On the Way to Theorising Mathematical Wellbeing

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Abstract

This article discusses a research project that attempts to investigate the usefulness of the capabilities framework as a means to empower adult learners to identify and reflexively consider the mathematical learning that they value. The focal point is a discussion around the methodological approach, of collecting stories about learning, and is an initial attempt to wrestle with the discursive terrain offered by the Capabilities Approach. The very early stages of analysis are used to sketch a potential theoretical landscape to gain insights into how a learner's approach can both impinge on and provide substantive opportunities for the learning of mathematics.

Introduction

Imagine you have returned to a mathematics classroom and the teacher before you asks you what sort of mathematician you want to become. Visualise yourself in an appropriate setting and then consider the ways in which such a challenge would appeal to you – or not, as the case may be.

Did you find yourself revisiting your schoolroom experiences of learning maths? Did you consider the mathematics that you use to resolve everyday problems? Did you think about how your values and beliefs affect the ways in which you approach and resolve mathematical problems? Did you think 'this isn't for me'? Teaching mathematics to adults is different from teaching children. Adults do not just bring mathematical skills with them into the classroom; they bring lived experiences and beliefs about the purpose of mathematical knowledge as well as constructs (albeit messy ones) of teaching and learning (FitzSimons 2002).

Research into how adults learn mathematics (Smith 2004; Coben et al. 2005; Swan

& Swain 2010) tends to converge around the findings that learning tends to be more meaningful when adult learners are able to influence the direction and purpose of their learning. In response, the architects of the curriculum for adult mathematics in the UK (Swan & Swain 2010) have positioned mathematical knowledge as a problem-solving tool that is accessible to all, and which is communicable through a weakly framed language (Bernstein 1977), malleable enough to embrace everyday situations (Kennedy 1998). In this vein, teaching practices of mathematics now tend to be less visible and more instructional in tone. General mathematical principles tend to be contextualised in local settings (Coben et al. 2005) and meanings tend to be shared from within the learning community (FitzSimons 2002).

In short, adult learners are asked to construct, articulate and value their own mathematical ideas. Yet, problematically, many remain distrustful of their knowledge. Mathematics continues to be regarded as something that is unobtainable and outside of their control (Wedege 2004) or, simply put, something that other people do (Mendick 2005). So, whilst the pedagogy of creating mathematics, as opposed to learning the abstract rules by rote, may hold exciting opportunities for learning (Swan & Swain 2010), Wedege (2004) posits that to do so in a meaningful way requires learners to develop agentic permission to value their own mathematical expertise.

This author posits that the capabilities approach to wellbeing can provide an authorised learning space that can encourage the learning community to explicitly explore the relationship between an individual 'doing' mathematics and their identity to go ahead and 'be' a mathematician, in short, to construct their own mathematical ideas (Bernstein 1977). This space is envisaged through a shared language that can allow the individual to look below the surface of their previous mathematical qualifications and enable them to unpack and make sense of past and present experiences as they unfold during the learning of mathematics.

The Capabilities Framework

Coined by economic laureate and political thinker Amartya Sen (1999) and diversified as a moral framework of thought, the capabilities framework is defined by Vizard and Burchardt as a

> freedom focussed approach to analysis that concentrates on the achievement (and lack of achievement) of human capabilities rather than other focal variables such as income, growth [and] … production. (Vizard & Burchardt, 2007: 21)

The freedom-focus of the framework centres on the twin notions of functionings and capabilities.

Drawing on Sen (1999), Alkire & Deneulin define functionings as 'the various things a person may value doing or being' (2009: 75). Valuable 'doings' are described in terms of activities which may include being able to visit loved ones, having a good job, being literate and numerate, or being able to take part in a discussion. Valuable beings are described in terms of states of mind, such as achieving happiness or feeling safe, valued and respected. In terms of learning mathematics, valued functionings could include (but are by no means limited to) being able to 'do' fractions, check change in a shop, and take part in a mathematical discussion or feel safe and/or valued within the learning environment. A valued functioning can also combine the two domains such as being able to write a cheque in the bank without a feeling of shame. It may even include aspects of negotiating identity such as 'feeling like a mathematician'.

Capabilities refer to the real and actual freedoms and opportunities that an individual needs to experience in order to achieve their valued outcome (the functionings). Learning capabilities, according to Walker (2008), typically include the capability of critical thinking, imagination and voice, and often hold the key to expanding and developing further valuable capabilities and/or functionings.

Methodology

This research is an attempt to gain insight from the ways in which a small sample of individual learners may have encountered learning in relation to historical conditions and factors that may have shaped the ways in which they have been able to live their lives (Snape & Spencer 2003). The methodological approach stems from the assumption that the recollection of an experience is not an attempt to seek a 'truth' about the past, but instead intends to gain a relational picture of how the participants might have made sense of their previous learning experiences in the particular time, space, and context of the interview.

The questions which the research seeks to answer are: to what extent do values and beliefs influence the ways in which these learners approached classroom mathematics? How do learner's perceptions of formal mathematical structures affect their learning progress? What are the implications, for policy and practice, of using the concepts of capabilities and wellbeing for improving the experience of learning mathematics?

The learner participants were drawn from a non-probability, purposively

constructed (both in terms of participant demographic and learning context) sample base to gain a nuanced understanding of experiences of learning mathematics (Bryman 2008). They were drawn from a small pool of experienced and specialist mathematical teachers who, in varying degrees, interweave mathematical discourse (as a pedagogic approach) into the processes of learning mathematics. The sample included 11 adult learners (age 19+) from a variety of educational settings. These included discrete numeracy settings (where mathematics is the sole aim of the learning programme), including an adult education college, a residential women's college, family learning provision within a primary school and work-based learning (classroom assistance). The sample also included embedded numeracy provision (where mathematics is part of a wider, generally vocational, full-time course of study), including a Foundation Tier (business), English as Second or Other Language (ESOL) learners (in Information Technology) and an Access to Higher Education programme (nurses and teachers).

Starting with an open narrative approach to collecting stories about learning, the research aimed to determine what mathematics actually meant to each participant. As such, an abstract question is almost impossible to visualise, let alone answer. Non-participatory observation was used as a second data-gathering tool. Such observations (of a learner 'being' a mathematician and 'doing' mathematical problems in the classroom) were then used, almost as a conduit, to provoke discussions for the second and final interview (this time semi-structured) to gain further insights into the oft-shifting nature of mathematical identity.

It is the discursive practices of how participants have made sense of their learning that provide the insights into the aspects of learning that the individual participants might value. However, adult learners are rarely free agents with neatly tied aspirations that are simply awaiting conversion into valued functionings (Walker 2008) and their anecdotes of learning are rarely neatly tied packages of coherent thoughts. Therefore, Rapley (2004) suggests that it is simply not feasible to start an interview on the premise that a few well-prepared questions can elicit a coherent picture of the past.

Bryman (2008) concurs and offers a narrative interview as a holistic and person-centred approach that allows the participant to frame their stories of how they feel, perceive and do mathematics (Valero 2008). Such accounts can then be used to gain insights into how the narrator's voice may have come to be authorised and/or silenced, contested and/or accepted (Squire, Andrews & Tamboukou 2009) both internally, through (non)identity as a mathematician, and externally, by the learning community. However, in recognising that an active role for the researcher remains a controversial

area of scholarship, West (1996) welcomes storytelling as a fluid and open framework that enables different, and often contradictory, layers of meaning to emerge.

Ethics

It would be naive to view the narrative interview as a conversation free from the hierarchies of power as the researcher has after all set and then controls the agenda. However, in the Foucauldian tradition, Tamboukou (2009) suggests that telling stories is often a political act whereby, in addition to the researcher, the narrator also holds multiple layers of motivations which may have led them to narrate a story in a particular way. According to Rapley (2004), the responsibility of the researcher is to be an active listener and to interpret the stories in a sensitive and reflexive manner that remains both in context and has regard for the circulating power relations that govern the processes of the research.

Findings

Given the size of the sample and the methodological approach, it is not useful to attempt to construct a multi-dimensional measuring device for evaluating the impact of learning mathematics on the freedom to live a valued life, or even to attempt to identify the 'freedoms' brought about by learning, as experienced by each of the participants. Instead, drawing from strands of critical mathematics pedagogy as well as post-structural literature on voice, the intention is to use the interview as a space to explore difference, by encouraging the participants to problematize their approaches to mathematics with particular reference to structuring factors (such as class, race and gender), which may have impacted on their opportunities to learn. The narratives will then be analysed in order to identify emergent themes through which to investigate the usefulness of the capabilities approach as a tool to reflexively consider the freedom and opportunity dimensions of learning mathematics.

Thus far, the research data has been collected, and while the analysis is by no means complete, initial attempts to organise and categorise the data has uncovered some promising emergent themes, which are briefly outlined below.

Learners' Relationship to Mathematics

According to Mendick (2005), learners often hold a fluid, fragmented and contradictory identification with mathematics, with mathematicians tending to be characterised as independent thinkers who are separated from, rather than connected to, the rest of the world. 'Real' mathematicians tend to be seen as different from other people. The preliminary results of this research show similar patterns of identification.

Within this small sample, many of the learners have constructed their relationship through the lens of an idealised and often masculine vision of a 'mathematician'. This tendency to view mathematics through a lens of 'otherness' is nicely captured by J's remarks during her initial interview:

> ... So it's almost like hands off, I don't know. So I think I have been brought up in that sort of environment although my father worked as an engineer so it's almost like, well he's the one that knows it all so ... yeah. (J 2011)

The Narrative of the Ideal Learner

M is studying mathematics on a foundation learning tier course in business and, like J, she voices her (in)ability to 'do' mathematics in relation to an 'otherness' that has been generated by her vision of an 'ideal' mathematician. M is not alone in her thoughts: according to Boaler (2009), speed and memory are often cited by learners as the key mathematical capabilities in order to succeed.

> Yeah, it takes me so long and everyone will do it like that [clicks her fingers] and do it in their heads and stuff. I mean, there is this guy who kind of knows everything and so he will teach me it, but it will be like 'derrr' [shows signs that she can do the maths], and then it's gone. (M 2011)

J also refers to the importance of memory for 'learning' mathematics, but in doing so gives some insight into the circulating nature of the power structures that have moulded her experiences and approach to learning mathematics:

> Well funny enough, the lady sitting next to me, which is [name of one of her peers], err, she did it all in her head. She was taught back in Africa and blah blah blah blah blah and so that's all in there [she taps her head] but she doesn't know what to do with it. So, she's working like a computer and I said, 'no you've got it, you've got it!' and she said, 'I've got it, I've got it!' So I said, 'all you've got to be able to do, is to take it out of here [points to her head] and put it down on here and then you'll realise what you know'. She says, 'I don't understand, I don't understand', and I said, 'you've got it, don't worry, you've got it' [pats my arm]. (J 2010)

Capabilities and Wellbeing

H has lived in England for two years and has achieved a very high standard of fluency in spoken English. Despite an impoverished childhood in Morocco, H was the first in his family to gain an undergraduate qualification (in human rights law). At the

time of the interview, H was studying mathematics through a full-time information technology course. Despite his success in speaking and writing English, he showed considerable frustration with his performance in mathematics. Throughout his interview, he demonstrated very effective and critical learning capabilities, but continually told a story of his personal struggle with mathematics. He is clearly frustrated with himself for not being able to transfer his generic learning capabilities into the mathematical space:

> All these numbers, you know, it was like some kind of magic ... I trying to [remember] these rules, all these things I learned before, but now they slipped and I couldn't answer the questions. I was thinking this is ridiculous to forget all these things but I don't. With this course all the things that I learned they are all gone. (H, 2011)

In addition, H's values, beliefs and mathematical trajectories are aligned to the more traditional, absolutist approaches to teaching and, consequently, he is frustrated and constrained by the contemporary instructional tone of the teacher that poses mathematical knowledge as a problem-solving tool. H wants to be taught how to apply mathematical rules and is conflicted by the ongoing demand to continually engage with open-ended dialogue and to co-construct his mathematical ideas with his peers.

> This kind of exercise, it give you the possibility to go around ... this curriculum ... for example if it doesn't make me learn these things that I don't know ... it doesn't help me, [it] destroy me little bit. (H 2011)

Agency

D is another ESOL learner, but this time with a poor experience of learning in school. In comparison to H, D's storytelling demonstrates an emerging sense of mathematical wellbeing. However, even given his emerging sense of self, throughout the interview, D made statements that suggest layers of contradiction and complexities that lie behind the notion of agency.

> Yes as long as the problem is give you this liberty, yes I like it because ... on your own you can say, you know, this is my result because ... but I have been taught [in Romania] and I got used with problems that give you something strictly asking [questions] so you look for the answer on thinking of those askings [questions]. (D 2011)

According to Swan and Swain (2010), there has been some progress towards supporting mathematics teachers to adopt pedagogic principles that require learners to reason, rather than to recall, answers. However, this approach could begin to frustrate D unless he is giving the curricula space to consider reflexively his changing approach

to learning mathematics.

> ... but you tell me exactly what you want me ... tell me exactly how you want it to be done ... If you want something you have to say what the askings... (D 2011)

Conclusion

It is in the space where a discursive approach to learning mathematics is implemented in the classroom that this author posits the need for a reflexive capability approach. An evaluative space authorises curriculum designers, teachers and most importantly learners to critically discuss the impact of social arrangements (Walker 2008). A multidimensional space can accommodate questions from multidisciplinary approaches, from the philosophy of mathematics, to the relationship between structure and agency of gendered, classed and racialised mathematical behaviours and of wider discussions about notions of social justice.

Biography

Tracy Part has been teaching mathematics in the post-compulsory education sector for the past fifteen years and has been a numeracy teacher trainer for ten years. She has worked in further education, adult education, in prisons and in family learning settings. She has co-published a NRDC Maths4life booklet on teaching numbers and is currently a full-time PhD student, third year, at London Metropolitan University. The title of her research project is 'What is Mathematical Wellbeing? What are the implications for policy and practice?'.

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