. Authority is constructed, for example, with relevant narrative detail (e.g. how much is spent; *why* their mums go). Their jointly produced accounts are examples of a common pattern in relaxed social talk, that of ‘topping’ stories: each participant outdoes the preceding contribution. The effect is convergent, however, with Emily eventually talking about both the mums together. These features contrast in some ways with the construction of the word problem, which is more hesitant, less authoritative, and without the same degree of human detail. Later in the discussion, however, Vicky says, referring to the two nameless children in their word problem: “**they’re** going shopping for their mum”, forming an explicit link between the students’ narrative accounts and their work on the mathematical task. Thus the narrative accounts are recruited as relevant in giving sense to their own word problem.

### **REFLECTIONS: WHAT DO I SEE AND WHAT HAS BEEN OBSCURED**

Working with the ideas of discursive psychology has allowed me to see how children in culturally and linguistically diverse classrooms do mathematics. These ideas particularly make visible the intricacies of students’ discursive practices in making sense of mathematics and highlights the ways in which these practices are used to do mathematical thinking. In the case of Noa, for example, the pattern of questioning can be seen as structuring the mathematical thinking of the two participants. In the case of Vicky and Emily, their narrative accounts are used to give sense to a word problem, as well as to identify with each other. Any perspective, of course, obscures as much as it illuminates. One possible aspect of interaction that is to some extent obscured by discursive psychology is the macro structures of class, ethnicity or institutional orders. In another word problem discussion, for example, which is in many ways similar to the extract I have used in this paper, the participants are a White student and a Hong-Kong Chinese student who is new to the UK and a learner of English (Barwell, 2005). A series of narrative accounts emerge concerning how much pocket money they receive. The White student talks about earning increasingly large amounts of money. Instead of a pattern of ‘topping’ stories emerging, however, the Chinese student talks about how her father is sometimes unemployed and how she has to work to earn any pocket money. Their accounts are in tension, though still used to give sense to their word problem. It is possible that the difference between these two instances of the use of narrative accounts may be due to the different ethnic composition of the two groups. Discursive psychology makes it hard to explore this possibility. Nevertheless, discursive psychology offers a rigorous theoretical and methodological approach with which to explore how discursive practice is implicated in mathematical thinking and learning.

## NOTES

1. The three antis are derived from a response given by Margaret Wetherell as part of a UK Linguistic Ethnography Forum colloquium at the annual meeting of the British Association for Applied Linguistics, Bristol, 15-17 September 2005.
2. Transcription conventions: Italics indicates emphasis. / and (.) indicate short pauses. ? is for question intonation. [ for concurrent speech. :: shows extended sounds. (hh) indicates laughter.

## REFERENCES

- Barwell, R. (2005) Working on arithmetic word problems when English is an additional language. *British Educational Research Journal* 31 (3) 329-348.
- Barwell, R. (2003) Patterns of attention in the interaction of a primary school mathematics student with English as an additional language. *Educational Studies in Mathematics: An International Journal* 53(1) 35-59.
- Edwards, D. (1997) *Discourse and Cognition*. London: Sage.
- Edwards, D. and Potter, J. (1992) *Discursive Psychology*. London: Sage.
- Sfard, A. (2001) There is more to discourse than meets the ears: Looking at thinking as communicating to learn more about mathematical learning. *Educational Studies in Mathematics* 46(1-3) 13-57.