

Attending to How Stories Are Told: Analysing Data in Mathematics Education Research

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This paper is about politics and the part it plays in research. My curiosity is not directed at how we attend to a culture of profit and competitive edge, but at how we structure our conceptual categories and what political effects they engender. Unpacking poststructuralist ideas on truth, interpretation and representation, I discuss what their implications for data analysis might be. I revisit my classroom study to reveal an unwritten chapter in which I elaborate the conceptual decisions that were made and the dilemmas which confronted in producing the narrative.

In recent years a number of theorists and researchers have argued that researchers should engage in research, mindful of the fact that we can no longer take for granted the notion of the disinterested researcher (e.g., Ernest, 1994; Lerman, 2000). Cautionary words from these commentators are not so much directed towards the question of how research might operate in a context in which the principle of economic utility is firmly upheld, though the role which various forms of political power play in the definition of research and in the naming of criteria necessary for transforming classroom practice and contributing to social change, is clearly not ignored. The concern is directed towards how, through the dynamics of our labour, we structure our conceptual categories and what political effects they engender. This is part of a newer debate which asks critical questions about truth, representation and interpretation, and in doing so, attacks the foundations of what we know as conventional research practice.

It is against the general background of this debate that I investigate exactly what these questions might mean for the doing of research in mathematics education. My focus is on the specific challenge to the notion of representation which derives from the general crisis in cultural authority, and the implications of that particular tension for the gathering and analysis of qualitative data. Confronting this problem head-on, in the first section I present a theoretical justification for a form of research that challenges the traditions of research legitimacy and their discourses of validity. What obtains from this critique is the development of a research practice which asks questions about the way in which representation is understood and the effectivity of its discursive constitution. In this new practice, the researcher assumes a self-reflexive position to consider the social constructedness of his or her work, asking questions about the methodological and theoretical choices brought to the interpretation of qualitative data analysis. This is the point where practice moves from an interest in establishing truth onto an understanding of how meaning is produced and created and of how these productions factor into larger decisions over category systems and over economy and power.

This opens up the complex question of the contingency of our research methodologies on a host of interests and persuasions and how it might be addressed. It raises important questions about the authority of the research report and the authority of the researcher, implicating the fundamental relationship between the knower and the known. In the second section I offer an example of another story of research which I believe addresses the question of political commitment and its relation to academic research. The example is from my own study of girls in a coeducational classroom. Its starting point is that, given that representation can no longer be considered a politically neutral and theoretically

innocent activity, it *is* possible to actualize the site of its occurrence through the telling of research stories. But those stories can only be told when all those involved in the process have been assigned newer kinds of interpretive power. However I want to be clear here that this is *not* a relativist issue of recognising different versions of reality, but rather of theorizing that ‘representation’ itself is more complex than we have previously understood.

I revisit my study of a coeducational classroom to reveal an unwritten chapter in which I elaborate the theoretical and narrative decisions I made, fully mindful of their political effects. Such decisions sit uncomfortably alongside contemporary understandings of the role of the researcher, insofar as the theory which motivates my decisions recognises that however neutral, ‘objective’ and transparent research stories may appear before us, those representations cannot be rendered arbitrary features of the researcher position, but rather complicitous with the researcher’s presence. The investigation leads me to consider the potential of this challenge as a source of more sophisticated analytical tools in formulating a research practice. Finally I suggest that we must undertake research differently, questioning the conceptual categories employed and ask what the political effects of our structuring practices might be.

Theoretical Framing

No-one would argue that mathematics education is situated within a complex world of interacting, reflexive people. Underlying this notion of social complexity is a theoretical position which not only problematises and acknowledges the dynamics of such social processes, but is able to theorise and actualise the site of its representation. I am referring here to poststructuralism. Indeed I have chosen to make a case for this theoretical position as productive for research in mathematics education precisely because it has the ability to theorise those important questions which are fundamental to any educational inquiry and which belong to this social complexity: the nature of knowledge, epistemic agency, and representation. Stretching the limits of our usual ways of thinking, it signals the inescapably political contexts in which researchers speak and work, but not in deference to a logic of profit and competitive edge. As one educational commentator has put it, poststructuralism holds up for scrutiny our commonsense understandings of the purpose and practice of research, pointing to the un-innocence of all aspects of the process (Lather, 1992). Within those terms, it must be admitted from the start that this is an unsettling proposal in that it exposes an analysis of the social world, which not only changes the nature of research but also the nature of the understanding brought to the detail of educational life (Davies, 2000).

The way in which poststructuralists speak of research is to insist that all methodology is political, and that all of our methods are politically charged since they “define, control, evaluate, manipulate and report” (Gouldner, quoted in Lather, 1992, p12). When methodology is defined as having an irreducible political dimension, we need to ask critical questions about the way in which we conceptualise our practices, and how we might explore more appropriate ways of knowing. And here I have chosen to concentrate on three orthodox notions of qualitative research which, through the politically neutral meanings they engender, and despite arguments to the contrary, foreground, from the poststructuralist’s reading of them, a ‘covert positivism’ These are our orthodox notions of observation, its representation, and the transparency of language. Their histories are grounded in a science which rejects bias and political agendas, but their historical trajectory traces a different path when reinterpreted by poststructuralism. In this reinterpretation, theorising objectivity, authorial voice, and universal meaning, becomes an

effort not in providing an account of the logic of description and validation, but an exploration of the way in which our research practices structure how we see others and how we see ourselves.

Embracing traditional concerns over researcher bias and objectification at an entirely new level, poststructuralism insists that there are more valid subject positions than the objective and disinterested observer and narrator, an observer and a narrator fashioned from noncontradictory experiences, from the innocence of observable data, and from the transparency of language. Over and above stands the proposition that objective reality can never be captured: it can only ever be approximated. Reality, it seems, is in a constant process of construction and that which is warranted at one time, may be unwarranted at another time. When the relationship between the real and its representation is in doubt, researcher authority comes under assault, theorizing becomes more tentative, and the best we can do is gesture toward truth by looking through the “detour of performance” (Lather, 2000, p 155), and give up the impossible struggle of establishing mastery.

The researcher’s knowledge of classroom life is always preinterpreted, clouding his/her perception of reality and re-presenting this knowledge is always only a limited strategy, always to, for and from others. This is the Nietzschean realization that re-presenting others is both inadequate yet necessary, caught up in the contingencies of history, culture, gender and other social markers. Meaning will always be political, contextualised within systems and relations of domination and subordination which give society its current form. These forces work through what the researcher sees in ways that can never be fully anticipated or controlled, so that representing others becomes inherently unstable, in flux, constituted by traces of other signs and symbolic statements. Britzman (1997) calls this “the existential limit of representation: both presentation and absence” (p35).

Theorising the politics of recounting and being accountable is one thing; another is actualising the site of this un-innocence. The issue here is how we might attend in our research practices to issues surrounding the production of reality, when the truth which we want to grasp escapes knowledge. In the following section I look at what all this might mean in terms of the interpretation of qualitative data analysis in a study of girls in school mathematics.

Installing and Subverting Methodological Conventions

In order to make concrete the poststructural subversion of conventional practice and what we take for granted, I look at the familiar concepts of representation, adequacy, truth, language, reality, knowledge, and the privileging of researcher authority, as they play out in my study. This exploration, taken from a larger ethnographic study (Walshaw, 1999) illustrates the clash of speech and action, of seeing and listening, and of public and private investments. It demonstrates my efforts to negotiate between the desire to understand and control better and the poststructuralist commitment to thinking about the data as a site of political struggle over the real and its meaning. Underlying this commitment to contradiction and difference, is an assertion that it is not very useful to tactically avoid representation *per se*, but that representation in its ‘purest’ and more ‘truthful’ forms is unattainable. In this study it points to the impossibility of data collection and its analysis to provide a ‘truthful’ account from observation, while keeping fidelity to the words spoken.

The data of this study is drawn from spoken and written texts taken from a secondary school’s senior mathematics classroom. I compiled this bank of data from the transcripts of recorded ‘private talk’ (Alton-Lee and Nuthall (1991), and teacher talk, from my conversations with Rachel (the student), through copies of her class work, and through the

field notes I took from my classroom observations. Continuous audio recordings were made for the entire block of a course of work on calculus, of both loud and quiet private conversations between Rachel and other students in the class, between the teacher and Rachel, and of the whispers and mumbblings that Rachel made to herself. At the time of my study Rachel was an 'extension' student, working with three others alongside students who were a year older than her. How Rachel came to be promoted and what happened during her third year of high school are part of her story. Her contradictory and conflictual experiences tell another and it is this other story which forced me to reevaluate and refashion the comfortable premise of Rachel's identity as stable and fixed. In speaking for her I self-consciously foreground the discursive and signifying nature of knowledge of others, and its irreducible political dimension. In all this the modernist impulse towards transparent representation is confronted to reveal a study of words and actions which acknowledges its own complicity with my own interests and values. In addition, it tries to accommodate within 'frozen' snapshots, the tensions in speaking for another when that other's voice and actions change across investments, desires, and levels and from one moment to the next.

Moments of Conflictual Experiences

On entering her third year of secondary schooling there was never a moment of doubt in Rachel's mind that she would enroll for the Year 12 academic mathematics course provided for by her school, since she had been accredited with an A grade in School Certificate examination. Almost all New Zealand students who take the School Certificate external national examination in mathematics are Year 11 students. Rachel sat the examination one year earlier in Year 10. By the time she reached her third year she had already learned powerful lessons from classroom discourses which provide cultural meaning systems about doing mathematics.

I remember my standard four [Year 6] class and I was doing extension maths and everything and, um, I know that there was one question in my standard four maths book and my teacher didn't know the answer to it. And I worked out the answer. ...

But doing School C [School Certificate] last year - that was a bit of a thing. 'Cos I missed two months of school, something like that last year 'cos I was off sick for six weeks and then for a month I was overseas and so I was cramming two years of stuff into less than a year. Such a rush! I learned most of that by teaching myself because I couldn't understand what Mr E was getting at. It was just going right over my head. It went right past me so I had to do it all by revision to get School C.

Rachel's desire to aim high towards a difficult goal is not formed from any perception of teacher as role model. What she saw as an unfruitful pedagogical relationship in her School Certificate year took on an critically educative meaning with self-satisfying rewards: "I was really happy with it at the time," she tells me, "especially considering I taught most of it to myself". Rachel relied upon her earlier mathematics success to inform her of what practices she was required to perform in order to succeed in School Certificate. She spoke of how she "wanted to do something that sort of extended me...I just wanted something to aim for, otherwise I wouldn't have got anywhere". She saw mathematics is seen as a critical filter to future opportunities. Overlaying this strategic enactment is another more powerful discourse through which she reveals her self-understanding of her place within the able/not able binary. Within the context of the mathematics classroom Rachel places herself in the powerful ascendant half in this binary. We can see how this

plays out in the following passage when her friend Kate has just checks her answer to a problem:

Kate: Wow! I'm RIGHT.
 Rachel: First time for everything!
 Kate: You're just jealous.
 Rachel: No.
 Kate: I'm going to do the whole thing
 Rachel: (laughs) You're not intelligent enough!

In another lesson, the class has been using the process of differentiation to find the gradient of a curve, making use of the conventional notation used in this procedure. Rachel and Kate are working on finding the gradient of the curve $f(x) = 3x^2 - 2x$ at the point (1,1). Richard and Blair sit behind them, a seating arrangement routinely chosen by all four. Amongst the 29 students in this class, these four are the only third year students.

Teacher: Two little steps: differentiation and then substitution. Make sure it's set out properly, not just a whole jumble of numbers with an answer at the end. Clearly distinguish between your original function and your derived function. Make this DASH very clear...

Rachel: Three x squared. So, it's $6x$ minus two. Is that one? (refers to value of x)

Kate: I don't get the dash.

Rachel: Get the dash? Put in the one. Yea, cos, it's a bit like a 'one'. Now what do I do now? You put it as x here, aye? So you've got six minus two equals four.

Teacher: (to class) Check with the answers each time you do an exercise. You know maths is a practise subject. You must practise things correctly.

Kate: (checking answers) WE WERE RIGHT!

Rachel: YEA! So now you have f dashed x equals five x to the four, minus two x plus five.

Richard: (to Rachel) That was quick.

Rachel: I LOVE making him feel stupid.

What becomes apparent from this passage is that Rachel takes up quite readily the discourse of 'how one does mathematics' as constructed by her teacher. She is able to reproduce and naturalise the definitive moves: "Get the dash? Put in the one. Yea, cos, it's a bit like a 'one'". Time after time Rachel's tapes reveal her access to knowledge. She also assumes the role of what Walkerdine (1989) has termed 'sub-teacher'. Clearly her power has much to do with her access to knowledge of mathematical processes and meanings which are, at that time, denied to Kate. This taking up of the mathematical tools provides her with access to a powerful position amongst her peers. Holding the ascendant position in her dialogue with Kate, she also appears to gain some standing in the dominant powerful position which her competence afforded her, when Richard comments on her quick solution. These identifications with others, taken together, provide her with the discursive resources for maintaining power differentials. However this site, like all such sites, is open to change and conflict. Rachel explains:

I'm just trying very hard not to let the guys get to me now. Then I don't have to laugh. Blair - he just likes really to get me in trouble and he has done that for the last three years and he'll just keep on doing it and there's nothing I can do so I just try not to sit in front of him. And hope that he doesn't sit in the row behind me ... The guys - they know that I laugh really easily and they keep making me laugh in class, and she [the teacher] just gets really frustrated with me because when I start laughing I can't stop and so she starts getting really angry at me. And apparently no-one has ever heard her raise her voice before she met me [giggles]. So it's a bit stressed there.

What Rachel says may help us tease out why she was so forceful in her interactions with the boys seated behind her. After her 'falling out' with her teacher, there was some reluctance on Rachel's part, to be fully reactive in this way again. Acting upon the discourse of regulatory behaviour as deemed appropriate by her teacher, Rachel rules out

‘laughter’, monitoring this behaviour to avoid potential conflict from the boys. At the same time it pointed to strained pedagogical relations:

- Rachel: I don’t know to do number three.
 Kate: Well, ask. Ask.
 Rachel: NO. Because I’m SCARED of that woman.

I want to discuss what happened in one lesson, during my visits to the classroom. In this I want to pay close attention to the complex relations between the desires and hopes of Rachel and others caught up within the pedagogical relation. During this lesson, as recorded on tape, Rachel made many references to the mathematics as developed by her teacher at the whiteboard. What I ‘saw’ from observing, was that Rachel was silent, concentrating intently during her teacher’s explanations. This was not unusual practice: in the course of my time in this classroom, she appeared to personify Walkerdine’s ‘nice, quiet girl’, always giving her undivided attention and from her interested and receptive demeanour I read that she was keen to learn. Indeed, her interviews with me reveal this to be so. My field notes record that when the teacher talk at the white board is ended, she showed obvious signs of off-task behaviour (untying and re-tying her long hair) when she should have been working on the exercises. Yet once the teacher issued a warning to the class concerning off-task work, Rachel resumed the set work, focusing on completing the exercises.

When I listened to Rachel’s tape at the end of this day I recall being profoundly surprised because her recorded private talk did not match my classroom observations of her and the notes which I made. During her teacher’s talk at the whiteboard, Rachel says:

- [2.31] I don’t get it. I don’t GET it. What am I ... What do I make it ... ?
 [2.36] It’s stupid. Can’t do THAT.
 [2.37] Can’t do THAT.
 [2.39] (to Kate) Don’t worry about it. It’s stupid.

At this point the students are asked to work through the classroom exercises. For the next nine minutes she talks to Kate about her hurt finger, about her friend Lisa, and about Kelly who is in Japan at the time. At 2.49 the teacher says: Some of you are wasting time. In response Rachel says to Kate:

- I know every dude that she’s talking about. ...(quietly to herself) I don’t just get any of it. I just ... I don’t even know what she’s trying to get at ... I don’t even know what ... I don’t even get what I’m supposed to be working for. ... Half an hour to go. ... What am I doing ... ?

Rachel says one thing and does another. There are problems here for analysis which have little to do with any developmental or constructivist argument. What would motivate such a paradoxical condition? The answer I believe, lies in the very issues poststructuralism brings to centre stage and problematises: the rational, autonomous subject, and the ‘view from nowhere’. Even when held with authority by the researcher, Rachel’s subjectivity is effectively doing its work elsewhere, under other guises. Through its work, Rachel enacts a refashioning of identity, as investments are lived in the classroom and simultaneously made public and kept private in the classroom, through language. Assimilating this diffuse functioning of subjectivity, poststructuralism transforms the terms of objectification, questions its modes of intelligibility, and reverses the stakes of the researcher’s confidence in truth, in the visible and in the real. The question that must be posed then rearticulates Britzman’s (1995) concern: is it possible to produce a narrative that exceeds the constraints of our research practices as they are currently defined yet still be intelligible?

When my observations became a site of doubt rather than a confirmation of what was being said, the researcher confidence I had in knowing her mathematical experience and in my ability to convey her experience through the conventions of scholarly writing, flew out the door. How can we approach this without clinging to the persuasive promises of 'good' research reporting? I could have queried my field notes as being at odds with and hence unrepresentative of what was 'really' going on. But stories which purport to 'tell it as it really is', reinscribe those useful standardised literary techniques of establishing themes, constructing time and space, to create a seamless narrative of development and ability, even as classroom life is lived as disjointed and non-linear. The true and 'real' classroom story serves to anchor the study's subjects firmly within the ability/inability divide. And that division brackets out the more useful investigation of conflicting interests, investments, costs and desires which are central to mathematical experience.

Opting out of the impossible, yet nevertheless seductive, desire for coherency, and the impulse to access the 'truth', I took the risk of a more ambitious investigation of mathematical experience and specificity, one that pushed the traditional boundaries in terms of how data are contested, represented and narrated. Right from the outset it was clear that leaving the certainty of true and false in order to theorise and analyse more tentatively was going to be discomfiting. Concerning itself less with establishing researcher authority, and more with questioning the very construction of that authority, the investigation tried to take into account competing stories working through and against the stability of meanings, identities, experiences, the treacheries of language, and the conceptual order constructed by all those involved in the study. Beginning with a recognition that knowledge cannot be disconnected from its discourses, from its discursive practices and from the interestedness of power, I took the primary category of analysis to be the *discourse of mathematical experience*, rather than experience itself. I looked at differences within and among the stories of mathematical experience Rachel had structured, the discourses at play and the way in which they layer themselves about her, simultaneously powerful and able to be dismissed.

What was finally produced was an analysis, organised to accommodate doubt and difference. It demanded attention to how research stories are told, and the inadequacy, yet necessity, of voice and interpretation. It required me to foreground the conditions and relations of production within which her mathematical work was generated. In that respect I tried to come to terms with previous education, with the pursuit of meanings, with theory and authoritative discourses. I looked at the discourses and theoretical tensions that affected Rachel's classroom experience. In this I attempted to see how power and knowledge relations are structured in the classroom by looking at how Rachel lived them and how these relations of power informed and politicised her mathematical work. I attempted to write of her in relation to a number of significant others: her teacher, her best friend Kate, and Richard and Blair who sit behind her. From this it was possible to note the complex interplay of relations between Rachel, her teacher, the reading of mathematical practice by Rachel, and the construction of it in relation to Rachel's small peer group. In linking all these together I examined how the production of mathematical knowledge is tied in complex ways to particular historical trajectories and sociocultural contexts. Just as it is place-specific, it is also a function of time.

Conclusion

In my reading of Rachel's 'text', I addressed the clash between observation and language by linking its work explicitly to the crisis in representation. And it is through this

particular response that it was possible to suggest that Rachel's classroom experience provides a very compelling contribution to what poststructuralism has specifically cautioned against: that 'seeing is believing'. Her experience and my efforts to relate it provided a useful resource to question researcher authority, shared meaning, and stable and unitary research subjects, in order to advance claims of multiple and contradictory positionings, and to question conventional constructions of objectification. But far from dismissing observation per se the intent was to query the uncritical appropriation of our conceptual categories and the logic we deem necessary to access 'reality'. Such an appropriation has everything to do with the power of the science on which research is based to prompt and sustain the impossibility of accommodating the contradictions, doubt and disunity.

All research, even that named as qualitative couched in the language and rhetoric of postpositivist discourse, operates within certain codes and conventions. The question raised by poststructuralism is not the existence of such commodified complicity, but the conditions of its deployment, and its effectivity. In drawing attention to the categories we construct and their derivative conceptual order necessary to access truth, we need to think about the way in which the political impinges upon and infuses all of our thinking and acting about research. The question we should be asking is not 'is this research objective enough', but rather 'if this research is authenticated and validated, what motivates its deployment? What are the political effects?'

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