Coming to do Mathematics in the Margins

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This paper explores teacher' 'identity' as two teachers talk about teaching mathematics in classrooms situated within two different contexts of learning – mainstream and alternative. Employing a form of discourse analysis framed within a participation approach to learning, this paper describes teacher identity in terms of the norms and practices that frame the translation of content, pedagogy and assessment in each teacher's classroom. Differences between each context of learning are highlighted and parallels drawn between similarities.

The notion of identity is difficult to theorise. It cannot be simply reduced to elements such as thinking, emotion, morality, gender, agency, or practice (Roth, 2007). However, researchers often focus on one or two elements of a notion of 'identity' in order to explore, for example, the power of agency through working mathematically (Grootenboer & Jorgensen, 2009). In many ways, what each of these studies is attempting to do is provide a believable account of individuals 'being' in a world that is observable, a world that is constituted of many contexts of activity based on distinctive principles and practices (Roth. 2007).

This paper explores the nature of the 'identities' engaged by teachers when working in mathematics classrooms that may be considered to be at the margins of mathematics teaching. 'Identity' is conceptualized in this paper as a community-forming process where adults and students express and communicate ideas according to a set of norms and practices (see Lave & Wenger, 1991).

Theoretical Framing

According to Wertsch (1998), the tension between people and the cultural means (norms and practices) at their disposal results in an on-going process of transformation and creativity that has the potential to not only change the relationship of people to the world by shaping and constraining their participation in it, but also to transform the individual person by incorporating his/her activity into new, functionally active systems that are culturally and historically situated. One means of capturing the norms and practices of a cultural group is through the use of narrative, that is, the telling of the "rich and messy domain of human interaction" (Bruner, 1991, p.4).

Narratives may be elicited as a spoken or written account of stories revealed in long sections of talk or in a single research interview (Liamputtong, 2013). The purpose of the research reported in this paper is to explore the nature of the identities constructed by teachers as they participate in face-to-face interviews designed to elicit their accounts of being a teacher. As narrative interviews are concerned with appreciating and contrasting differences in perspectives (Jovchelovitch & Bauer, 2000), the interviews of two teachers, one from a mainstream system of education and one from an alternative system of education were analysed for the purpose of exploring the identities constructed and their links with the principles and practices privileged in their context of teaching mathematics.

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Method

Interview Design

In order to privilege the context of education, mainstream or alternative, interview questions were designed that conformed to the 'participation framework' employed by Vadeboncoeur (2006) to map young people's learning in different contexts. This framework situates interview questions within broad categories relating to location, relationships, content, pedagogy, and assessment, allowing different questions to be asked according to context, thus allowing the story of the interviewees to be told, but ensuring that information is provided to assist in explicating the similarities and differences across contexts. Interviews were conducted by researchers in places where interviewees felt comfortable to tell their story. Each interview lasted for approximately 30 minutes, was audio recorded and transcribed for analysis.

Participants

Mainstream School Context: The teacher who is the focus of this paper, Sam, taught mathematics to students (ranging in age from 12 to 18years of age) at an independent co-education P-12 school located in a middle-class suburb of a major city. Sam started his career, now in its 26th year, by framing his teaching of mathematics within pedagogical practices that reflected a transmission approach to teaching and learning. However, after a decade of wondering why students performed inadequately when it came to the application of mathematics to everyday situations, Sam began to view student learning within a framework that anchored his teaching to pedagogical strategies that afforded him a focus that privileged student understanding over teacher demonstration and student practice. It is well understood that the predominant pedagogical view in many mainstream mathematics classrooms is based on traditional approaches to teaching that privilege teacher demonstration and student practice (see for example, Handal & Herrington, 2003). As such, even though Sam teaches in a mainstream school his views about teaching mathematics (see Brown & Redmond, 2008, for more information) place his classroom on the margins of classroom mathematics teaching.

Alternative Education Context: The teacher who is the focus here, Lisa, is an experienced female teacher in the middle phase of schooling (students ranging in age from 12 to 16 years of age) and a long-term member (over ten years) of a 'network' of alternative education schools. It is for this reason that Lisa's classroom may be considered to be on the margins of teaching mathematics. Lisa is responsible for planning and delivering the Numeracy program in the school. The alternative education school in question is a co-educational Catholic school where teaching and learning is characterised by small class sizes, a flexible curriculum that draws on individual student interest for curriculum focus, and a democratic pedagogical approach that encourages learner empowerment and autonomy. Multi-disciplinary teams of professionals work with young people who are vulnerable and experience a complexity of inter-related needs. The learning experiences also build self-confidence and esteem in students, promote an optimistic view of their potentialities and future, and assist them to develop the knowledge, skills and attitudes necessary to enjoy a healthy and fulfilling life. Teaching and learning is grounded in principles that guide practice such as: respect, for self, others; participation; safe and legal; and, being honest (see Vadeboncoeur, 2009 for more information).

Analytic Process

To systematically analyse the interview transcripts, a framework was developed based on Vadeboncoeur's (2006) participation framework that centred on the following broad categories: location, relationships, content, pedagogy, and assessment. This framework was chosen because it allows researchers to see links between learning contexts, thus allowing for an explication of the similarities and differences in the dilemmas encountered by the interviewees across teaching contexts (Vadeboncoeur, 2006).

Analysis and Discussion

The dilemmas that we aim to highlight and discuss in this paper focus on the categories of content, pedagogy and assessment. This focus was chosen for this paper due to the emphasis given to these categories in national school curricula documents. Only those segments of text pertinent to the analysis have been tabularised.

Content: Knowledge Versus General Development

Teaching curriculum emerges from the interview transcript as being of secondary importance for Lisa; her aim is not to teach young people mathematics knowledge and skills, partly because she thinks it is too 'unsafe' of these 'kids' to learn (see Excerpt 1).

Excerpt 1: Safe to take risks

Question: Can you tell me something that explains how you work with young people?

Lisa: Um (...) it's a hard question to answer in that it changes a lot of the time. You know it's a dynamic place and I think that I have always come to the place with the understanding that I teach kids not curriculum. So the content of what I teach is not of great importance to me, it's um, it's certainly not my priority, neither sometimes is actually teaching them skills. Initially, my priority is to make them feel like they are learning. So there's a lot of work, I think I put most of my energy into that, how to re-engage, how to help a young person experience success in some way. And that may be through addition or a piece of writing, or it may be through something curriculum type, but until they feel safe to take that risk, the rest is nothing.

For Lisa, teaching curriculum and skills emerges in opposition to re-engaging 'kids' to learning, offering them opportunities where they can feel safe to try and make mistakes, where they can experience success and see opportunities (see Excerpt 2).

Excerpt 2: Experiencing success

Question: Are you preparing them (the young people) for anything?

Lisa: We open windows, we open the curtains for them that's what we do. And I think that's what you'd find here, it's not always about building up skills, but it's about seeing yourself as a learner again. It's about believing in yourself, it's about being willing to take risks. It's about experiencing success in something.

For Sam, teaching Mathematics emerges from the interview transcript as being of primary importance. His aim is not to teach young people mathematics knowledge and skills out of context, but to find topics of interest that will assist the students to develop an 'holistic view' of Mathematics where the knowledge and skills that are developed are seen as useful (see Excerpt 3).

Excerpt 3: Building a holistic view of Mathematics

Question: How have your learning experiences that you provide your students with changed?

Sam: We try things, I mean we try things that are interesting, that we find interesting, that hopefully the kids will find interesting and so we try to build things around that. To allow kids to build things around mathematics but also see the use in the mathematics. So it's a case that we are sort of doing that. So we try and build a holistic view of mathematics so that kids don't see mathematics as a bunch of functions, things that don't relate to one another and I think that is probably really important.

For Sam, teaching curriculum and skills emerges in tandem with engaging students in the learning of Mathematics, offering them opportunities where they can 'stretch themselves' and be guided and helped by a teacher who has a particular plan in mind to 'get to a particular place' in the curriculum (see Excerpt 4).

Excerpt 4: Moving understanding forward

Question: What roles do you adopt in the teaching and learning process?

Sam: I control it a fair bit because I want the kids to get to a particular place. There's only a finite time that we have to get to it. We need to move the kids thinking forward. But if you give them something where they have to stretch themselves and that sort of stuff and I think that is pretty useful when the teacher helps and guides them and gets them to move their understanding forward. I don't know how that is all going to go in the future though.

Pedagogy: Teaching Versus Socialisation

Teaching emerges for Lisa as having something to do with academic content, teaching the young people tables, to read and to spell and teaching them to solve tasks like planning a trip with a specific budget. However this is not the aim of teaching for Lisa and for those young people she teaches; she has a different benchmark for success for these young people; she would like the 'kids' to leave the school being socialised into ways of being that allow them to function in the world (see Excerpt 5).

Excerpt 5: Saying sorry and meaning it

Question: How does teaching and learning relate to what you do with young people?

Lisa: I probably have a much lower benchmark for success, than mainstream teachers. The kid that says sorry and means it is a huge success for me. Um, when you see the lights go on, "Oh that's why the zero goes there", you know those little things, or when they speak nicely to each other, those are the things that actually show me success and certainly give me a lot of joy.

Socialisation emerges for Lisa as the main goal; socialising these young people into 'proper' ways of behaving and talking; their own ways of being are not acceptable for the wider society; school is a place that teaches them how to leave these ways of being behind, how to switch them off, gain 'self-control', and instead become like others (see Excerpt 6).

Excerpt 6: Becoming like others

Question: How does teaching and learning relate to what you do with young people?

Lisa: I also think that um, we probably, most of us I would say, have a broader view of what, ah, what needs to be taught and what is teaching. I mean sitting on that chair for longer than five minutes is teaching. Not swearing in public is teaching, so our view of what teaching is, I think is, yeah, and I think that those things are as important as the academic teaching we do, socialising.

Teaching for Sam is about learning, it is about playing with the form of teaching to 'get the kids to do the learning'. It is about facilitating students' construction of understanding through engagement in meaningful and interesting tasks. Interest is the key to teaching for

Sam; he has a high benchmark for success for his students and their engagement with mathematics and he is willing to spend time, effort and resources in the pursuit of meaningful academic learning (see Excerpt 7).

Excerpt 7: Finding interesting things in different places

Question: How has your approach to teaching and learning changed?

Sam: To my mind the learning is the thing that is important and that comes first and the teaching is there to facilitate that sort of learning. I try to get the kids to build their understanding and find ways of doing it, but also get things that are meaningful and are interesting. So I guess in terms of my teaching, that's sort of where I am at. If I am not particularly interested in it then I probably won't play with it too much. But if it interests me or if I think there is something that I can drag out of it, I am happy to spend time on it, and if I am happy to spend time on it then maybe the kids will find something interesting in it, and you will find interesting things in different places.

Socialisation for Sam emerges in the context of linking mathematics to the 'outside world'. Socialising in Sam's classroom is about providing tasks that the students can relate to and 'get engaged in'. School is a place that teaches students to see relevance in and to draw out meaning in the mathematics that they learn (see Excerpt 8).

Excerpt 8: Seeing relevance in Mathematics

Question: So what do you perceive to be authentic activity in the classroom?

Sam: I think that authentic, we try to find contexts that link to the outside world that the kids can see relevance to it. But sometimes something that's authentic is something that the kids can relate to and can get engaged in. So it might not necessarily be a life related type thing, but if the kids can relate to it and can engage in it and can draw some sort of meaning from it then I probably think that can probably be considered as an authentic task.

Assessment: Scientific Versus the Everyday

For Lisa, academic knowledge appears to be of secondary importance; she seems to be very rational about what these kids can and cannot achieve – she seems to know exactly where they are and even more that they cannot go or be anywhere else in terms of their skills and knowledge (see Excerpt 9).

Excerpt 9: What you need to learn

Question: So how do you gauge your successes in teaching?

Lisa: There's a story I have that I think is a real example of that and I think this young man is quite a bright kid, um academically, and older, I think he was almost fifteen and I get a phone call in the office one day and I answered the phone, and this um, it didn't sound like a young person actually, he had quite a deep voice and he said, "is John there?" John was a teacher at the time and he was in class and I said, "can I take a message?" and he said, "when does he come out of class?" and I said such and such a time, and he said, "can you just tell him that 3000 is nowhere near enough, I have to have at least 5, I can't possibly do it on 3000", and I said, "who is this?" he said it's Pete, this kid, "oh right, what are we talking about Pete?" and then he went on to explain to me. He was doing this assignment where he had to plan for a trip with a budget of $3000, it really struck me. It was actually one of those things that I took away and reflected upon, and I thought he is going to pass that assignment and he is going to get a good mark for that assignment, and yet he couldn't use the phone properly, he couldn't say to me, "It's Pete here can I speak to John?", you know have we succeeded? You know I just had a different view of the grade he'll get for that assignment, really doesn't reflect what he has learnt or needed.

While Lisa does not see much relevance of academic knowledge for these kids, she does value some of their interpersonal skills, such as leadership and initiative; she is willing to legitimise and celebrate these over and above the academic (see Excerpt 10).

Excerpt 10: Privileging interpersonal skills

Question: Are you preparing them (the young people) for anything?

Lisa: There's one young man in my class, I have had him for five years now, and he hadn't been to school for three years before he got to us um, a chronic school refuser, extreme behaviours et cetera. This last term he got 100% attendance so I got him a little wall plaque for it. Now he comes from a family of nine and I have actually taught six of the kids. And they all have this really specific learning problem in terms of reading. So in five years with me, his reading has not improved a great deal, and basically now we are in survival reading. Can you fill in forms, what do you need to survive beyond here? But, he won the leadership award from the ADF, Australian Defence Force, just last week, the grade eleven leadership award, he ran the footy team.

For Sam, academic knowledge appears to be of primary importance. Instead of being concerned only with what students should achieve he seems to be very rational about what his students could achieve if provided the opportunity. He doesn't seem to be concerned with simply knowing where his students are in terms of learning mathematics but also with knowing what might provide them with 'a lot of usefulness' (see Excerpt 11).

Excerpt 11: Getting usefulness out of what you do

Question: So what do you perceive to be authentic activity in the classroom?

Sam: You know you try and find things that, like I had a kid that, in my year, he's in my year 11 and he's going into year twelve. Now we set up a task for them to do but he, on the way through, he collected some data of a ball bouncing and he spent so much time trying to build an equation for that and do something with it. Rather than making him do this assignment over here, I just structured the assignment so that he could do what he wanted to do. He went away and he has built some really sophisticated mathematics to be able to model a ball that's bouncing along the ground. But he wouldn't have necessarily done that if I said, "No you can't do that you have got to do this over here". But he spent a huge amount of time doing that thing. Now that's not necessarily what you do for all of the kids because maybe they can, maybe they can't, and maybe they don't necessarily show the interest, but this kid did and we were able to, at that particular point of time, provide him with the opportunity to do that and I think he probably got a lot of usefulness out of doing that.

While Sam focuses on the relevance of academic knowledge, he does value some of the interpersonal skills that his students have, such as peer interaction and communication; he is willing to legitimise these as being 'useful' aspects of the academic (see Excerpt 12).

Excerpt 12: Getting an idea of the sorts of understandings

Question: So how do you allow students to express their social selves in the classroom?

Sam: Oh that's alright, I mean I think that peer tutoring and that sort of stuff is useful. But they have to have that time at the beginning to think about whatever it is that they are doing. Think about what they know and what they can bring to the discussion table. Then that interaction between the students and teacher is really, useful. In terms of getting kids to be able to verbalise their understanding because the number of kids who say, "Oh I know what to do", but can't communicate it, um, tells me that they really don't know what they are doing, it's just the procedure that they are following and they really can't put it together. So when they actually verbalise it to somebody else or to the teacher, and they can do a good job of it, that's when you start to get an idea of the sorts of understandings that they are building and how strong their understanding is.

Conclusion

What emerges from these interviews are teachers who on the one hand have positive ideas about teaching in non-traditional learning contexts, as evidenced by their emphasis on interpersonal skills and re-engagement in general development alongside or above academic content knowledge. On the other hand this positive basis is lost by Lisa in her positioning of these young people as coming from dysfunctional families and rough world conditions and seeing them as not capable of making any real progress or re-engagement with education. In this way her goals of re-engaging these young people with education become translated into practices of socialisation; that is, teaching them how to talk nicely, how to sit still and follow the routine, how to learn to control themselves and hide their rough backgrounds. Instead of legitimising the knowledge and experiences that these young people bring to the learning context, and trying to re-engage them through those, Lisa aims to suppress these different ways of being and to teach them ways of overcoming these ways of talking and behaving. She does not seem to work on 'what could be', but on 'what is' and 'what should be', aiming to create what is appropriate and acceptable for the world of opportunities.

However this positive basis for learning and teaching is used by Sam to position his students as partners in the learning process and to see them as capable and as having potential to make real progress in their education. His goals of engaging students in authentic tasks privilege meaning making and transference of learning to their own worlds, that is, his teaching focuses on teaching students how to talk about mathematics, how to see the mathematics in real world tasks, how to work with others (teacher and students) to progress learning, and how to see difficulty and challenge as being important aspects of knowing and doing mathematics. In this way, he legitimises the knowledge and experiences that students bring to the classroom, teaching them that mathematics is an important aspect of 'who they are' and 'what they do. In many ways, Sam not only works on 'what should be' done to teach the mathematics curriculum, but also works on 'what could be' done in order to well position students for the world of opportunities.

Even though Lisa and Sam have different foci in their teaching of Numeracy/Mathematics, both Lisa and Sam are highly regarded in their respective schools. For Lisa the teaching of numeracy is about present and future health and well-being, for Sam the teaching of Mathematics is about present and future learning opportunity. Both teachers provided efficacious learning contexts. Common across both learning contexts is an engagement with epistemic, ontological, and axiological positions for young people. These contexts, albeit in different ways, mediated knowing and doing, identity and difference, through relational norms and pedagogical practices.

It is clear from reading the interview transcripts that both Lisa and Sam are teaching in the margins. Lisa works with young people who are vulnerable and experience a complexity of inter-related needs. Participation and retention are key elements in her philosophy of teaching. Sam 'battles' to teach students in a mainstream schooling system, participation and meaning making are key elements in his philosophy of teaching. Both teachers have elements to their identities that teachers of mathematics across all contexts may lay claim to. It could even be stated that, without knowing the context, either teacher could be assumed to be teaching in a mainstream or alternative context. As such, both Lisa's and Sam's approach to teaching have important contributions to make not only to developing the identities of teachers and the young people that they teach, but also to bridging the divide between mainstream and alternative contexts of learning.

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