

## Evidence Used by Teachers to Assess Pupils' Mathematics in the Classroom

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*I ask teachers how they know what children know and can do in mathematics. The complexities of interpreting my interview data parallel the complexities of interpreting children's mathematics. In this paper I summarise some of the issues discussed in the seminar.*

### Introduction

As a Head of Department in an Upper school I received information about future pupils' achievements in mathematics. I had doubts about the usefulness of this data. Interviews with many teachers confirm that most teachers have some doubts about such data, even if it is passed within a school. Sometimes the doubts are based on knowledge of other schools and teachers, sometimes on a sense of superior knowledge of mathematics or the children, past history of disagreement over records, children's failure to demonstrate what the previous teacher had said they knew, and so on. In order to preserve some professionalism about receiving these records it is necessary to find out, in some detail, how they have been compiled.

### Interpretation

The knowledge I seek is mainly in the teachers' heads and not observable through actions, hence I only have access to it through discourse. The very best I can do is to interpret what they say, but that does not absolve me of a responsibility to be rigorous. Therefore I am interested in how to generate as wide a range of interpretations as possible. Nevertheless, I am not intending to reproduce closely accurate descriptions of individual teachers. Instead I hope to end up with a range of possibilities, gleaned from the interviews, which may or may not be strictly accurate portraits of real teachers, but which could be true of some teachers somewhere, rather than these teachers now.

In this way I am not after truth, or "right" interpretations, but "good" interpretations. Here I am using "good" in a relative sense, i.e. to mean the best that anyone can do in the circumstances. I would sometimes go further and say "good enough for my purposes" which means that it may be possible to further define the interpretation, for instance I could go back to the teacher and check it out, but this would be unlikely to result in any more information about the broad sweep of possibilities.

### **Analysis**

After initial interviews I began to analyse the teachers' utterances. It was clear that the process of arriving at an assessment of a child's mathematical knowledge and potential is complex and involved many judgements, external and internal influences, preconceptions, and possible pitfalls. I concluded that statements in favour of teacher-assessment such as:

*Teachers must be trusted to make qualitative statements based on knowledge of a pupil and her work* [Pirie, 1989]

need to be considered in the light of writings on teacher expectations and the social and cultural factors at work in classrooms.

I also found a range of types of evidence used by teachers to decide what children know and can do in mathematics: oral, written, observed actions, unprompted use of mathematics, knowledge of the pupil, views of mathematics, behaviour and body language. [Watson, 1995] I did not accept this as a complete picture, however, because I was aware that by this time I was heavily influenced by my own previous interpretations of the transcripts. Methods of analysis of qualitative data often depend on thorough and continuous generation of many possible viewpoints [Mellin-Olsen, 1993] but the interpreter has personal historical blinkers which may grow more narrowly focused as the research progresses and the researcher attends to the questions and issues so far identified. I therefore had to introduce some strategies to generate new interpretations or draw my attention to other aspects.

### **Generating new interpretations**

Firstly, I simply reprinted all the transcripts in new fonts and began to read them again, in one sitting, using a red pen to indicate passages which I had not noticed before. After about three transcripts I had developed a whole new set of questions for this reading. The new foci were about explicit or implicit theoretical revelations in the interviews, such as teachers' notions of ability, or of a hypothetical time gap between what a child can do and what they can show the teacher they can do. I also began to notice apparent inconsistencies between some beliefs and practices.

Secondly, I presented fragments of transcript to new audiences, who have their own viewpoints about the subject matter and discourse analysis. Currently I am using their comments to generate new questions for the data. In doing this I use their knowledge and interests, but am aware that they only have fragments of dialogue and no contextual knowledge. This may be frustrating for individuals but provides me with insight both

about the content to be interpreted and the interpretive process. At BSRLM I offered two fragments. This is one of them:

*q. Back to Stephen, where does your information come from?*

*a. It's my own judgement, my own thoughts about him and from watching him work.*

*q. When you say "watching him work" you don't stand there watching, do you?*

*a. I suppose what happens is you record things in your mind continually. What is it I record? I record how much work he is able to do, his interest in it, his attitude, how much supervision he needs, or encouragement, in particular do I have to speak to him to stay on task, and then I would also record how prepared he is to work without my help, or asking, who he works with, how well he works, whether he likes to work on his own or not, whether he asks questions that are not prompted by me ... or being stuck.*

There were two main issues raised. The first was about interpreting lists. Can the reader assume completeness? Can the reader assume that the list is in order of importance to the speaker? I could also search for more possible components of this list which the teacher had mentioned elsewhere. This strategy is already a major part of my interpretation, particularly when identifying implicit theory. I, as researcher, decide what each utterance is about and attempt to fit it into a possible schema for that teacher. Validation of this schema, if necessary, is problematic but there is not the space here to comment further.

The second issue was the absence of mathematics from this list. It was mainly about effort and could have been said about any subject, although it is important that the context in this case was mathematics.

The second fragment (which was longer so I shall not reproduce it) generated some discussion about how casual use of language in conversation can lead to interpretation problems. The interpreter cannot assume every word has been used with considered accuracy. The researcher can look at nearby statements to find further information to help sense-making.

Related to both fragments the influence of the interviewer's own viewpoint was mentioned. It is inevitable, I believe, in a conversational interview that the interviewer's perspective will influence what is said. However, the respondent's interests will also influence the direction [Masserick, 1981]. Interpretation is further complicated by the fact that the teacher has to interpret signs in order to know anything about the pupil's

knowing in the first place; I am interpreting a teacher's interpretation of the pupil's knowing:

*The pure act of cogito is empty, and remains to be mediated by the world of signs and interpretation of those signs* [Ricoeur, 1974]

### **Conclusion**

The process of interpreting a child's actions and words in the teaching and learning of mathematics is complex; my interpretation of the teacher's report of that process is similarly complex.

Offering excerpts of transcript to new audiences helps the researcher to look at them afresh and see new questions and issues therein.

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