

## **Seeking mathematics teachers' descriptions of their own classroom practices**

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**Parallel session 3: Socio-political perspectives on researching with mathematics teachers.**

### **Introduction**

*What challenges are there for researchers seeking mathematics teachers' accounts of their own classroom practices?*

(Adler et al., 2005) found that case studies were helping to reveal the complexity of teacher development and a need for further research into a number of areas including how teachers learn outside the reform context; from experience; and how programmes of reform can be scaled up from their original sites. The idea of 'scaling up' is rooted in a particular way of thinking about developing teaching. Normally, the initiation of reform, original reform, involves teachers in trialling resources and approaches and thereby being involved in the development of the eventually 'complete' reform. 'Scaling up' normally involves selection of knowledge about the original reform and packaging it ready for dissemination. Products of the reform context are then consumed by teachers not directly involved in the reform context. This is clearly not the same experience for the teachers involved at the 'scaling up' stage so is unlikely to lead to the same results.

The context for mathematics teachers in England and Wales is one of national political and media promoted concern about performance in international comparisons alongside regulation by statutory law and accountability through inspection. Inspections are high stakes with provision for schools to be taken over by new managers or closed if judged 'inadequate' or 'unsatisfactory'. In these circumstances school managers are compelled to establish monitoring and evaluation systems in school to reflect the inspection framework (Perryman, 1994).

In this context, I perceive the boundary between researcher, consultant, adviser, trainer and inspector to be blurred so that paying attention to issues of power is important. So one of the challenges for researchers seeking mathematics teachers' accounts of their own classroom practices is to pay attention to how power structures and relationships are evident in interactions with teachers.

What teachers say and the words they use cannot be mapped to unambiguous meanings even with reference to events, episodes or happenings to which they refer and terminology can be appropriated to describe different practices or to construe reality in different ways. Examples of studies critically examining terminology as part of their methodological approaches include: Burton (2004) on the way teachers read 'confidence' in their pupils; and (Houssart, 2000) on primary teachers' conceptualisations of 'pattern'; Penn (2002) on the reliability of Ofsted inspections of nursery school provision questioning the connotations of terminology such as 'pupil', 'lesson', and 'pace'; and Morgan (2011) showing how terminology such as 'exploring' and 'investigating', can be transformed to accommodate both pupil-centred and teacher-centred approaches.

In London, where my research is situated, we have an ongoing political reform context working alongside any mathematics teacher development processes including: subject teaching reforms that might be initiated locally or be in the process of being 'scaled up' from their original development elsewhere; packaged courses for subject knowledge or pedagogy development; and ongoing

experience of teaching on a daily basis. Regardless of the form of teacher development processes, the question of how teachers develop their teaching is an ongoing research pursuit in the field of mathematics teacher education. However fundamental transformations of mathematics teachers' practices tend to be restricted to when teachers develop their own practice using reflective approaches such as action research (Morgan and Xu, 2011). Such reflective activity will involve interaction between teachers and researchers, consultants, advisers or trainers.

But if the language and terminology we use is problematic, this suggests that interpreting what teachers say will not be straightforward. So another challenge for researchers seeking mathematics teachers' accounts of their own classroom practices is to pay attention to language and terminology used in interactions.

The two challenges identified to do with power and terminology suggest two more questions. How can relationships be established during research without researchers putting words into teachers' mouths? Is it possible to elicit original and authentic accounts and what, if anything, might originality and authenticity mean in this context?

### **Theoretical Framework**

Terminology is important and can regulate perspectives. When advanced by individuals or organisations it can promote interests and lead to language users promoting others' interests unwittingly. Terminology used in particular ways with particular meanings can make things visible or invisible, direct our attention or restrict it. When Bourdieu and Wacquant (2001) argue that neoliberal categories of perception "*bring into being*" the realities they claim to describe (page 4) they highlight the potential of powerful people to appropriate terminology to construe social reality as they see it or would like to see it. This is not deterministic because the validity of terminology can be in dispute, challenged and undercut. But this requires effort and pre-existing power structures make it difficult (Paechter, 2000 cited by Mendick, 2005). So it is not straight forward to unfix established meanings of terminology or introduce alternatives to construe reality in different ways locally or more widely.

A person with power in any construal of the social world has the ability to propagate a terminology and its meanings in self-interest including to direct attention away from matters of no interest or against their self-interest. Another person might join in and appropriate terminology to make an alliance with this kind of power and thereby become powerful too. Alternatively, a person might choose not to join in. These positions are neither fixed nor simple to navigate. Positions might vary moment to moment depending on individual feelings of solidarity, vulnerability, loyalty, and so on. So it would not be simple to establish how an individual was positioning themselves within this complexity. General power structures do not strictly dictate how power works within individual interactions. To show a particular relationship between people interacting exists, we have to find evidence for this in the interaction (Speer, 2005). This also applies outside a feminist conversation analytic approach.

Considering the problems of the meanings of terminology and power relationships in the context of seeking mathematics teachers' descriptions of their own classroom practices makes particular methodological and analytical demands. The methodology and analytical framework must facilitate data and analysis to make sense of and stay alert to how terminology is used to construe reality and how the relationship between teacher and researcher is developing. Halliday (1978) adopts a

perspective on language as social semiotic; from this perspective saying something to someone is not thought of as a transmission of information but as a social act. The system of language is organised around the abstract meta-functions: ideational, interpersonal and textual. From this perspective, in any interaction, we can pay attention to: how people observe and construe reality, their experience, in an institutional setting or ongoing social activity (ideational); how people take on roles within the interaction to act out social relationships (interpersonal); and how language choices are made and the relevance of contributions is established by speakers (textual). From this perspective each utterance is a simultaneous act of construing reality, taking on a role and establishing relevance to the interaction; and each utterance simultaneously becomes part of the social historical reality on which it acts.

### **Methodology**

*How can relationships be established during research without researchers putting words into teachers' mouths?*

I observe and video lessons and interview the teacher afterwards using the video as stimulus. Video aided recall is used to limit the need to introduce terminology when seeking descriptions. There are three aspects to the interview approach.

- To avoid leading terminology
- Part of the method is to plan specific mechanisms for asking for elaboration on points made by the teacher. The idea is to steer the agenda but always from starting points evident in the teacher's talk about the lesson. One mechanism for prompting further elaboration after the interviewee has made a statement and stopped talking is to repeat back what the teacher has said. However, these moments are improvised at the time and fluency is difficult to achieve in these situations. It would be possible (and easier) to robotically repeat the last three words an interviewee said for instance. But there would be a loss in rapport potentially. This need for spontaneity (or at least a balance between spontaneity and being systematic) makes interviewing problematic.
- When choosing a point at which to start the video I use contemporaneous notes of marked teacher interventions. For example, the data below follows immediately on from a new point in the video being chosen. The reasons for my choice were:
  - It was a point when Simon stopped the class to address all pupils;
  - I thought Simon was acting in response to how his pupils were getting on;
  - I thought quite a few pupils struggled to follow Simon's thinking in the discussion that followed and wanted to find out what Simon would say about that;
  - I thought he had run out of time and could not afford to spend any more.

It is not possible for me to eliminate or minimise myself in this; there are too many decisions for me to make. An alternative perspective is to attempt to make the analysis (including my actions in it) as simple as possible by ensuring my 'self' is as fully revealed as possible. This does not 'minimise' my influence or presence but perhaps moves me towards transparency.

### **Data**

In this extract Simon (pseudonym) is watching the video of a lesson I have just observed and we are 30 minutes in to the interview. Prompted by the video, Simon has been talking about his approach to teaching the class how formulae work. I have asked if it is okay to skip forward. In lines 1 to 7 I am referring to my contemporaneous notes of the lesson. As I am searching for the right point of the video, I say that I am interested in a point later in the lesson. I am looking at my notes and Simon is

looking across at them too. I find the note of the time of day we started recording the lesson and the time of day of my contemporaneous note and we both calculate that I want to look at a point 35 minutes into the lesson. I am offering this detail because I think it shows something about our relationship that Simon helps with the technical aspects of working out the time and finding the right point in the video. There is a history to this. Simon allowed me to observe him teach on a previous occasion without video and part of the discussion afterwards was about what we might need to do a good technical job of videoing the lesson. Simon had lots of ideas about this and clearly had much greater expertise than me. He was able to recommend the equipment I might buy and where I might get a bargain.

In the transcript R is Richard (me), S is Simon and V indicates a long period of watching the video when neither Simon nor I speak. Transcription conventions are adapted from (Jefferson, 2004, see appendix).

<b>Line</b>	<b>Time</b>	<b>Speaker</b>	<b>Speech</b>
1	27:40	R	So I think (1) round about (.) something that was quite interesting (1s) er (4s) to go a bit later in the lesson (2s) where it was getting to the point where- (11s) yeh let's look at this bit (4s) half way through (.) Yeh?
2	28:15	S	Yeh (35s)
3	28:50	R	I think I'll check that again (1s) I think (7s) I want to go to (5s) eleven forty -five (.) which is (3s)
4	29:08	S R	Ye'so be [thirty-five] [thirty-five] minutes.
5	29:13	R	Well it'll be more- it'll be a bit longer won't it (.) so-
6	29:17	S	Right
7	29:17	R	So it is coming up here
8	29:21	V	(Simon – on the video - is getting the attention of the class and telling them that "Using BIDMAS we'll be working backwards." Simon and Richard watch the video for 43 seconds then Simon starts speaking.
9	30:00	S	The reason why I did that was because I pick-picked up (.) misconceptions
10	30:05	R	Ye-
11	30:06	S R	Errm (1) Some o'them were square rooting and then dividing by pi so: (.) about four or five [ of them ] [right that's interesting (.) okay]
12	30:13	S	Erm: so:: I'l asked someone to do it (.) I didn't know which way round they'd do it but I asked him to come and do it on the board (.) then I thought I should highlight that bit (.) about it anyway. And ↑I thought it was really interesting because- it was using the algebra back in the context of volumes of circles and getting them to make those sorts of links together ↓(.) 'nd th'they could use BIDMAS to hel'help themselves work backwards through that sort of a problem.
13	30:39	R	Yeh
14	30:40	S	(1s) Errm. They, they were- (.)
15	30:42	R	Had you plan-planned to bring in BIDMAS?
16	30:43	S	No:
17	30:44	R S	[So that came up in your head as-] [(.) But that's always (.)]

<b>Line</b>	<b>Time</b>	<b>Speaker</b>	<b>Speech</b>
18	30:45	S	But that's always (.) there
19	30:47	R	Right
20	30:48	S	As an underlying factor and it's something which you need to be able to (.) explore straight away as a mathematician is the idea of (.) .hhh working your way back through
21	30:56	R	And you've used that before (.)
22	30:57	S	Concepts=I've used that before with them with the algebra if you work your way back through .hhh rearranging equations-(.)
23	31:03	R	Right
24	31:03	S	They should be able to do that (.) so what I've tried to do is I've – I've look at fairly complex algebra ↓with them↑but just try and really unpick it into some really simple steps just by going, "Well (.) the last thing we do is (.) normally is add and take away but when we work backwards you have to (.) .hhh do with that and move those to the other side it just 'cause it's easier.
25	31:20	R	Yeh
26	31:21	S	(.) Errrm. N' John (pseudonym) – John is very bright he got the fact that you have to square – square root pi (.) as ↑well↓ (0.5) Errrm which:: I didn't wanna dwell on too much >because I think that would< would'a detracted a bit from .hhh from what was going on but he mathematically he (.) >perfectly sound< but I didn't want to make too much of a point because (.) There's enough of me talking anyway hhh (laughs).
27	31:44	R	[Right (.5) so what do you do]
28	31:44	S	[(.6) ↑I mean ideally I'd-I'd ] much rather have (.) ↓them working ↓rather than me talking (.) but (.)
29	31:50	R	[Yeh]
30	31:50	S	[But] (.) with this sort of lesson you ki:nd of: .hhh (.) a lot of it is it's-is unpicking the work which they've done (.) so: 'kay this what you've been doing:: let's:: structure that erm: 'n'::: make you s::ee how you can: (.) how it-how best you: work. A:a:t doing that so >when you(.) approach other problems then .hhh >then you can: do it for longer 'n you< (.) can (.) work your way through rather than need me stepping in as much
31	32:20	R	Right
32	32:20	S	(.)↑there's always a question of when do you step in when do you not step in↓
33	32:23	R	Yeh
34	32:23	S	N: th-th-th's why i's quite useful. to:: break it down into these parts so you can just step in a:t the appropriate times. [.hhh]
35	32:29	R	[Right]
36	32:30	S	In that sense (2s)
37	32:32	R	So what are you using to decide those appropriate times? <u>How</u> are you deciding:
38	32:37	S	=er:m: a: lot'of it is: (.) when: (1.5s) the m::ajority of the class've done it. (3s)

<i>Line</i>	<i>Time</i>	<i>Speaker</i>	<i>Speech</i>
39	32:48	S	If you can do it when the majority of the class've done it (.) then: (.) all those people who've finished (.) Sh:ould be able to access what you've just seen.
40	32:56	S	= 'cause they've done it themsel:ves (.) But often they've just written the calculations=you saw .hhh Maude (pseudonym) had just written the calculations out rather than explaining what she's done .hhh er:m (.) an:d (1s) if I had longer: (.) I'd've finishes that.
41	33:10	S	What< <a nice thing to've done would be say give them a piece of sugar paper .hhh and then they can explai:n each little bit of their calculations exactly what they've done and why they've done it (.)
42	33:20	S	Bu:t (.) s:econd best ther:e wa:s erm: .t.hhh (.) the fact that:
43	33:27	S	>she could explain it to the rest o'the class 'n' the rest'o the class could follow through so this was the volume 'n this gives you the area, this area, find r: you can you need to do this<
44	33:36	S	Once you've found r you can double it is what she was moving towards when when we were explaining that bit before .hhh
45	33:41	S	↑Now (.) that show:s (2.0s) <you: really understand what's going on. And if you can do that you can teach it to someone else in a way= rather than (.) erm: just just being able to do it (.) ↓ N: (.) if you can do that you you really understand the problem rather than just kind of (1.1s)
46	34:01	S	We- I can- I've got- done the calculations I'm not exactly sure why (.) So it's really testing them and making sure they really do understand why they're doing what they're doing.

By line 8 I have chosen the point at which to start watching the video. It is a point about thirty-five minutes into the lesson where Simon begins to lead the whole class. I have chosen this point for a number of reasons to do with seeing if Simon will talk about 'pace' or 'time' or rates of learning and if so what he will say; how he will talk about it.

### **Extracts of analysis (illustrative only)**

In lines 1 to 7 we are finding the point in the video corresponding to the point in the lesson I have noted. There are two textual dimensions to this: Simon is adopting his historically established role as technical expert and I am taking charge of which part of the lesson video we will watch next (which is also relational).

In line 9 Simon has watched the video for 43 seconds without any verbal prompting from me and he construes his decision to bring the class together as reasoned following him picking up misconceptions.

Line 11: another of my prompts is, "that's interesting" perhaps this is not as innocuous as it seems. Does this invite or allude to the relevance of being analytical (textual)? How does this differ from alternative prompts such as, "I like that", which I do not have a plan to use at the moment?

Line 15: I ask if he had planned to bring in BIDMAS, a spontaneous mistake in my application of planned prompts, a question with connotations of accountability for whether lessons go to plan and are rationally thought out, with implications that maybe planning should be for every eventuality.

Lines 18-20: Simon resists (relational) my construal of teachers capabilities (ideational) to offer his own that mathematics teachers need a repertoire, "but that's always there". In so doing he makes a

connection with the macro. He says this is something mathematics teachers have to have. His construal reaches beyond this interaction and talks about teachers not just himself.

Line 26: Simon's habitual elongation of sounds when he wants to think but wants to keep on speaking is evident, "Errrm which::"

In line 41 Simon uses a number of conversational signs to keep hold of his turn speaking. "Bu:t (.) s:econd best ther:e wa:s .t.hhh erm:" Elongating sounds within words and at the end of words.

At line 37: another mistake, "So what are you using to decide those appropriate times? How are you deciding:" It would have been better to find words to ask for an elaboration of "appropriate times."

At line 38: however, there are signs the interview question is a challenge. Simon offers a slow and deliberate justification. The slow and deliberate aspect of this seems to me to indicate a careful construal of reality that is not easy for Simon to navigate.

### **Discussion**

*Is it possible to elicit original and authentic accounts and what, if anything, might originality and authenticity mean in this context?*

Resonances with Valero (2004) are: the location of power in my research; what I reveal about myself in terms of what I am researching and why I am concerned about it; and how I will be implicated in what I find; how I interpret and articulate my research activity; and how to develop a dialogue between my theory, methodology and 'self'.

For Valero (2004, 9-14) there are three broad notions of power evident in the field of mathematics education. One construes an "*unquestioned intrinsic goodness of both mathematics and mathematics education...*" From this perspective mathematical practices are not necessarily questioned, empowerment of learners is assumed and 'mathematics' itself has agency. Alternatively, a Marxist perspective questions the cultural and historical foundations of mathematics and how it is used to exclude and include different people according to social attributions such as class, gender, race and so on. And there is a third possibility:

*... power as a relational capacity of social actors to position themselves in different situations and through the use of various resources of power. (Valero, 2004, 15)*

Along with Valero's calls for researchers to knit together the micro and macro contexts, this third notion of power resonates with Halliday's theory and my approach to seek evidence for how power structures are evident during interview interactions.

Valero's critique of mathematics education could equally be aimed at the field of mathematics teacher education and resonates with my own perceptions (see introduction above) of the context in which teachers work and develop their teaching. Research theories, methods and approaches have supported teacher education discourses and practices that "*fulfil essential social functions, which help in sustaining a certain kind of social organisation*" (Valero, 2004, 5). Similarly, the construal of the child learner as rationally measured has its parallel in the notion of the mathematics teacher as rationally measured. The result is a powerful directing of our attention to certain phenomena which are already named and of concern within the field (or perhaps of new concern for us in the field) such as teachers' qualifications, subject knowledge, pedagogic capabilities, being able to 'deliver' an 'Ofsted-Outstanding' lesson and so on.

It seems to me that through an analytical framework based on Halliday (1978) we can access what Valero (2004) refers to as the conditions of the social space including, “*the people, their interactions, their activities in particular social spaces and historical times, the traditions and rituals of entering into those spaces and the overall structures in which all the former take place*” (Valero, 2004, 6-7).

Valero contends that, “socio-political research in mathematics education... has the task of constructing alternative discourses about the research process itself” (page 14) and to make the researcher visible.

*“The revelation of who we are and what we stand for as researchers constitutes a transgression of the established norms of traditional academic discourse. This discourse, based on the idea that knowledge production and research are technical processes in which the ‘knower’ is separated from the ‘known’, and that their main goal is to produce ‘objective’ descriptions, explanations or interpretations that leave the ‘known’ untouched by the ‘knower’, is limited in recognising the role that the knower in fact plays in constructing the known while interacting with it in the process of research.”(Valero, 2004)*

*This means that as researchers, we create the ‘objects’ of our study while we engage in the practice of researching those objects. (Valero, 2004, 2)*

*Is it possible to elicit original and authentic accounts and what, if anything, might originality and authenticity mean in this context?*

I think my methodology will reap original accounts because of the video witness to a unique historical event. But for authenticity the account will have to acknowledge my presence.

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**Appendix: Notes on transcription (Jefferson, 2004, 24-31)**

...just seen.	Full-stop indicates a normal lowering of tone at the end of an utterance with no particular emphasis evident.
Yeh?	Question-mark indicates a normal rising tone when a question is asked with no particular emphasis evident.
Maude (pseudonym)	where names have been used during the interview a pseudonym has been chosen with the same number of syllables to maintain the rhythm of speech. The word (pseudonym) in brackets after the name indicates this.
[thirty-five]	
[thirty-five]	Square brackets contain overlapping speech
ye-	a dash indicates the speaker cutting off speech
hel'help	apostrophes are used grammatically and to indicate stuttering speech
(.)	Full-stop in round brackets indicates a natural sounding interval of a beat (with reference to the rhythm of speech at the time)
(1.5s)	duration in seconds given in round brackets for intervals longer than a natural beat
↑	up-arrow for a shift in tone to especially high pitch ended with ↓
↓	down-arrow for a shift in tone to an especially lower pitch ended with ↑
<u>No</u> :	underscore combined with colon indicates contouring emphasis followed by elongation of sound
hhh	indicates audible exhaling breath
.hhh	indicates audible inhaling breath
.t.hhh	indicates audible inhaling that starts with a t sound as in a 'tut'
finishes that=	indicates no break or gap to the next word
=what	indicates no break or gap from the previous word
<th-th-th's>	left and right inequality signs enclose noticeably faster speech
<word	A pre-positioned left carat is a 'left push', indicating a hurried start; in effect, an utterance trying to have started a bit sooner than it actually did. This can be heard, for example, as a compressed onset of the utterance or utterance-part in question. A common locus of this phenomenon is 'self-repair'.
word<	A post-positioned left carat indicates that while a word is fully completed, it seems to stop suddenly.
> <	greater than and less than signs bracketing an utterance or utterance-part the bracketed speech enclosed is speeded up.
< >	greater than and less than signs bracketing an utterance or utterance-part speech enclosed is slowed down.
m::ajority	colons follow prolonged sound (here the 'm' sound)
them <u>sel</u> :ves	<u>_</u> : indicates a 'punched up' sound followed by an elongated sound; a downward contour