

Imagined futures: mediation of the mathematical biography

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Abstract

This paper presents data drawn from biographical interviews with students (ages 17-18) conducted as part of a research project on widening participation in mathematics education. The students were asked about their educational background, their experiences of learning maths and their disposition towards future study.

We view the stories students tell us in these interviews as narratives of identity – narratives in which students draw on troubles, obstacles and resources as they map the trajectory of their imagined lifestory (Bruner 1996). Thus, we are interested in the ways in which students identify with mathematics and how this connects with the trajectories they construct within the interviews. The paper asks: how do students connect their identity as a learner of mathematics with their other salient identities within the interview narrative?

The paper focuses on three students (Gemma, Mary and Lee) drawn from our wider sample of 50. These have been selected because of their contrasting positions towards learning maths. However, all three cases exemplify the kind of positionings which were evident in students' narratives across the dataset. All interviews were analysed as biographical narratives focusing on how students' self identity statements fitted with the overall story they were attempting to construct. We are particularly interested in self-identity statements regarding students' career plans (e.g. 'I want to be an engineer'), their decision to enter HE and their relationship with mathematics.

The stories told by these three students illustrate various modes of positioning with or against mathematics and highlight how one might narrate oneself as some kind of 'maths person' or 'anti-maths person'. For instance, Lee, finds himself marginalised from mathematics due to his insititutional position as a 'struggling' student and consequently draws on the notion that 'maths is irrelevant' to his career trajectory in order to reconcile a sense of 'not belonging'. The notion of a 'leading identity' in the student's narrative appears to be pertinent for some – this is the imagined 'identity' of the future which appears significant in 'leading' the individual's development (derived from the concept of leading activity from Stetsenko & Arieviditch 2004, Leontev 1981). For example, Gemma, a 'low grade' student, who in another college would have been prevented from taking AS maths, constructs her narrative with the view that 'mathematics is hard and challenging' which provides positive energy for her imagined future identity as a marine biologist.

We conclude that some students may narrate a 'leading identity' in their account at 'critical moments' in time (e.g. on completion of the UCAS form or having watched a particular film). Once this emerges it then permeates the narrative throughout. Sensitivity to the use or non-use of 'leading identity' in our analysis enables us to see the degree to which student's identity as a learner of maths plays a part in the students imagined future.

Introduction

Previous research has demonstrated that 'identity' is a useful tool for understanding student engagement (and disengagement) with mathematics. Key to the learner's relationship with mathematics is their evolving sense of self and their understanding of how mathematics fits with this. For example, Mendick (2006) notes how students' conceptions of self are connected with their choicemaking and performance at A level and Boaler and Greeno (2000) highlight how identity is crucial to the belief that one can be a creative participant in mathematics as a social practice. This body of research has reported a wide range of such mathematical or learner identities and has established a connection to the pedagogies experienced by students in the mathematics classroom. For example, several authors have highlighted how students who experience a different kind of pedagogy (in accordance with their ability grouping) take on a different view of themselves as learners of mathematics (Solomon in press, Bartholomew 2000, Boaler 1997). Boaler and Greeno (2000) found that those students who experienced an inquiry- and discussion- based pedagogy (what Morais, 2002, after Bernstein, 2000, would call a weakly-framed pedagogical discourse) identified mathematics as a field of inquiry in which they could engage actively and 'sociably'. Significantly, and in contrast to more 'didactic' pedagogies, this encouraged certain kinds of students into further study of mathematics.

Furthermore, the research literature also suggests that students' mathematical identities may vary in accordance with cultural categories such as gender, class and ethnicity (Mendick ref?, Leung 2001, Nasir 2002, Zevenbergen ref?). Bartholomew & Rodd (2003) highlighted how female undergraduate mathematics students struggled to see themselves as successful mathematicians. Whilst Solomon (SCTIG conference paper) has pinpointed the fragility of the identities taken up by female undergraduate students with some more willing to resist dominant discursive positionings than others.

In this paper, we explore how students construct their identities in relation to mathematics at AS level by exploring two key aspects:

- i) how doing maths fits with the other identities taken on by students – particularly, their understanding of themselves in relation to future aspirations
- ii) how beliefs or perceptions of what it means to do mathematics, what we may call cultural models (Gee 1996, 1999), mediate both their identity as a learner of mathematics and their future aspirations.

Theoretical Framework

The paper draws on a broad framework of Cultural Historical Activity Theory (CHAT) which views identity as emerging from engagement in joint object-orientated activity; socio-culturally mediated 'activity'. This is because, as Vygotsky pointed out, the use of 'psychological tools' (such as language) in practice is always double edged, what is used in social interaction comes reflexively to be used internally, on the self. Thus, one 'becomes' what one 'does' and, importantly, one comes to 'think' what one 'says': reflexivity and self- and social positioning ensures that we become the player that we perform (see Jenkins,2004,).

In adopting this position, we are particularly interested in developing and applying the concept of 'leading identity' as a way of tapping into the imagined identities students desire to 'become' in the future. This notion is derivative (although not the same as) the concept of 'leading activity' used in CHAT (Leontev 1981, Stetsenko and Arieivitch 2004). 'Leading activity' recognises that at different stages of one's life we engage in a leading type of activity which forms not only who we are but also our meaningful contribution to the social world. For example, Leontev argued that young children are positioned into dominant activities such as play or learning – crucial to their socialisation into becoming a contributing participant in the social practices, which constitute our ever-evolving society. In a similar way, the adult's understanding of self may be defined in terms of their occupational activity and subsequent position in the labour market. In this sense, the notion of the self as a leading activity encapsulates a process of real-life activity which "explicitly positions individuals to meaningfully contribute to the ongoing social collaborative practices in the world" (Stetsenko & Arieivitch 2004, page number?).

For the students in our sample, one account of their 'leading activity' might be doing the activities associated with being a student who is in transition to HE (since many are hoping to take this trajectory in future). Thus 'leading *activity*' with its reference to concrete, practical experience as well as the ideal, captures that which is dominant for the individual in the present. Nevertheless, as Sfard and Prusak (2004) remind us in understanding identity there is a distinction to be made between what we actually do in the here and now (actual identity) and what we may desire to become in the future (designated identity) and these may critically interact. What we are in the present is not only determined by participation in certain activities but also by our historical trajectory – what we have been and what we might become in the imagined future. Thus there is a need to recognise the imagined identities entrenched in students narratives which may motivate their understanding of self in the present.

In doing so, we hold onto the 'leading' element of leading activity. Whilst the imagined or designated identities to be taken on in the future are multifaceted, for

some there is a clear sense of what they will become as an adult in the labour market. In understanding such imagined futures, some students see themselves in certain occupations and are able to evaluate these in terms of the contribution they might make to society (see Mary's story below). Thus, for some there is a particular imagined identity of the future which is 'leading' the students biographical account of 'where they are headed', their goals in the present and how mathematics fits with this. For example, a student who wishes to 'become an engineer' – may position themselves in a particular way in relation to studying mathematics. A positioning which is distinct from the student who would like to become an accountant. Thus, we can analyse the student's relationship with and participation in mathematics in terms of how this relates and is made relevant (or irrelevant) to their 'leading identity'.

As we have already suggested, this understanding of self sees it not as internal to the individual but as dialectically connected to the fabric of society. The individual is always 'positioned' (by self and others) in a division of labour, held in place by 'rules' governed by cultural norms and expectations. Holland and Quinn (1987) originally developed the notion of 'cultural model' to describe the culturally derived rules and schema used by students to tell stories of themselves and their everyday activity- tools for doing their identity. Gee and others have expanded the concept to include everyday cultural concepts and conceptual frameworks that govern what we can perceive, but also what we can tell. Thus, cultural models provide a resource – and a constraint – for reflective identity work (with reference to one's leading identity or otherwise).

We find the more recent notion of a kind of cultural landscape of 'cultural models in figured worlds' evocative (see Holland et al., 1998); one's narrative of identity can be told as a path or trajectory through our available 'figured world'. Thus, a student might tell of their identity as someone who "likes to work alone ... and always needs to know there is a 'right' answer." Such self-identification might lead to such a student coming to be regarded – and to regard themselves - as a potential mathematician. This would be their imagined leading identity of the future if the dominant cultural model of doing mathematics in the culture/subculture is that of a lonely, black-and-white activity. Thus, in our theoretical framework, cultural models such as 'maths is hard', 'maths is black and white', 'maths is lonely' or 'maths is for geeks' (all models we have found in our interviews) are models that students learn in practice from social activities in general and classrooms in particular, and they can provide tools for students doing identity work of various kinds.

This paper intends to answer "to what extent do the stories students tell about their identity manifest a leading identity (e.g, university life, career etc) relating to their imagined future?" and "how are cultural models about mathematics and the students mathematical identities made relevant to such stories?"

The Project

Keeping open the doors to mathematically demanding F&HE programmes is a project which investigates students' participation in A level mathematics in 6th form and FE colleges and into HE. The study has investigated post-compulsory students undertaking two AS level programmes: Mathematics and Use of Mathematics (UoM) with a view to understanding how (i) pedagogy offers resources for students to engage with maths, and (ii) pedagogy is itself shaped by policy, Programme, and institutional context. The project examines how pedagogy impacts on students' dispositions towards studying mathematics, and electing to study mathematically demanding courses, (e.g. STEM subjects) in HE. The research has focused on practices that can explain how students who might typically be expected to be 'at risk' of dropping out of mathematics continue with its study, sometimes with success.

As part of this project, we have conducted a number of biographical interviews with students focusing on their 'background history' (including whether they would be the first in their family to enter HE, etc.) their experiences with mathematics and disposition towards future study; their current attitude to their experiences in mathematics classrooms is also of interest, as this helps reveal how their identity work makes use of or is influenced by pedagogy. Thus the project holds the concept of 'identity' as central to understanding the dialectic relationship between practice and the individual.

The students were selected specifically to include those 'at risk' in terms of prior attainment in maths (GCSE grade C or below) or from lower SES neighbourhoods who's families typically have a low participation in HE. 50 students were interviewed at three data points – at the beginning of the AS year, towards the end and in the A2 year when UCAS applications are being completed. The data reported here focuses on 3 students who's stories highlight the significance of one's leading identity in mediating one's position towards/against the cultural models about maths and learning maths which we have identified across the biographical data set (see the paper by Hernandez-Martinez in this same symposium). All three have different experiences in their current college AS programmes and provide a useful contrast.

Gemma's Story

Gemma will be the first from her family to go to university. In fact she cannot name anyone she knows in her circle of friends and family who has been to university. But there is no question in her mind that she WILL go, she says, "I've been going to uni since I was 8". She has lived 'locally' all her life in a community that has all the 'poorest' social indicators. Her principal and teacher described, with almost ironical pride, the local community as sitting regularly at the bottom, or near the bottom, of every league table of performance and social index of deprivation the government has produced. Gemma tells us that her mother's

work as a cleaner and shop worker is stressful, which has helped to motivate her as “I see my mum, like, working in a shop and cleaning and I don’t want to do that, so that’s kind of influenced me in my own work not to follow that path cos she gets stressed out and stuff”. Gemma tells us several times that her mum has been very supportive of her and encouraged her ambitions all her life (as has her mother’s partner). She did well at Primary school: “I was always into books at school and I was always levels ahead”. She said that getting level 5 – a very high grade - at age 11 in the National tests was an important marker for her. She experienced her Catholic primary school as relatively – compared to secondary – ‘inspiring’.

Gemma reports a ‘critical moment’ in her lifestory at age 8 when she decided she wanted to become a marine biologist so she could work with Orca whales: “I’ve just always taken a fancy to Orcas, ... Killer whales, ... Free Willy is my favourite movie (laughs).” Even though her mother thought she would ‘get bored’ of this particular ambition, Gemma has stuck with it and her mum has continued to support her; she got advice during secondary school from the ‘connections’ service and knows exactly what she has to do in her AS and A level grades in science and maths to get to university and then to do a PhD in Marine Biology. She knows she will spend 6 years at university and which one she wants to go to for her studies, as it has a connection with research into Orcas. In fact she tells us that the field she will need to follow to get to work with Orcas is more specialised, those who study big sea animals are called marine mammalogists, and “you have to be one of the top ones” to get into it.

In Gemma’s story we see several components which might be considered as a ‘leading identity’ regarding what she will become driving her narrative in the present. Firstly, there is her assertion that she WILL go to university (in Liverpool) and consequently, her future position in the labour market will be shaped by this fact. Secondly, she has a specific career in mind as a Marine Mammalogist which presumably is intended to contribute to society’s future scientific understandings of Orca Whales. Finally, we also see Gemma define what she will not be in the future – working in a shop or as a cleaner like her mum. This is not an identity, which she can identify with and subsequently this is to be avoided at all costs – her leading identity provides a ‘way out’ of the designated identities offered to others who come from her community.

The particular way that Gemma constructs herself as having a positive relationship with mathematics appears to be relevant to this leading identity here. We speculate: her early imagined lifestory of ‘becoming a marine biologist’ comes together with her success in Primary school, and “getting a level 5”. As she develops her plan in secondary school she finds out that mathematics will be important to becoming a science student at university. This apparent positive synergy could perhaps have been expected to be dampened or even destroyed by a dull experience in secondary school, but (i) she is at least as good as the average of her peers in mathematics, and (ii) her family – especially her mother – encouraged her to continue. Consequently, the nexus of positionings taken up by

Gemma in relation to maths here do not contradict but sustain her leading identity and in some ways are rationalised as part of a narrative of how this imagined future came into being in Gemma's mind. The 'imagined journey' in Gemma's case has a clear beacon in the distance, envisioned for her initially in film, and through other media later.

To return to Gemma's story, she got a modest grade in her final GCSE mathematics examination at age 16, and then did a statistics course, not being allowed to do the higher mathematics course for some reason. She would be considered a 'high risk' according to statistical trends at post-16, and in many Colleges she would not be allowed onto the Advanced Mathematics course. She says she was worried she might not be able to cope with the Algebra on her current course but actually feels she is doing well, and is enjoying maths now, "... it's a good system here: it gets the whole class involved and you get to hear how others do it and if it's better you can learn" which she compares to the dominant teaching practice in secondary school which is "boring and you forget it..." Her attitude to mathematics seems to have undergone a transformation since going to 16-19 College: "I am liking Maths as much as I like Biology which is my favourite subject ... so I'm getting really... liking it compared to before." She explains why: Maths is more 'engaging' and she can express her opinion and hear what others have to say – she even mentions the interactive work with white boards and posters... and maths is now described as 'fun'.

Now let us consider how this positive relationship is constructed through certain cultural models about what it means to do mathematics. By way of contrast, let us also consider how the story, with much the same resources, might have been different. Gemma accepts, but makes use of the cultural model that many of our students share - that mathematics is 'hard'. However, rather than perceiving this as a hindrance she posits maths as 'challenging' and she likes a challenge. Within another lifeworld, Gemma might well have adopted this notion as a means of representing a different disposition, of telling a story of a different person and imagined life. We know that for other students, mathematics is 'hard and dull', or 'too hard' and thus becomes something to be avoided. Additionally, such cultural models are not static but ever changing as students negotiate their way through their figured world. In some cases perceived obstacles can turn out to be friendly, what was said to be 'hard' to do becomes perceived as 'challenging'. Yet each 'resource' has a potential downside: if one experiences failure too often perhaps 'challenging' will become 'too hard', and the immediate part of the journey too difficult. Certainly, at the time of telling this story, Gemma's experience of 'maths as a fun activity may have offered the resources to see the difficulty as a challenge rather than an obstacle which appears to be crucial in sustaining her imagined leading identity of the future.

However, as we know, such positionings can be fragile. On our most recent visit to Gemma's college, she was no longer in class – her absence attributed to

'some trouble at home'. Consequently, we were not able to see if her story had changed and if the relationship between her experience of mathematics in the present and her leading identity for the future had transformed in the intervening time gap. Because of this, we turn now to the story of Mary, a student similar to Gemma who constructed her future self with a leading identity, which also required a positive disposition towards maths. Nevertheless, since we have data from a follow-up interview with her, which took place further into her AS year, we are able to explore how the cultural models students draw on may change over time in response to obstacles and in order to sustain their 'leading identity'.

Mary's Story

Like Gemma, Mary will also be the first in her family to go to university. Her parents migrated to England from Africa when they were young but despite being 'intelligent' did not manage to go to university. Also, like Gemma, Mary positions herself away from her mother's educational experience who 'failed her GCSE's because her father passed away, my granddad, when she was sixteen'. This she reports resulted in 'only getting cleaning jobs' until she 'got herself a job in the canteen at school'.

Mary wants to do engineering at university and is taking the AS Use of Maths programme in addition to Double Applied Science AS (Physics & Chemistry) as part of a package designed to get her there. Unlike Gemma, this leading identity was not influenced by popular culture such as watching a film but by her prior experience at pre-16 doing a double GCSE in the subject.

"I did a course in G.C.S.E's which counts as two G.C.S.E's. I just liked designing animals, you have to work out what measurement you want it to be, whether it's too big it's not going to work and I did a lot of moving things. We had to make a bazooka gun that fires out a ping pong ball which was quite fun, and you had to make it so it can move. It had a stand and everything. Other people just did their's quite straight, mine it could move, it had handles and it was metal, and I had to bend metal with a hammer..."

Maths is viewed as a key part of this ambition not simply as a requirement for university (which it may well be) but as central to her capacity to act as an engineer. For example, she says of her past experience of engineering:

"I liked doing all the Maths in that as well as you had to find out what size would be ok, like I had to make a dog on a skateboard and it had moveable arms, I had to figure out what size to make the hole and what size to make the dowel, so it could go through the hole so the fit had to be, so if the hole was 10, I would have to get a dowel that was 10.5 or if the hole was 9.5 I would have to get a dowel that was 10. So then the dog, the arm would not fall out or wear out as quickly as it should. That was quite good. I made it so if you pulled the dog, it was like a pull-a-long toy.I had to have a pad underneath .. to push it up and down, and I had to make it so it wasn't as big as the wheels but I had to make the wheels really big, and the pad so it didn't touch the floor ... I like that sort of Maths where

it kind of relates to making something. So I had to use loads of Maths then make it and see if it worked and if not then I have to go back and say where it went wrong. I like hands on stuff where you actually have to do it.”

Mary also reports that her family have been supportive of her interest in maths, highlighting her father’s competence in the subject as relevant to her own mathematical learner identity.

.”. my dad is very good at Maths, he has always been very good at Maths, Maths is my strong point out of all the three major subjects. In my class I am usually one of the top people in the class”

N.B. Note the use of the adverbs ‘always’ and ‘usually’ to emphasise the consistency of both the identity she ascribes to her father and to her self.

But again this is not a story without troubles. Like Gemma, Mary also tells of her problematic journey with maths in secondary school where she was ‘lazy’. Despite being able to ‘whiz through the work’, she was not good at other subjects and was consequently put in a lower set.in maths. This she deems as ‘one of those things I do get annoyed about’ since she perceives that not being in a higher GCSE set meant that she did not get to do the extra work which she feels is required for AS level.

In this story, once again we can see an imagined identity leading Mary’s storying of herself. She has formulated the ambition of becoming an engineer and this affords her a positive relationship with maths, which is also resourced by her father as role model. The degree to which this imagined future can be classed as a ‘leading identity’ is twofold – firstly, she states that engineering is her ‘dream’ to do something massive, and be like, “Yes, I did that”. This suggests she sees engineering as key to her meaningful contribution to society as an adult. Secondly, ‘becoming an engineer’ drives or leads much of her narrative in her biographical interviews both in terms of the cultural models she draws on and how she alters these in light of obstacles (to be discussed shortly).

In the first interview, Mary draws on cultural models which positions maths as useful in actually doing engineering and thus, in pursuing her goal. For instance, in the following quotation we see her refer to ‘maths as fun’ with specific reference to shape, area and volume – key components in her story of making a dog on a skateboard in GCSE engineering above. Her comments regarding her enjoyment at being able to solve long problems/equations also draws on the cultural model that maths can be satisfying for those who are disciplined enough to pursue it’s rigour.

“I like finding areas and doing shapes and stuff like that. I like finding the formulas and when you get this really odd shape, and you have to find the area and volume of it. I like doing loads of very complicated stuff and going through a

whole long thing to find one answer. That I find quite fun. Little things as well, like I can do lots of long stuff, but when it comes to little, small questions I get stuck on those. Which is quite funny, but otherwise, I like really long equations, and really long sums to find one little answer. I'm very weird like that."

Like Gemma, we also see Mary position herself in line with the idea that maths, although hard, provides a challenge – a challenge which she relishes:

I was very good like that. It was basically like at college, but at college it is more challenging. But I have always liked challenges in Maths and stuff.

I - Would you say that Maths is hard or challenging?

M - Its challenging, it's not hard. I find it challenging, like a fun challenge.

We see here a very positive disposition towards actually doing mathematics. Nevertheless, the statement 'I am very weird like that' also suggests that Mary recognises the wider belief that enjoying maths means one is some how strange or different from the norm. This suggests she is negotiating her way through both the traditional Discourses surrounding mathematics and her own emerging figured world in pursuit of her 'engineering dream'.

However, such positionings in respect of cultural models can be fragile. Nine months on we see Mary has encountered further problems in the pursuit of her engineering 'dream' – problems she connects to her prior experience of being in the lower set at GCSE. She has dropped Statistics 'because I thought I was going to fail quite badly' and is now only doing algebra. When asked why she is not doing so well, she says: '...there were many things that I should have learnt at GCSE that I couldn't use coz I didn't know how to do them in the stats and that brought me down and it would have taken me three times as long to catch up with everyone else and I didn't have that time because I much more needed to push up my grades so I thought I should just leave it for now.'

Consequently, unlike Gemma, Mary's prior troubles have come back to haunt her, shifting her view of doing maths from being a 'fun challenge' towards it being a series of assessment tasks where one engages in strategies (such as dropping modules) to maximise success. A cultural model which may align her much more with the dominant Discourses of the education system.

Despite this however, Mary's narrative is still led by her imagined identity of becoming an engineer and has shifted her positive disposition towards maths in general towards her remaining Algebra module:

'I like the algebra side more and I'm doing better in that'

And also towards doing the mathematics which underpins her Physics course.

'Physics I do love and there are calculations similar to algebra, and I'm very good, I've been told and I've been getting extra marks for the maths.'

Thus, across Mary's two interviews we see a sense of consistency in her leading identity and subsequently, in order to sustain this leading thread we see how she shifts her cultural models about what it means to do mathematics. However, being able to engage in this type of identity work and consequently transform one's 'figured world' in light of certain obstacles may be more possible for some students than others. This does not only depend on the positive energy provided by the student's leading identity (if they have one) but may also depend on the different landscapes they are offered to do their life journey through. The educational institution and classroom, and pedagogy appear to provide different tools also. To illustrate this, we now present the narrative of another student, Lee, who constructed an identity in the present which distanced himself from studying mathematics.

Lee's Story

Lee's imagined future is somewhat less definite than either Gemma or Mary stating that he hopes to be the first in his family to go to university, since he wants to "get a good job" but "to get a good job, you got to go to Uni". When asked what he will study, he answers "I am not sure, one of the subjects I am doing now at A level probably" [Politics, Psychology, Sociology and Use of Maths]. In this sense, rather than one designated identity leading his narrative, Lee has several possibilities in mind in terms of what he will become as a university student in the future. Nevertheless, at this stage, some options are closed to Lee. It is clear from his interview that he perceives his imagined future definitely does not involve future study of maths. In the following extract he questions the relevance or "Use" of maths to his future plans in life:

"Like, they say it's real but I don't want to know about how much coffees and coffee (are?), ...[] No, it's not relevant to me. I don't need to know that. [] But I don't need to know how to do trigonometry, in everyday use. So I don't see that as real life context. Unless I am going to be like...whatever you need to use it for. Because maths is just like equations and stuff like that, and numbers, [...]...you either like maths or you don't. I don't like it, so...that's how I see it."

While it is difficult to speculate why Lee constructs such a negative disposition towards mathematics, his interview suggests that his prior experience at learning maths may be partly responsible.

Lee says that he was one of “the clever ones” at primary school, with Maths as his strongest subject. When asked if he liked maths, he says: “Yes. I was always good at maths, pretty much. (...) I never struggled in maths, it was pretty easy. I got like top levels and stuff, in primary.”

However, at secondary school he says he lost interest: “No, it’s not something that interests me. I am good at it, but it didn’t interest me. I don’t see the point of it” and identifies his relationship with his maths teacher (the same one throughout secondary school) as particularly problematic. Despite his lack of interest, Lee got a Grade B at Higher level in his final exam and chose to take up Advanced maths when he started college because it would “look good for university”. However, he began to struggle with the subject and as a consequence, was encouraged by his teacher to transfer courses from Mathematics to ‘Use of Mathematics’ as an easier option.

“And I was doing... all right in maths, and then I just...I don’t know. I was like that in all subjects because when you...like do a step up to college, it’s quite different to secondary, isn’t it? [...] Because it’s more work, it’s like less time spent on one particular way, [...] And I just weren’t used to it. [...] And then, like the math teachers, ...they were saying if you are struggling now you won’t pass your January mock, you know there is an exam in January. So if you struggle...and because like I got a couple of bad results in the tests, like practice tests kind of thing. I got to kind of lost it one day. [...] So it was like December, November time, he said ‘I think it’s best if you do Use of Maths which is like this course’, so I was like ‘Oh, it’s way too late now’. He said ‘you’ll do all your exams in May, June, whenever it is’, and he says ‘you will do it at the Uses and you should do coursework, someone like you will do that easy and pass quite easy’. [...]

Lee says that he thinks the reason he struggled was because he did not keep on top of the workload and it was no longer possible to “just go through the course and pass it like ...quite easily like I did (before)”. But the Use of Maths course has also been problematic for Lee and he predicts that he will “completely fail the course”. He has tried dropping out a number of times and has remained in the class only because his teacher has insisted he stay. This, he feels is a waste of time:

“[...] I have to do 4 exams, and I know I can’t do it, I have not done the coursework, so...it’s just a waste of time for me. I could have concentrated more in my other subjects.”

In constructing this negative disposition (and the deterioration of his relationship with maths), Lee draws on the cultural model of ‘maths as too hard’. He says “it was like, you got all like harder stuff coming up obviously, like formula, and stuff like that” and that “I just don’t see the point”. Indeed, the fact that the Use of Maths (UoM) course was presented to him as easy but turned out to be harder than he expected is central to his account of why he is going to fail.

“So when I came here [UoM] I wasn’t interested in the first place and then it was harder, I wasn’t interested. []...I think if I’d really gone on on it [the previous maths course] I would have been able to pass at least, but then I got told that this course is ...you were going to get UCAS [university] points and stuff, and that it was quite easy...”

The way Lee constructs his story regarding his relationship with maths highlights how not all students are equally positioned in terms of drawing on particular cultural models. Like Gemma and Mary, Lee draws on the notion that ‘maths is hard’ but instead of using this to positively align with the subject as ‘a challenge’, he uses it to position himself away from maths because it is ‘boring’ and ‘not relevant to me’. We suggest this more negative use of ‘maths as hard’ as a cultural model may relate to Lee’s disposition as marginalised from maths in college. In both his Maths classes, Lee has been positioned as a ‘struggling’ student by his teachers and even his physical location, seated on the margins of the UoM class (as a late entrant), appears to have exacerbated a sense of increasing isolation.

“[...] like I sat over there, because that’s where my chair was because all other seats were taken, I am just sat there and it’s like just pop in alone, day dream, because it’s no like nobody to tell you, you’ve got to...work kind of thing. Because there is no pressure to finish.”

Thus, we argue that the way Lee uses the notion that ‘maths is hard’ in his lifestory is an attempt to reflexively distance himself from the marginalised social position his teachers have assigned him, and which he has accepted.

However, whilst this sense of being marginalised by his teachers is strong in Lee’s account, so too is the lack of a clear cut leading identity throughout his interviews. He even comments on saying ‘. I change my mind a lot. ... in my head, there were loads of changes, if you know what I mean.... I don’t like thinking too far ahead in the future because I don’t even know what I’m doing tomorrow.’ Thus, unlike Mary and Gemma, in the face of obstacles, he is unable to draw on the positive energy provided by a clear-cut goal in his imagined future. Nevertheless, he does recognise that ‘I need a goal because if I haven’t got a goal, I don’t see the point.’

By the time of his follow up interview, a year later, this goal has manifested as a plan to study Psychology at university with a preference for staying in Manchester. At this stage, this is by no means a leading career plan since he states: ‘If I want to take it on, I’ll have to do a post-grad but I’m not thinking...I don’t want to get ahead of myself’, instead he says he wants to pursue this ‘because its interesting.’ Nevertheless, this goal is now much more concrete than before. Why Lee has shifted in this respect can only be speculated but it may be

that the completion of the UCAS form some months earlier (for entry to university) was a 'critical moment' in formulating a designated identity which now leads his narrative. For instance, it appears that the plan to do psychology now provides enough motivation for him to forsee a possible, if not problematic, future involving maths.

For instance, when asked whether he thinks he will need to use maths in his Psychology degree, he says 'nothing extreme. Just basics like, basic maths stuff' which he also describes as 'everyday maths' that he is confident with. When challenged further that Psychology may involve advanced statistics, he states:

"I'd just do it because...I'm not saying I'd want to do it or I'm going to get any enjoyment but if it's part of the degree then I'm going to have to do it, aren't I?"

Thus, rather than dismissing maths as completely irrelevant to his future, he states that he would endure and 'struggle with it' in pursuit of completing his degree.

"I probably wouldn't feel that confident. It depends what it involved or how much...I don't actually think there's any, much maths, like special topic of maths in the actual course but if there was, then I would have to obviously do more work, get into it more because it would be something that I'd struggle with compared to the rest of the course."

Nevertheless, his positioning in relation to maths remains passive – only engaging with the subject if he had to. Furthermore, despite never having studied advanced statistics before; he already feels 'a bit wary' and believes 'I'd probably struggle'. His disposition remains negative towards mathematics in spite of an emerging leading identity in his biographical account. However, it appears that having made the decision to study psychology certain possibilities have opened up where before they were closed.

In summary, the first part of Lee's story suggests that crucial to the use of cultural models in students' narrative accounts is *how they are positioned* by teachers and institutional policies, e.g. who 'can do' and 'can *not* do' mathematics. Gemma, who in another college would have been prevented from taking Advanced mathematics, is given the space to construct her narrative around the notion that mathematics is 'challenging,' providing potential energy to 'maths as hard' that could otherwise become 'maths is too hard'. Meanwhile, Lee finds himself marginalised from mathematics due to his insititutional position as a 'struggling' student and consequently finds a way to construct a narrative which reconciles this sense of 'not belonging'.

Nevertheless, the sense of a leading identity in these students imagined futures also appears crucial to the cultural models they utilise in their stories. Both the

shifts identified in Mary and Lee's accounts highlight how the student's relationship with mathematics can change in light of the positive energy provided by a leading ambition or goal. Although, Lee continues to see maths as 'too hard' he no longer sees it as completely irrelevant to his future and is willing to 'do more work' and 'get into it more' in pursuit of a broader goal (a degree in Psychology). In a similar way, Mary refines the kind of mathematics she can do in light of obstacles (potential failure) and in pursuit of her engineering dream. Thus, we see the student's imagined 'leading identity' acting as a kind of 'gravitational pole' for the self (Stetsenko and Arievidtch 2004) - constantly evolving but simultaneously driving one's positioning in alignment or disalignment with the cultural models which sustain this identity.

Conclusion

These three narratives illustrate how in understanding life stories we need to look at the affordances and constraints of the relevant cultural models that students can use, and in each case ask how they might be resources for representing distinct dispositions, e.g. sustaining a student's 'leading identity' on the one hand, and/or negotiating obstacles and troubles for students on the other (or both). We have also suggested that students develop a leading identity in relation to their imagined future at varied points in time; whilst some students, such as Gemma and Mary have a clear sense of what they may become in the future from an early age, in his first interview Lee is apparently 'living in the moment' with a range of designated identities potentially available. We have seen some signs that students, like Lee, are likely to be particularly suggestible to short term and local influences, including the positions offered to them by teachers and institutional practices. Without a leading identity in his story, Lee ends up 'dropping out' (albeit temporarily), whilst Mary re-focuses on what she is good at in light of her strong ambition to be an engineer.

Nevertheless, what we do see is that when 'critical moments' arise in the student's experience, a 'leading identity' may arise. For Lee, participation in the transition to HE process demands that he must complete his UCAS form and this requires narrowing his designated identities so that one may emerge as more 'significant' than the others. However, it may also be the case that his experience of being positioned by institutional policy and his teacher has already narrowed certain possibilities (he can no longer become an engineer or do maths at university for instance, without beginning his studies all over again). Similarly, pedagogic practices can also resource and open up possibilities for the future where before they were closed or not considered. For example, Mary attributes her ambition directly to her experience of studying engineering at GCSE and a particular project undertaken suggesting the potential of pedagogic practices to shape future plans. Consequently, we have seen in these accounts that the positions offered to students through pedagogic and institutional practices and by teachers can be crucial in closing, opening or sustaining a particular 'leading identity' relating to the imagined future. A 'leading identity' which may only

manifest itself at certain 'critical moments' in the students life. However, at the same time, such 'leading identities' are 'leading' and as such may provide positive energy to the students positioning in relation to maths and the kinds of cultural models they associate with it.

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