RELATIONSHIPS TO MATHEMATICS; RELATIONSHIPS TO LEARNING MATHEMATICS

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ABSTRACT

Research in mathematics education is surely conducted for the benefit of teachers and the children they work with. The purpose of research might be viewed as being about opening spaces that allow us all to think about how our worlds may be changed. This paper will examine ways in which researchers can work with pupils and teachers to develop an authentic "voice" that speaks to researchers, academics, administrators, and those who have responsibility in policy formation. By privileging experience over theory as a basis for understanding an opportunity is created for marginalized or "silenced" groups to be heard. Using innovative and collaborative methods the research explores the relationships of groups of learners in schools in the UK to both mathematics and the learning of mathematics. It suggests that students may become disaffected as learners of mathematics as their self images become disconnected from their images of what it is to learn mathematics.

INTRODUCTION

This paper describes a methodology that takes as its starting point the 'voice' of those engaged in the research. It suggests that the exploration of educational settings should be a collaborative activity engaging those who live and work in the settings as well as the researcher. This gives a deeper understanding of the current context within the setting and offers areas for intervention and action by all engaged in the research.

VOICE, NARRATIVE AND SOCIAL JUSTICE

A socially just society would be one in which we would be happy for our worst enemy to choose our place. Perhaps a more pertinent metaphor for mathematics education is the image that a socially just mathematics education system would be one in which we would be happy for our own children, or children that we hold dear, to replace any other child within that system. If there are any children in situations in which we would not willingly place our own, injustice exists.

Some of the young people we hear from in this chapter do not feel in control of their own learning within the mathematics classroom, and would certainly not see their experience as mathematics learners as an opportunity to experience growth. Those who feel excluded from mathematics learning see themselves as outside an exclusive club. Their constructions of self do not include the category 'good at mathematics'. Margaret Walshaw and Tania Cabral explore this from a Lacanian perspective. They suggest that by investigating the process of learners self-construction of identity in connection with others, processes of learning within the classroom can be exposed (Walshaw and Cabral 2005, p. 301). For them, the space to explore is the struggle for

meaning between the teacher and the learner over what it means to be a learner – they suggest that when this gap is small the 'classroom becomes a safe place in which to speak and act' (ibid. p301). The learners we will hear from offer clues as to how this space becomes unbridgeable for some young people in our schools. The view of social justice I outlined above sees justice as a basic human right – and as something that our learners will struggle for. Until they can develop the language to describe how they 'feel' about the situations they find themselves in they will continue to struggle for justice. Coming to this language is both a part of identity formation within the classroom and a process of empowerment.

FINDING VOICE

The use of 'voice' within research texts is not unproblematic. The development of powerful narratives takes work (Hadfield and Haw, 2000). The critical voice seeks to challenge existing structures and assumptions about working practices:

> authentication comes both from an awareness of the teller of the story as to the purpose of asserting her voice and the particularity of her experience. The theme of representation aims to raise arguments and issues that are often marginalised in policy making.

In tackling this difficulty I would like draw to on the idea of *techne.* From Aristotle, *techne* is usually translated as 'art' or 'craft' and seen in opposition to *episteme* or knowledge. This opposition sets up a false divide between the domains of theory and practice however and it may be more useful to see *techne* as theory in practice. Maria Nussbaum suggests we should see *techne* in opposition to *tuche* or luck. So here *techne* allows us to apply our knowledge to our world giving us some form of control rather than simply succumbing to luck. She describes *techne* as being 'concerned with the management of need and with prediction and control concerning future contingencies' (Nussbaum 1986, p. 85). If we live by *techne* we possess 'some sort of systematic grasp' that will allow us to enter a 'new situation well prepared, removed from blind dependence on what happens.' (ibid, p. 85) We may argue that such a person in possession of *techne* can be described as empowered. In the Lacanian sense the 'learner personalizes rules of conduct in order to optimise existence in the classroom' (Walshaw and Cabral 2005, p. 310). Martha Nussbaum also suggests that from Aristotle there are four sources of *techne*: universality, teachability, precision, concern with explanation (Nussbaum 1986).

The process I describe below outlines a process of collaborative research with young people to develop a description of how learning 'felt' for them. I would argue that at the beginning of the process those learners who had become excluded from the process of learning felt out of control of the process of education. They were living by *tuche*, the knowledge of the work that they brought with them into the classroom did not offer them '*prediction and control concerning future contingencies'*. As learners come to a language of critique they can gain *techne*, through the narratives which detail what has happened to them in the past they can gain some control over

their possible futures. *If* we feel in control of our future, *if* we can understand how our previous work moves us forward and if we feel in as much control as we can expect of our future(s) we are moving towards social justice.

WHAT IS IT LIKE TO BE HERE?

The research that follows was undertaken with two groups of students in a Midlands inner City school in England. It is seen as a school in 'challenging' circumstances within the city and the teachers work with many young people from disadvantaged parts of the city.

The first group of 12 students, aged 11-12 had been selected by their teacher to provide a cross section of skills, abilities and attachments to learning mathematics. In contrast I also worked with a group of 15 – 25 Year 11 students. These students were about to sit the national examinations at 16 and were placed in the lowest achieving groups of students.

The beginning of the process is about exploring who we are. If we are to describe 'what is it like to be here', we need to articulate how we see ourselves early in the process. I asked the two groups of learners to create a web diagram answering the question 'Who am I? with as many different views of themselves as they could think of. The younger group described their families, the wide range of linguistic backgrounds they could draw on, their hobbies and interests. All their definitions of themselves were phrased as positive statements, including three of the group who described themselves as 'someone who loves maths', or 'someone who is good at maths'. This group averaged 18 statements about themselves.

In contrast the group of 16 year olds found it very difficult to describe themselves at all. The average number of responses from this group was 10. These described familial relationships and interests as with the younger group. None of the students described themselves in terms of their linguistic background although many were positive about their ethnic background. One student phrased this in a slightly more complex way saying, 'People say I look like an Iraqi.' In this group there were several negative comments – three young people said 'I am someone who hates teachers.' 4 students stated that they 'hated school uniform' and 4 other students said 'I hate maths'. Unlike the younger group this groups' complex view of their identities often created a tension between their view of themselves and a view of self, which is compatible with seeing learning in school as a positive endeavour.

I asked the two groups to draw me a 'mind map' which described, for them, what it was to 'be good at maths. Most of the younger group treated this is as a collaborative activity, engaging in discussion before making their mind maps. When the students described what skills people who were good at maths had they listed; they do not need to use calculators; they can answer questions very quickly; they can use all the mathematical operations well; they use complex mathematical vocabulary and explain things well. This suggests a narrow view of the nature of mathematics. The

students could all describe peers who they saw as good mathematicians, and several pointed out individuals within the group. One whispered to me that they knew one of their friends was good at maths because the teacher always asked them the questions.

In contrast all the Year 11 students used their current teacher as a model for someone who is good at mathematics. They described success in mathematics as mastery over content. They suggested that individuals who are 'good' at maths understand the content – these individuals are also 'boring'. This view of successful learners in maths completely cut across their view of themselves as learners. In this way they could not see any way that their identities as individuals were compatible with an identity which would include being successful learners of mathematics.

To further explore the young people's images of learning mathematics and their images of themselves as learners of mathematics I asked them to draw me images of 'what learning maths was like'. The younger students drew a wide range of images, and articulated clearly how these images related to their prior experiences of learning mathematics – they could also describe their relationship to the images. The older students could not articulate what it was like for them to learn mathematics, none of them could relate a time when they had felt successful in learning mathematics. In order to support them I used the images that the younger students had drawn and asked them to sort them into two piles. Those that resonated with their own ideas of what it was to learn mathematics and those that didn't. This activity allowed them to begin to describe their feelings towards learning mathematics.

I used a similar process with the younger group – they selected a key image from the group that they thought fitted their view of the process of learning mathematics. For the 11 year old students the key image was of a tape recorder sitting on a teacher's desk. There is also a sheet of paper resting on another desk. This is a pupil's answer sheet for a mental maths test. The pupil has written next to the image *'I like doing Mental Maths with the tape recorder in the Primary School'*. This image refers to the process which is used by the national tests at age 11 in the UK. Pupils are asked to respond to a series of questions using mental methods. The process is standardised nationally by using a common set of questions delivered to schools on an audio-tape. This suggests a view of learning mathematics as disembodied, literally in this case. The tape recorder was not required to take account of individual needs – it did not bring emotion into the equation. This view linked directly to the sense the young learners had that success in mathematics is measured through successful completion of tasks.

This view of learning mathematics was not recognised by the older students. This group selected three cards; one showed a pupil sitting at a desk, almost swamped by a huge piece of paper saying 'Oh no not maths again'; another image showed a face with swimming eyes with the statement *'learning maths is some times confusing'*; their final choice was a card showing a sleeping pupil sitting at a desk with a teacher. The teacher's speech bubble contains 'Blah, blah, blah, blah, blah, …'. The student

has written on the card ‘I don’t like it when teachers take FOREVER to explain something and Boring teachers shouldn’t teach maths’.

This suggests an image of learning mathematics as a process of confusion and frustration, which could not be alleviated by the teacher trying to explain concepts and ideas. In fact the lengthy explanations were perceived as increasing the frustration. Mathematics for these learners appeared to be confusing, frightening and enraging.

DEVELOPING A VOCABULARY OF CRITIQUE

I have suggested above that the data shows a group of young people who, at age 11, are able to see ‘mathematics learner’ as a facet of their identity, although with this group there was an emerging sense of identifying success in mathematics as external to their self-image. The group of 16-year old students, identified as ‘disaffected’ by the school, made no connection at all between their images of themselves and images of successful learners of mathematics. This disconnection makes any form of teacher – student relationship in the mathematics classroom very difficult. There was also a marked difference between the ways that the younger students could articulate their images of themselves – particularly in relation to school, learning and mathematics learning and the older students, who could articulate self identity but often saw it in tension with what it is to be a learner of mathematics. These students found it very difficult to articulate their relationship to mathematics and mathematics learning – except as an opposition.

The process of research allowed the students who felt disconnected to the process of mathematics to begin to articulate this sense of disconnection. I suggested earlier in the paper that developing *techne* allows individuals to take some control over their lives. It removes the sense of ‘blind dependence’ on the experiences that life throws at us. My hope would be that the process of research has begun the process of developing a vocabulary of critique for these young people. If we can describe what it is like for us to be in a particular situation, we can begin to think through the possibilities for change.

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