# Renegotiating identities: mediation of troubling AS Level mathematics.

*Opening doors to mathematically-demanding programmes in further and higher education (FHE)*: Working Paper Series.

Davis, P., Williams, J., Hernandez, P., Nicholson, S., Pampaka, M., Black, L.,Wake, G., Hutcheson, G. & Kleanthous, I.

**Purpose of this paper in the project working paper series**

The ongoing analytical and interpretative work of the project has led to the importance of the cultural model of 'value(s) of mathematics' as a significant conceptual thread throughout all this work: it ties the institutional and policy culture of performativity to the teachers' professional subjectivities and to pedagogic practices, and hence to the activity of the classroom and its 'joint object', and so to students' subjective experiences of agency and learning in the classroom, and finally to their narratives of identity, and their strategic decision-making (refer to end of project report).

This working paper considers how students' narratives of identity account for their educational choices and decision making. 'Canonical' narratives (e.g. "when troubles come, aspirations adjust") were constructed for 44 interviewees. These allowed us to identify three categories of what Bruner calls 'trouble' (Bruner 1996): troubles-about-maths (e.g. maths is hard), family troubles, and troubles with 'the value of maths' (e.g. A' grade media studies worth more UCAS than a lower grade in AS Mathematics). We found that in the face of troubles how students (re)negotiated their identities was mediated (i) by a number of cultural models about making one's way in the world into adulthood and (ii) by the quality of their identification with a specific intended career. Students' perspectives about the pool of possibilities, available to them, with regard to career choice, were culturally and historically situated. They drew on a number of cultural models to do with performance, which could be construed as mediating their university degree subject choice. Decisions about whether to continue, or not with learning mathematics sometimes were significant to the direction of their trajectories.

*Abstract  Full Paper p.d.f.  hyperlinks*

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**Abstract**

*This paper examines serial interviews with 44 students from five 6th form/Further Education institutions in England. The students were taking Level 3 (pre-university qualifications, usually taken over a period of two years), and as part of their programme had opted to take an AS Mathematics or Use of Mathematics course.*

*According to Geertz narratives are the stories we tell ourselves and others about ourselves and are central aspects of culture. Narratives are also the lenses through which we understand and organise our world as individuals and collectively. Bruner suggests that narrative is a means for explaining the exceptional and forming a bridge to the ordinary (Rosenwald and Ochberg, 1992) and suggests that people's troubles provide a means with which to understand changes of direction in narratives. Thus, a classification of troubles in narratives may provide a lens with which to see the salient values in the students' lives that implicate their degree choices.*

*Holistic "synoptic" accounts intended to capture the essence of students' trajectories were compared in order to identify students with similar trajectories. Drawing on Bruner's account of narrative inquiry we focused on the influence of "troubles" in students' accounts as means of classification. These categories (canonical story schematic outlines) were classified as (a) "steady as they go –no significant troubles articulated", (b)"trouble comes ambitions adjust", and (c)"troubles come I persist in my plans".*

*We found that when confronted with a trouble (for our students example troubles were experiencing "maths as too hard", "feeling a need to maximise grades", concerns about ways to gain a lucrative, outwardly successful career in future times, or troubles occurring in other aspects of their lives and usually associated with family life) students' renegotiation of identity, could be recognised in the interview text by means of changes or shifts in positioning towards or away from certain values (cultural models) that mediated their decision making. We found that in the face of troubles how students (re)negotiated their identities was mediated (i) by various cultural models about making one's way in the world into adulthood and (ii) by the quality of emerging professional identification with specific intended careers. Students' who articulated a view of their projected professional selves, which showed an intrinsic valuing of the "chosen" professions were in the category of students who persisted with their goals in the face of troubles, whereas students in the category that adjusted their intended career in the face of troubles, showed a strong identification with values of performativity and status, which came above those to do with the intrinsic worth of their abandoned originally intended careers.*

*We found that students' explanations/accounts of decision-making are nuanced by a myriad of socio-cultural circumstances, to do with class, gender and ethnicity, but is also very much about their imagined futures. Therefore simplistic, policies that fail to take account of this by touching the valued concerns of students' lives are less likely to have sustained impact. On the other hand, arguably policies for education that can touch students' identities may have a greater chance of success. In the case of widening participation in mathematics we have a complex case because students take mathematics for a wide range of reasons often to do with its perceived exchange value rather than use (see Davis et al, working paper c).*

**Background**

The project *Opening doors to mathematically-demanding programmes in further and higher education (FHE)* (www.lta.education.ac.uk/TLRP.html) explores students' dispositions for further study, particularly in higher education, and particularly to study courses in which mathematics might be relevant. As part of this study (the full study involved a longitudinal survey and quasi-experimental study) we conducted multiple case studies of students as they progress through a year or so of further education (usual age 16-19 years). Interviews were conducted with 44 students (up to four interviews, transcribed) over the course of a year or so during which their early pre-university course studies progress and when they make decisions about university applications. This student sample was constructed to ensure that we included students likely to drop out of maths at advanced level due to 'risk' factors such as low previous mathematics grades, 'first generation into higher education families'. In interviews we (two full-time research assistants and four of the main investigators were involved) asked about their biography, their dispositions and future intentions (Williams et al, in press). This paper contributes to the third main research question of the study, *How do different pedagogic cultures mediate students' mathematical identities and aspirations for further study and how is this influenced by gender, social class and ethnicity?* In particularly, this paper focuses on students' life narratives, which we believe can give insight into their decision-making and show how pedagogic culture may, or may not, influence aspirations for higher education and particular imagined future careers.

This paper begins with a description of the research methodology. The paper then maps trajectories in the "narratives"[1] of the 44 students and summarises how different kinds of troubles influences their trajectories. It addresses the questions: *What are students HE and career trajectories during the two years prior to applying to university? And, how are these trajectories mediated by troubles encountered (or made) by students, during this time?*

We then draw on this tapestry to explore how students' choice-making is afforded and constrained by their figured worlds, which (after Holland et al) we see as mediated by cultural models. It explores how values critical to decisions can intertwine and be nuanced in various ways by ethnic, social class and gender cultural differences. This part of the paper addresses the question: *How do cultural models mediate the ways that students understand their Figured Worlds of HE and career choice-making?*

**Methodology**

The forty-four students were on Level 3 programmes (pre-university qualifications, usually taken over a period of two years), and as part of their programme had opted to take an AS Mathematics or Use of Mathematics course. Most of the participants were on a general education A Level programme and twelve were taking a BTEC National in engineering .With the exception of one mature student, participants were between the ages of 16 and 19. 34 were from 1st generation to HE families (combining 1st generation and 1st generation "siblings at university" categories). 15 participants were female and there were no females on the BTEC Engineering programme. 25 of the students are non-white, and these have a range of heritages:

[1] It is debateable whether we can claim that students in the "steady as they go" category all have narratives over the two year period prior to university, if by narrative we imply a story that has an obvious beginning, middle and end, beyond the more trivial or "null".

African, North American, Bangladeshi, Borneo, Brazilian, Bulgarian, Caribbean, Chinese, Columbian, East Asian, Ghanian, Nigerian, Pakistani, Somali, Ugandan and White. Participants were each interviewed on up to three occasions in order to capture their trajectories. The interviews focused on students past and present experiences of learning maths, how they choose their A level and degree subjects, their educational and career aspirations and the role of maths in their imagined futures.

In order to summarise the trajectories of the students it was first necessary to synthesise the serial interviews into holistic short stories. In this regard analysis was of narratives in the dataset, after Bruner (1996):

> *"In this analysis we hold on to the 'whole' story of the individual student and try to make sense of their trajectory of identity, their cultural history, their present experiences and their imagined futures (drawing on Williams et al., 2007). Each individual story is a holistic construction by the interviewer/research analyst and the student. The coherence of the narrative relies, inter alia, on its temporality and plot (Bruner, 1996; Kaasila, 2007). The story can also be thought of as an 'account', in the discursive psychological sense (Potter & Wetherell, 1987) but it is more, in that its structure demands a narrative, biographical form that weaves together many elements into a whole. Bruner (1996) has outlined the essential elements of the narrative form of construal of cultural 'reality': temporal structure, generic particularity, reasons, hermeneutic composition, canonicity, ambiguity, 'troubles', negotiability, and historical extensibility (pp. 133-143). Temporality, reasons and troubles are most significant for gaining purchase on a trajectory of… identity and its attendant conditions, which is of particular concern to our research project. In these narrative analyses, then, we argue that it is possible to understand how aspirations can evolve, how identities grow, and how key moments are said to deflect trajectories in significant ways for the students"(*Williams et al, in press).

The serial interviews (usually three but up to four interviews) with 44 students were condensed in terms of simple (canonical) schema, by first producing short, one or two paragraph synopses, (see later for examples). Short accounts make comparison between more than forty students feasible, in a way that is impossible without some kind of reduction from what amounted to well over a thousand pages of interview transcripts. Used in this way the synoptic account becomes an object that stems from a process of immersion in the data and facilitates the analyst in re-entry to that state, over a more sustained period of time - they are simultaneously analysis and props in the form of aide memoirs for theory building/inductive analysis. The synoptic accounts, (which were sometimes narratives with beginnings, middles and ends) were used to identify troubles and canonical storylines to do with students' education and imagined future careers, and so allow for scoping across the stories in order to map out canonical trajectories for the sample: "steady as they go", "when troubles come ambitions adjust" and "when troubles come I persist". The synoptic accounts and other key information about the students, to do with university subject choices, socio-cultural background information and performance indictors were compiled in an EXCEL spreadsheet. This allowed for ready comparison between groups of students whose trajectory profiles could be sorted in different ways.

According to Bruner, and it was borne out in our study, we might expect narratives to be articulated more easily when there are troubles to prompt stories, so that troubles can provide a means to understand trajectories. Thus, a focus on troubles acts both as an organiser to map out the troubles as articulated in the data for our sample and as a pointer to data that can be

expected to show student's negotiation of values – and sometimes their negotiation of contradictory values, which result in a subjectively-felt experience of conflict or dissonance – and mediate their university- and degree-decision-making. The resolution of such conflict is sometimes made visible in the accounts by an articulated shift in alignment (or positioning) in favour of one value over another.

Gee (1999) refers to the everyday theories (i.e. storylines, images, schemas, metaphors and models) that people use to make sense of their lives as cultural models. "Cultural models are not static… and they are not purely mental but are distributed in socioculturally defined groups of people and their texts and practices (Gee, ibid: 23). Thus cultural models tell us what is "typical" or "normal" and mediate our actions, not universally, but from the point of view of our experiences. According to Holland et al (1998: 51), it is this "stuff of existence", which grants shape to the co-production of activities, discourses, performances and artefacts. This then connects nicely with Holland et al's notion of "figured worlds"[2] (and this framework is also used in Davis, 2007a & b). Indeed, Bruner suggests that narrative can only be understood when considered from the perspective of the individual and the culture they are enmeshed in.

If then we return to the idea of the synoptic accounts, we can say that they are by their nature selective, the aim in writing them being to capture troubles, contradictions and changes in students' trajectories and to situate these culturally, in very simple ways. These are interpreted accounts intended to be useful for comparative purposes, so that we were able to compare across the full set of 44 students in order to look for categories of university degree subject choice-making, so as to capture the canons we see students using within the accounts. Moreover, according to Bruner canonical narratives are powerful indicators of cultural reality

The synoptic accounts draw on readings of the text and each interpretation made is grounded in data, but they are not themselves thick descriptions of a students' point of view. Neither would we go as far as to say that these synoptic accounts describe the students' "figured worlds", we do not believe that such "figured worlds" can be reduced to a few sentences. In this paper, however, we do provide glimpses into the figured worlds of university and careers for a few of the students, whose narratives we selected for illustrative purposes, in order to demonstrate differences in motivations and decision making orientations for those students' narratives we classified as the "persisters" compared with those we classified as " adjusters".

The status of the synoptic accounts as trustworthy syntheses of trajectories is therefore of interest when considering the validity of how our research addresses the first two research questions[3]. Often in work of this kind it would be usual to demonstrate the validity of such

[2] We see "figured worlds" as a useful concept for helping to understand how students become engaged in learning, whether this is learning mathematics or learning to become a university student, because it provides a way to understand how students assume orientations necessary to participate in (collectively) imagined situations. Figured worlds are simplified interpretive frames that describe characters who are inspired by a particular set of concerns to participate in a narrow range of meaningful activities. Artifacts play an important role in figured worlds because they can serve as pivots (Vygotsky, 1978), which shift the frame of an activity and evoke or "'open up' figured worlds" (Holland et al., 1998, p. 61). Thus, we can be view the interviews as attempts to capture the "figured worlds" of students in relation to learning maths and university subject choice.

[3] We draw on accounts of students' figured worlds to address research question 3.

claims through the student voice. However, since working the data in that way takes up valuable space within the normal few thousand words allowed in a paper, showing the student voice in a written text presents not insignificant problems of selectivity and exclusion. Then, if such extended accounts are to be used as objects for comparative purposes they can also present a problem of cognitive overload for the analyst concerned with comparability across the dataset (at least they do for this analyst, for me!). The synoptic accounts provided are thus authentic (they were not written with the purpose of demonstrating to the reader that they are grounded) and are as were helpful for me to be able to synthesise well over one-hundred interviews, for what is essentially (for research questions 1 and 2) intended to be a quite simple analysis.

Early in the paper, we prioritise the provision of good coverage across the dataset and so provide the reader access to the full range of these short accounts. This includes the synoptic accounts of *all* fifteen students who articulated "troubles" and another 6 examples from the group of students we categorised as "steady as they go", i.e. those who went through 6$^{th}$ form/FE college without experiencing a trouble that they articulated to us as being significant to their educational trajectories. Including all these short accounts has the advantage of allowing the reader to experience some of the cultural diversity in the dataset, and to become able to cross check the contents of the set of canonical storylines – the research output - which is produced by way of analysis of the "troubles". This is appropriate given the aim of comparing the 44 trajectories was to map out the outcome space of troubled narratives.

An indicator of the validity of the synoptic accounts is inter-researcher reliability or agreement: the accuracy of the synoptic accounts was ensured through validation by team-colleagues who also had read the interviews and so could provide some comment. This was strengthened because some of the team had already worked with a number of the student interviews (see Black et al, Hernandez et al, Williams et al (a), Williams et al (b)). Particularly, accounts for certain earlier "featured" students provided a ready means for some additional checkpoints. Member checking/participant validation of the synoptic accounts was intentionally not sought given these are interpreted, and in any case, the response rate by participants, during a different analysis of students' narratives in this project, to requests for member checking was low (only 2 students responded).

Following the mapping of the canonical trajectories in an outcome space, we turn our focus to how students draw upon particular cultural models to mediate their accounts of choice-making and decisions. Our focus, then, is on how explanations for choices and decision-making were articulated. This demands a return to the original texts, but this time not to whole transcripts, but by progressively focusing (Hammersley and Atkinson, 1989) on cultural models used to justify choices or decision-making arising from some perceived trouble. It is on this return to the *transcribed texts* in order to explore students' "figured worlds" where we recognise that stories were not always told sequentially. This stage of the analysis seeks to play with some of the complexities of the data, its ambiguities and temporal occurrences.

Cultural models about how learning mathematics mediates students' degree choice are considered only in as far as learning mathematics implicates their stories told. The value of mathematics in students' figured worlds is thus presented here as just one of a number of cultural models that mediate their decision-making. (An exploration of the value of mathematics in students' different ways of participating in learning mathematics is taken up in Davis et al, working paper c).

**Students' HE and career trajectories during the two years prior to intended university entry**

Analysis of the storylines led to the construction of three categories of narrative "*steady as they go*", "*when troubles come, aspirations adjust*", and "*when troubles come I persist*". Of the 44 interviewees, eight narratives were classified as "when troubles come ambitions adjust" and five were classified as "when troubles come I persist". These categories were constructed by pin-pointing troubles and subsequent changes in students' narratives, which could be connected with troubles. Outline trajectories could then be compared and grouped, e.g. aspiration a → trouble → aspiration b, *or* aspiration a → trouble → aspiration a. These canonical outline narratives formed the categories, which were then described in concrete terms.

The main classification of students' accounts was one of "steady as they go". This reflects how students had often already a firm idea in mind about their imagined futures at the point we entered their lives, and that 6th form/FE college programmes were largely serving their purpose by taking them onwards. Historical troubles might have come and gone, but we refer to these in the synoptic accounts and their classification, *only* if such troubles were significant in their decision-making with regard to university degree subject or career choices.

We note, however, that historical troubles, told to us post-hoc, were often about how learning mathematics in secondary school became dull, more difficult or were reflections on how they experienced sub-standard maths teaching, but that these troubles, and their sometimes associated "nigglingly" poor grades in GCSE mathematics did not result (for our sample of mathematics students) in decisions to discontinue with mathematics. This, of course, may not be typical of the many GSCE students who subsequently chose not to take mathematics AS level. That our sample students have chosen to study mathematics AS level makes them special, because previous troubles in mathematics have not resulted in a decision to drop mathematics. This exploration is interesting, but is outside the scope of this research project, and will be taken up in another research project (ESRC RES-000-22-2890 led by Hernandez). However, it should be pointed out that for some students taking the "Use of Mathematics" AS level, low GCSE mathematics grades were sometimes a barrier to their entry to a traditional mathematics AS course, or a reason why they had experienced AS mathematics as too difficult and they had opted instead to move to "Use of Mathematics", which is a terminal course (see working paper on GCSE to A level mathematics transition, Hernandez et al a).

However, it was notable that, with just two exceptions (both of whom stayed with mathematically-demanding degree options), we classified the BTEC engineers as "*steady as they go*". In part this might be explained because these students have opted for a vocational course and so can be seen as being that much nearer to their profession, than the general education students in our sample. However, the BTEC engineers, despite some difficulties that may make them appear at risk, (some have low GCSE grades and /or in our perhaps idiosyncratic sample, there was a high incidence of students from recent immigrant families) were buoyed up because university entrance into engineering did not rely on their achieving a pass grade in AS Use of Maths, since offers were made also on the basis of their BTEC alone. Indeed, students' spoke of AS UoM as supporting engineering, and this view was independent of grade achieved.

The students who told us that they had experienced troubles of some kind that influenced their degree subject or career choice were predominantly general education students. These students were gearing to a diverse range of careers and degrees, and by far the majority of these students did not intend to pursue a mathematically demanding route. One explanation for this is that these students were selected as "at risk" in some way by their teachers, and had relatively low GCSE and for some this carried over to AS mathematics grades, although our students had the full range of AS mathematics grades from A to U: these non-mathematically demanding trajectories may not then by typical of students with the full range of GCSE mathematics grades. These general education students, unlike the BTEC students, were still negotiating an educational market place, where performance counts and some were also negotiating their futures career choices with their families. Thus, for those who articulated troubles, their worlds were still subject to some degree of liminality. Indeed, we found that often students' trajectories were complex, for instance, apparently resolved troubles may reappear later and then lead to a change of plan.

The narratives are presented here as short synopses. Sub-categories are listed and illustrated below:

a) "*Steady as they go*":
   (i) I had a good idea about what I wanted to do at University two years ago and basically have been getting on with it and still seem to be on course, (perhaps putting aside a few more minor ups and downs…) (Leanne, Ade, Xin, Louise, Adam)
   (ii) I've never really seen the point of me going to university. (Lucy)

For example:
*Leanne is highly ambitious for material and social success. She has a Hong Kong heritage and moved to the UK a few years ago. She intends to go back there, at least for a while, to make her money, after studying business in the UK. Leanne is steady with regards to her ambition, which she sees within her grasp and as a product of her heritage to be able to make money - she wants a flashy car and to experience the high life. Leanne sees maths (UoM) as having a high exchange value, which can help her on her way. She achieved a C grade at AS (intermediate B GCSE) and, other things being equal, it would appear that her trajectory is still on course as she applied for a degree in Business Studies.*

*Lucy works at B&Q with her Mum and enjoys this, and probably will work there full time when she finishes her A levels. She is not inclined towards university and doesn't really see the point of going there. She feels this is her decision rather than a family pressure, and in any case why should they try and influence her? No one in her family has been to university and she identifies strongly as belonging to her family and established social network. Lucy failed AS maths in year one, but has persisted and is retaking AS maths in her second year. She enjoys the social side of how maths is taught at college and this seems to fit with a view of the college as providing her with a social space. Apart from continuing to work at B&Q, Lucy doesn't see herself "doing anything really".*

*"Steady as he goes" Ade wants to be a civil engineer and continues to want to be a civil engineer throughout the year's interviews. He doesn't face a particular trouble and he has the support by his family to go to university and then join the family profession. If Ade experienced a trouble it was before he aligned with his family influences, who have high ambitions for him. While he sees maths as highly relevant to his future, it is not always a requirement for his*

*degree choice and so his mathematics grade will not be an obstacle for his continuation, which smoothes the passage of his seemingly somewhat "designated" trajectory.*

*Xin had GCSE higher-tier paper grade C GCSE maths on entry and went on to achieve a grade B at AS UoM. He took the BTEC Engineering programme and is now at university studying electronic engineering. His story is straight forward in that his aspirations remain steady, but we see here also the influence of an open access 6th form College policy in allowing him the opportunity to succeed. He appears to have a strong (Chinese immigrant culturally influenced?) sense of "how to get on" that is driving his trajectory. His mother has low paid work and as an immigrant to Britain has made many sacrifices. It is for his generation then to succeed. Maths is part and parcel of engineering for Xin.*

*Louise is taking a BTEC in Health and Social care. She wanted to be a nurse throughout and chose maths because it will look good on her cv. She never intended to go beyond AS level, but also says that she finds AS maths hard and so decides to drop maths at A2, rather than risking her grades. For Louise, achieving AS maths serves its purpose, and she continues on her trajectory to become a nurse.*

*Adam comes from a family with expectations of university and he is strongly aligned to this expectation. He tells us about his father being a chemist and this may be a possible influence on his trajectory. Adam talks consistently about taking a mathematically demanding degree in the sciences, but also explains how he would adjust his plans if necessary according to his grades. Higher than expected grades may lead to a rethink in favour of medicine, and lower than expected grades a rethink in favour of doing something else. Adam sees maths as supportive of achieving his goals. However, Adam copes well with his A levels and goes on to study for a degree in chemistry.*

(b) "*When troubles come aspirations adjusts*":
I've changed my mind about what I want to do at university because:

(i) I was finding maths was just too hard, and so the change meant I could avoid needing maths;
(ii) I was concerned to maximise my UCAS points and get the best possible A Level (or equivalent) grades I could manage by changing my A Level (or equivalent subjects);
(iii) I realised that the prospect of better financial rewards and/or status were offered by an alternative pathway and so changed my pathway.
(iv) I was thinking ahead concerned with implications for a smooth family life in future years, so I've gone for a more family friendly degree option.

Note the synoptic accounts for all the nine students in this category are provided, since these show a renegotiation of students' imagined futures because of a particular trouble, and so we might expect be most revealing of a process of identity (re)negotiation:

*When we first met Anupreet she wants to become a Doctor (GP) but then decides instead to follow a different pathway and to become a Barrister. Anupreet is confronted by troubles in learning mathematics and getting high grades, which she needs to become a medic. She is struggling to understand, putting in some hard work, but getting nowhere. She feels a need to negotiate a culturally acceptable outcome, one she herself buys into, including the desire for status and success. Her desire to make people well is dropped to become a barrister (and we*

*have a sense that wanting to become a medic was for its outward material and social exchange). She likes the idea of being able to say in future that she is a Barrister and this adjustment provides her with resolution to all her trouble, since this newly chosen career also seems to meet the approval of her Mum. Anupreet gives some valuable insights into how she negotiates Asian expectations about female success. She takes up Law as an A2 and tells us she is now doing very well on her non-mathematically demanding courses that she believes will get her to where she now wants to be in a few years time. (See also Davis et al, working paper a.)*

*When we first met David he wanted to study mathematics/engineering and had high expectations for a place in a very good university. All was going well until he obtained a grade B in AS UoM. A talk with his psychology teacher encouraged him to drop maths in favour of psychology A2 and this provided a solution he believed would maximise the likelihood of a first class A Level performance. David decides instead upon an accountancy degree which he reconciles as providing status and future rewards as well as allowing him to study at the good university he craves. His alignment is with a culture of performativity, although he does also articulate some regret about having dropped maths and the opportunities this might have then afforded him.*

*Paul begins with a year on a media course but this was before he started to consider seriously his future and who he might want to become. We see in his trajectory a growing alignment with an Army career. At first engineering provides a potential connection with the Army by way of an imagined high flying career, but troubles in the way of a need to stand out and get ahead, the performance lead him to turn to a degree in computer science and mathematics, strategically chosen for its exchange value within an Army context—and high financial and status gains. We see Paddy's choice of subject making sense when considered within his alignment with an "Officer" Army culture. However, we also see that Paddy feels comfortable with mathematics and is concerned with a future that appeals to him as interesting.*

*Charlotte is a mature student who studied previously some years ago for a music degree. She had left university after a short time because she was homesick and soon after married and moved South. She says she would like to go to university and would like to get into criminology. Her father is in the police force and this appears to be an influence on her choice. Charlotte obtained an A grade in GCSE maths but is clear that although she enjoys maths, she sees her studies as a means to secure a job she believes will be interesting. She achieved a "D" grade at AS and maths appears to have served its purpose for Charlotte. There also appear to be some tensions in her story. She says her parents would be very pleased to see her go to university (this being it seems a family expectation) but while Charlotte also holds to this goal, she is now planning a year off in order to spend more time with her husband, and possibly to get a job. Here we see family pressures possibly mediating her choices and decisions.*

*Lisa is set on going to University (we are left a little unsure about the support of her family in her achieving this aim). Lisa was initially firmly of a view to become an Architect, and talked about the possibility of living in Northern California to practice this. She has since changed her degree subject to "Interior Design" because she says that this will be mathematically less demanding, and she see Architecture as being demanding of maths. Her decision to change university degree was taken in the light of her low AS maths grade.*

*Sabir comes to us with a view to become an engineer. He finds he is struggling with maths to reach the grade and this leads him to reinvent a future for himself in business. Sabir repeats a*

*year with this new goal in mind – an HNC course – that will mean that he will not have "lost" a year in relation to his peer group, since he can complete his A levels and then shift focus towards business and still go on directly to take a level four qualification. He achieves resolution by evading learning mathematics he experiences as difficult, since he believes maths required in business studies will not be so demanding and so will no longer present him with a problem.*

*Jason has come back to resit maths at the time we first meet with him. His decision to resit seems to be influenced by his family who have convinced him about the high exchange value of mathematics amongst employers. Jason would like to take a degree in retail management and so for him getting through the year, will mean maths has served its purpose.*

*Punab's story begins with some partial resolution. Punab would like to be a singer and/or an actor and hasn't had an easy ride at school. He wanted to socialise and didn't focus enough at school when in the 6th form, and this got him into various kinds of trouble, including a set of AS U grades – and one of these in AS Maths. A move to a new college and BTEC engineering offered him a fresh start on a pathway that provided a compromise between satisfying his parents aspiration for him and an alternative pathway that he could imagine taking. Punab tells us he has always liked fixing things, taking them apart and putting them back together. He also has a friend who is an electrician who he considers to be doing well. We see that Punab becomes more enculturated into the BTEC engineering group as time goes on, though he tends to distinguish himself in terms of a more colourful and varied social life than he believes the group could provide him with. Acting may be a hobby but is seen later as a bit dead end, in terms of likely financial rewards. Doing well/making money is important to Punab and we see him moving from engineering only and choosing strategically, for its exchange value and social capital, electrical engineering with computer science - he quite likes computers and is aware of good financial rewards. We can see a thread of awareness of exchange of mathematics running through his story. He moved from AS maths (in school) to UoM (as an addition to BTEC eng programme) and contrasts the two programmes, drawing on a view of AS being "normal maths" and more valuable in the market place. There is also perhaps a little more than a hint that "normal maths" is better because it is more difficult and, hence, more valuable it would seem. Punab has always considered himself good at maths, and although being disappointed by a C at GCSE identifies positively with maths as being something he is good at, and as part and parcel of being an engineer.*

*Adrian seemed fairly firmly set on taking maths at university but he changed his mind as a result of a conversation with his maths teacher, who said she thought he'd make a good primary school teacher. He told us that he was hoping to continue his interest in maths by specialising in maths during his now planned for Education degree. Later Adrian achieved a U grade in maths so we need to see if this has presented him with any obstacles to achieving his new goal? Adrian also talks about a possible Army interest as a fall-back alternative. His family are supportive of him in his choices rather than being steering of him and he has a brother at university (1st generation to HE).*

(c) "*When troubles come I persist*":
... When confronted with a major difficulty of one kind or another I persisted, determined to overcome the obstacle.

All the six stories in this category are included because these studies articulated experiencing troubles of some kind in relation to keeping their trajectories on course

*Gemma decided at quite a young age to become a marine biologist, having been inspired by the film "Free Willy". She sees maths as absolutely necessary for this goal, and although she enjoys maths, in a sense this is immaterial because she believes that she needs to study maths if she is to achieve her dream. Personal troubles led to a break in her studies (and to missed exams) but she is now back on course to resit her AS levels. Gemma is now thinking to study marine biology in Queensland University, which she says has a great course and is a lovely place. (She visited Queensland, Australia on a family holiday). It seems possible that with financial support from her wider family (none of whom are university educated) that studying marine biology in Queensland may be realisable.*

*Christopher is the only pure mathematician in the sample. He wants to take a mathematics degree and go on to take a PhD in maths. He achieved a B grade in Maths, having resat Maths AS to "up" his grades. At first Christopher was unsure whether he would move away from home to study, as this may have reduced his father's benefits, but this potential obstacle seemed to become resolved and he now has decided on a well regarded university some way away from his home town. Christopher is interesting because he demonstrated a very able understanding of particular algebraic manipulations and of solving equations, but yet, he tells us that he cannot do decision maths or mechanics, because he doesn't bond with these approaches to maths. For Christopher, maths means pure maths. He tells us a little about his Asperger's syndrome, which earlier in his schooling had presented him with many difficulties. A diagnosis seems to have made the pathway easier for Christopher. His is an interesting case and we are left unsure whether he really can't do decision maths (given the ability he has demonstrated to us) or whether he just doesn't want to do it. However, we are left in no doubt that mathematics provides him with a very significant pathway for how he sees himself and his future.*

*Manjit shows a strong commitment to become a mechanical engineer and she embarks on this path by choosing A2 engineering and this is confirmed in her application to university. However, her story is not without troubles for she has had to negotiate some family cultural resistance (which she says sees medicine and related subjects as better and more in keeping with expectations – i.e. engineering is not a typical Asian female pathway, and she says her family would prefer she opted for pharmacy, a career from which she appears alienated) and times in school when she says that unsatisfactory teaching impacted on her test performance. She also draws on "inner strength". She recognises she isn't a typical female and knows what she wants to do - being different isn't always easy, and she also wants to negotiate an identity which will make her parents proud. We see a strong intrinsic connection with maths (which she loves and sees as essential for design) that is part of who she is, which seems to carry her over cultural obstacles, and perhaps reinforces in doing so (identity work) that sense of who she is. (See also Davis et al, working paper a.)*

*Diepe wants to be a medic and she has the support of her family in this. She achieved an AS maths grade D and is repeating a year to get the better grades needed for medicine (though not in UoM as the course no longer runs). Maths appears to have served its purpose for her. She has the full support of her family in taking the additional time.*

*Mohamed wants to be an accountant, and comes from a family with a strong tradition of working in accountancy. He doesn't achieve the grades he had been hoping for and is now retaking the year with the full support of his family. He toys with the idea that he enjoys law, but reverts to a view that it is a family expectation that he becomes an accountant, and this is*

*what he wants to do. Mohamed tells us he is now studying hard to achieve his goal. (See also Davis et al, working paper a.)*

*Darren is managing to swim and keep his head above water. He has a heavy family responsibility to help in running his household (both his mother and brother have illnesses that mean Darren needs to take control). Darren has also had unpleasant housing problems that have made studying difficult for him. However, he has managed to over come this and get by in College. We see a change in his preferred course from politics (stemming from housing troubles) to maths and history, and he says that he may want to teach, Darren achieved an "E" grade at AS level and we need to find out whether this presented him with any obstacles in achieving his goal, which is consistently one of going to university and we are left wondering if this is seen as a way out for Darren?*

We also note that stories, and hence any constructions of their classification, are temporal. For example, a student seen until then as "steady as they go", revealed late on that they had already adjusted their career choice, but given changes in circumstances had since decided to persist with their original dream:

*We hear in Craig's third interview that he will take another year at 6th form College with the financial support of his Mum. Previously, Craig had wanted to become a vet but had adjusted his aspirations to fit with the grades he could expect on a normal 2 year "A" level study period. His resolution had been to take a degree in biology or zoology and he seemed enthusiastic about this in earlier interviews and fairly well informed about it from his mother who is a biologist. Craig sees UoM as a supportive AS level for his main science A levels, so that UoM serves its purpose in helping him along his chosen trajectory. By the third interview we find Craig ready to repeat a year determined to get the science grades he needs to become a vet. Craig seems reconciled to going to university later than his peer group. It may also be worth noting that Craig comes to take a modelling approach to problem solving and uses the graphic calculator genre of maths when discussing his problem solving. He demonstrates to us a good appreciation of uses of maths, but in spite of this does not see maths as any more than a support subject for science A levels that would lead to a then biology degree, or as of now a vetinary science degree, for which mathematics is not a stipulated requirement.*

In summary, the outcome space of trajectories as mediated by troubles during the two years prior to university entrance was as follows:

(a) "*Steady as they go*":
(i) I had a good idea about what I wanted to do at University two years ago and basically have been getting on with it and still seem to be on course, (perhaps putting aside a few more minor ups and downs…)
(ii) I've never really seen the point of me going to university.

(b) "*When troubles come aspirations adjusts*":
I've changed my mind about what I want to do at university because:
(i) I was finding maths was just too hard, and so the change meant I could avoid needing maths;
(ii) I was concerned to maximise my UCAS points and get the best possible A Level (or equivalent) grades I could manage by changing my A Level (or equivalent subjects);
(iii) I realised that the prospect of better financial rewards and/or status were offered by an alternative pathway and so changed my pathway.

(iv) I was thinking ahead concerned with implication for a smooth family life in future years, so i've gone for a more family friendly degree option;

(c) "*When troubles come I persist*":
... When confronted with a major difficulty of one kind or another I persisted, determined to overcome the obstacle (e.g. retaking a year).

**Degree choice decision-making and the negotiation of troubles**

When considering how students in our sample negotiate their trajectories, we see that decisions to continue with maths, or not, had often less to do with participation in particular classroom pedagogic cultures (indeed it is hard to find evidence of the impact of pedagogic culture on trajectories) than they have to do with participation in other cultures or communities perhaps unrelated to school. University degree subject choice decision-making is clearly not a case of simply choosing to take a course that students intrinsically enjoy or that they perceive themselves to be good at, although for some students these subjectivities are not entirely unimportant to a decision-making process, which we find intricately bound with students' identities, values and aspirations. In this regard, we did **not** find that we met students who had "open books" on their futures, for while some *decision-making* took place that sometimes did alter the course of their trajectories we found that *their figured worlds* about the kind of career and life they might lead, on the other-hand, were culturally and historically rooted, at the point we entered into their lives[4].

Of the eleven[5] students who changed their degree choice during the period of our interviews, three (e.g. including David) dropped maths because they believed it was too demanding, three changed degree course although maths had served its purpose (they - e.g. including Louise - had never intended to continue to study mathematics beyond A Level). Two of these told us that they changed degree choice for reasons to do with family life). For example, for Charlotte the value of going on to university was not so important as the value she placed on fulfilling her role as a good wife, and we are reminded that students operate in multiple communities and negotiate multiple orientations.

For example, if we consider David, we see him valuing a particular view of social and material success, and he trades in maths (for which he gained a grade B in AS Use of Maths) for psychology A2 as a bet that this will result in his achieving higher grades and being accepted in a "higher status" university than he forecasts would have been the case had he stuck with maths. "I *don't know, it was just Psychology, I could get a really good grade in and I thought if I took Maths maybe I might not be able to get the grade I would get in Psychology*" and "*The choice of Nottingham Trent was something to … If I don't get the grades that I believe I can get, I've got something to fall back on so I'm still going to university. And LSE was 'cos it's LSE, which is like the best in the country for accounting. Warwick was because it is the third*

[4] Note the questionnaire survey sample shows a higher proportion of students as undecided. However, we insist that interpretation of "undecided" needs careful treatment. Firstly, the interview sample tells us that "undecided" can mean undecided because the choice is between two or more concrete options, secondly that "undecided" doesn't mean " I could end up doing anything at all", and thirdly that the meaning of "undecided" is culturally mediated.
[5] Nine were in the "adjusters" category and two in "steady as they go" (because subject change for these two was not a problematic.

*best in the country for accounting, plus it's nearer to home and it's cheaper housing and I thought, if I get the grades, I thought I still might not be able to go to LSE".*

We see David drawing heavily on a discourse of performativity, e.g. in his talk of the "*best*" and of "a *fall back*". Particularly we see his concern for performance signalled, by a sigh of regret about his loss in having dropped traditional AS maths in favour of "UoM" (during the first few weeks of the course), because of concerns about top universities recognising his chosen maths qualification, which seemingly in contradiction he later also describes as being "very good". We first see David's decision to move from maths to "use of maths" as a one of loss of confidence in his predicted future performance.

*MP: What was the problem with Maths? I mean, you had to drop to Use of Maths, or it was your decision then?*

*D: Um, it was my decision and I remember it was the first, I remember going through high school and I was top of my year, with top, some people were smarter than me in the class but some people weren't and I was like an average but, like, top grade student, but I never felt challenged really by the work and, like, never thought it stretched me. You'd do like algebraic expressions and stuff like that. Then I came third and stuff like that in the higher paper and then came here and my first lesson was*
*Surds and I haven't, I didn't, for one I didn't re-do it over the summer so I didn't really know what was going on, and then I just struggled with the work and it sort of scared me in the first week, that maybe, 'cos it's your first week so you're thinking 'Oh this is going to continue straight away'*

*MP: 'and it's going to get worse ..'*

*D: 'and it's probably going to get worse.' And then a mate of mine who went to the same school, who got B overall, and I got an A [in GCSE], turned around to me and went 'You're smarter than me, I don't see why you've dropped it.' 'Cos he's getting As overall. So he said, with a bit of work you would have been, still, not having that much trouble.*

Later, we see how a concern for maintaining a strong performance (we note how he chooses to give his rankings earlier) again leads to a trouble for David who is unsure about the market value of the qualification he now holds, and this overrides a sense that this was a good course: *Um, Use of Maths was very good. Use of Maths nearly swung me into doing Maths again.* However, his allowance that there may be some intrinsic value in his learning is quickly followed by a return again to a discourse of performativity*: I'm glad I did it 'cos at least I've got a Maths qualification; most unis will ask me for an A level in Maths but they might settle for a Use of Maths degree, 'cos it is a Further Maths qualification. Um, but I've also, it's just a big regret that I just dropped Maths. Maybe, if I had Maths, I could see it, could see a chance of a uni turning around to me and saying that I can't go to their uni just 'cos I haven't got an A level in Maths. I can see LSE, LSE asked for it, but they also say if you have got an A at GCSE you should be ok on entry. But I still see them asking for an A level in Maths 'cos they've got like a lot of people applying.*

We are then left somewhat in limbo, David reveals that if he had his time again, he would have continued with AS maths and then gone on to take A2 mathematics and possibly a different pathway, but we are left wondering whether this is for the love of the subject or

for the extra credit he may accrue from wearing a badge that says "A Level Mathematics".

*MP: So you wouldn't like just to have the AS, I mean if you did this year, you would then ..*
*D: I would have carried it on. I definitely would have carried it on.*
*MP: But you decided to drop that as well, because … it's going to be easier to ..*
*D: Yeah, it's going to be easier to get a higher grade in the other subjects. But I just, I can't stress how much I'd love to go back to start of AS and not go into Use of Maths and stay with actual ..*
*MP: So there is no way to go back to the Physics and Engineering pathway now? Definite?*
*D: The only other way is if, if I do get into Nottingham Trent for Accountancy and I don't get the grades to get into the other universities, I might also look at, um, what are they called, apprenticeships at Rolls Royce for mechanical engineering, and they say they'd sent you off to university as well, one or two times a week as well to gain the knowledge ..*

We note that other students also draw on a discourse of performativity when justifying their subject choice positions. For example, Louise, who from the outset had not intended to study mathematics beyond "AS" Level: "*I just chose Maths because I thought it would look good on my CV and I found it easy in Year 11 and I thought why not. That's why I chose it."* She later confirms that she doesn't need maths for her chosen career as a nurse, *"I've researched it and you don't really need A level or AS level maths. But I did want to do it [AS] just to gain me that extra boost and things so…"*. Indeed, it appears that she is learning mathematics for its exchange value, more than for the possible intrinsic value it may hold for her (we note, however, she says she *enjoys* maths):

*I still want to be a nurse. I think, yeah, you'll have to use maths then but not this type of maths. Like, the maths we're doing, logarithms and things, you won't use it when you pop down to the supermarket or anything like that so I don't, even though I enjoy it, I still don't see the point why we have to do this but then again, maths is just for a qualification. Even though you're learning this, it's in the end I'm not going to use it. I'm just doing it to get a qualification so I can get a job. Whereas some people might be using it because they enjoy it and they might need it in their career, like law or something. I don't…….. I've already told [the teacher] that I'm intent on not doing A2 because it's a lot of hard work…*

Of the eleven who changed their minds about their intended careers, another four changed degree option because of research they had conducted in order to find out more about the kinds of careers the particular degrees could be expected to lead to, although, these four all expected to continue with maths in some way. Indeed, two of these four changed to more mathematically demanding options, because of the perceived exchange value that they believed this would confer on them when they go into the employment market place. Finally, one (Craig) reverted to a previous dream to be a vet, in part because of a successful AS year, which included a grade C in use of Mathematics AS level. Again we see all four of these students drawing on a discourse of performativity.

For example, we see over the three interviews how Paul is swayed by the promise of good pay and job security – he considers that a degree in computer science *and* mathematics will provide a higher exchange value than his original choice of a degree in engineering,

and in doing so we see Paul is looking ahead to a perceived performance in a more distant future.

*A lot really, mainly just because I didn't really like the course I'm on now but also I think looking at pay and personal interests, you know, and where I can study and what I can do with the degree if I get the Computer Science degree with the Maths I can go on to do, not just a particular IT job but I can branch off into anywhere in Computing and I know for a fact there's a great demand for computer programmers all the time, as computers are everywhere now.*

Punab (BTEC engineer), decides on computer science and engineering for similar reasons, to enhance his job prospect and future projected earnings*:*

*P: No, I enjoy using computers already and I find it really interesting. I just didn't decide to take a computer course because this course, if you pass it and do well in it there's more money involved - in the wages involved. So, yeah I thought this one first... Before I was really into drama. Last year I took drama as well. I used to do drama. I used to go to drama school on a Saturday. So there was two branches, there was a branch to engineering or to go to drama school and doing some drama stuff.*
*MP: did you drop that or it's still on that.*
*P: I dropped it to give way to this type of course.*
*MP: why is that, is it your....?*
*P: I think that I decided that drama was more of a hobby...*
*MP: what made you change you mind?*
*P: I think it was just instinct. I think it's became a hobby, and I've heard that it's quite a dead end job also so....*

And we see how he situates his original dream to become an actor/singer as being *"dead end"* because he perceives a high risk that he would not earn enough money. His replacement safer option of engineering is then later adapted for potential future financial rewards. Punab also shares some of David's concerns about the market value of "*Use of Mathematics*" and he too articulates some concerns that this qualification, which he also enjoys studying, will not carry the same kudos.

> *I think it's quite important I think that to be honest, when I heard it was AS Maths I thought it was the real AS Maths, like the four cores, pure AS. When I heard it was Use of Maths I was quite disappointed again. I took a shot last year and missed it* [Punab studied AS maths the previous year but didn't pass], *so I guess it was doing half of one which is what I wanted to do then. If I took AS Maths on top of Pure Maths I would have been quite happy that I was doing that again. But because it's AS Use then it's ok. I guess I can get by with that.*

Craig, also shows something of David's loss of confidence in his ability to perform during his earlier interviews.

*C: So it was your decision to take that course [UoM]? You didn't consider to take the Pure Maths?*
*A: I did consider it but it was clashing with other subjects and I was told it was one of the hardest subjects to take. Because I am doing Biology, Chemistry and Physics already which is hard enough at A level. I then thought Use of Maths was the better*

*option because its 50% course work and I enjoy course work more, I feel more comfortable with course work. I think in exams it's the pressure that you have got to finish in this time and you have to get all your answers right, whereas course work you can take your time and think about it more and there is no pressure and no-one shouting over your shoulder saying you do it in this time, "you have five minutes left" and all this. You do it in your own time, you type it up and you hand it in and you get feedback from the teacher and they will say "this is what you need to improve" and you can go away and prove it. I think that is a lot better way of teaching.*

Biology or Zoology degrees had become safer bets for Craig in earlier interviews (much as accountancy provides a perceived safer route for David than a career as a scientist, about which he was a little nervous as to whether he could be clever enough). A gain in confidence led to a readjustment in favour of a rekindled dream. Here we see how discourses of performativity and of intrinsic worth can play against one another, when in his third interview Craig talks for the first time about becoming a vet.

*C: I always used to like animals and stuff like that and then I went into a veterinary practice and I worked there for a while ..*
*MP: In high school?*
*C: In high school. And I worked there for a while and then I really, really enjoyed that, absolutely loved it and then I sort of thought, ok, if I like this let's see what other sciences there are in it. So I went to an equine clinic, a horse clinic, and I worked there, at a veterinary for horses, and that was also brilliant. But I know I preferred the other one, but that doesn't matter, it's just looking at what there was out there, you know.*
*MP: So it was always there, and these things made you ..*
*C: Yeah, it was always there in the back of my mind and it just made me want it more, really .. want to go into that more.*
*MP: What do your parents think about your decision? About this option you have?*
*C: They don't mind. They think it's brilliant, yeah. I mean, going to university, my mum obviously wants me to do that and she thinks it's a brilliant opportunity and stuff and she keeps saying to me stuff like, if you want to stay an extra year, you stay an extra year. 'Cos like I said, it's one year of the rest of my life, you know what I mean? If I spend one year getting the grades I want and then get onto the course I want, then it's only one year for me to get everything I want.*
*….*

*MP: What about your friends? Do you discuss your career?*
*C: Yeah, sometimes, yeah. Everyone knows that's what I want to do and I don't mind that and they all think it's a good option really. They, everyone knows it's difficult. Even my parents know it's quite a difficult thing to get into. But if I want to do it and I give it my all, yeah, I may as well go for it. And, like I say, if I have to stay an extra year it's worth it really in the end.*

While we see Craig's concern for performance mediating a shift to Zoology, we can also see how he also draws on discourses of intrinsic value (we gain a sense that being a vet is something of a dream[6], and we see this being revealed to us over a period of around eighteen months. David, on the other hand also drew on discourse of intrinsic value and of performativity, but he does so by flip-flopping (Williams et al, ???) in the interview

[6] See also Hernandez et al, 2008 in relation to aspirational repertoires, in this case of fulfilling a dream.

"…*Use of mathematics nearly swung me into doing maths again. I'm glad I did it because at least I've got a maths qualification…".*

However, we have then a situation (for our interview sample) whereby changes in degree choice are more often than not, *not* made because mathematics is experienced as too demanding, but for other reasons to do with family or a sense of getting ahead. We have shown how a sense of mathematics conferring a higher value on students marketability in the University economy can impact on decisions to study mathematics: overall the proportion of students (in our interview sample) who dropped maths at AS because they perceived learning mathematics as being "too hard" was quite small, and although there was some renegotiation of subject choice going on because of how students' experience learning maths, this was not the main impetus resulting in a change in trajectory (for example, David was nearly "*swung back to maths*" because of his experience in studying the Use of maths course, but a good experience wasn't in the end decisive for him.)

Although students in the "adjusters" set can be shown to draw heavily on a discourse of performativity, this was not solely in relation to their playing the educational market. We also have examples of students in this group seeking to perform according to family and cultural expectations.

However, when considering the group of adjusters as a whole, we see little in the way of intrinsic value[7]. For example Anupreet's swap from medicine to law shows her concern was to negotiate a pathway that her mother would approve (similarly, this appeared also so for Punab in his negotiation of his future - *But, I think every parent wants to see their children in that graduation kit*).

*Anupreet: No, it's ok, yeah, because Medicine is like .. one of the reasons why I chose Biology was because my mum wanted me to go in Medicine, you know, she thought ..*
*MP: Your Mum?*
*Anupreet: Yeah.*
*MP: She doesn't want you to go into Law now?*
*Anupreet: No, no, no, she's live about it. Cos I said to her, you know, and I told her 'Look mum I've got you. I gave it a try.' And then she goes ' "nickname" ..' She calls me "nickname", that's my name. And she goes 'nickname, what do you want to do?' And I go, 'Well see this, …… no I've tried doing um Medicine, you know stuff for Medicine .. it didn't work out.* [Anupreet gained "U" grades in both AS biology and Use of maths"] *So let's stick to Law or Psychology.' So she's ok about it.*

*.A… I mean it's hard, it's really hard but it just gets me it's like .. I want to be a barrister. Then I think, the other day I was in the car with my Mum and I said to her 'Mum imagine, couple of years down the line I'll be known as Barrister Anupreet, instead of Anupreet.'*

On the other hand, if we now consider those students who have experienced troubles along the way but who then persisted in their goals, we see the beginnings of professional identities being drawn upon to see them over potential hurdles, and we suggest that, arguably, it is possible that it might be this identification, and along with a sense of their already belonging, that can lead to decisions to persist with a particular career goal. With

[7] We note how in his third interview Craig drew less on discourses of performativity than he does on discourses of intrinsic value when articulating how he was now following his dream, he was crossing the boundary to belong instead to the group of "persisters".

the exception of Darren, who might be better treated as an outlier, given his special circumstances: his story could be one of "keeping his head above water", all the other students in this group all have strongly designated identities (Sfard & Prusak). We stress that it is not that these students do not also draw upon a discourse of performativity at times, or that they are not subject to similar family expectations and diverse cultural influences. However, it would appear, from their talk, that they are less governed by a sense of "looking good" than they are pulled along be a vision of who they want to become. For example, for Gemma and Manjit their identification was, respectively, as a future marine biologist and as a mechanical engineer. For example, in the case of Gemma we see an early decision as mediating her trajectory:

*MP: That's good. So, yeah, the marine biology thing is a definite decision?*
*G: Yeah, it has been since I was about eight.*
*MP: Eight?*
*G: Yeah* ( see also Williams et al, 2007, Black et al, submitted).

For example, Manjit is prepared to walk a tight rope because she sees a mechanical engineer as part and parcel of who she is already, and who she wants to become. *It's* [mechanical engineering] *not something which anything else is going to do…no be what I want to do. This is something I've chosen to do and it's something I want to do as a career.*

For Manjit her commitment to engineering becomes a narrative of resistance in the face of family/community cultural norms, which at the same time, she also wants to continue to be part of (and in so doing perhaps change?):

*Interviewer: What do your parents say about your choices and what you want to do?*
*M: They kind of, I think, my parents haven't really…they don't really mind me doing mechanical engineering or doing anything like that. They love the idea that I love maths, that's good, but I think with Mechanic Engineering they kind of think because I'm a girl it's going to be quite difficult, I think older people in my family are..I don't really understand. I'm fighting against that, holding my ground.*
*I: Do you think that has anything with your ethnic background or ..?*
*M: My culture's very 'man does all the work and woman stay at home' I get it from my older Granddads, they, all of them saying it. I don't really mind, its' what they've been used to their whole life, because it's different obviously since they've came to England. I was born here so I don't really know, but with me, I really want to do it [mechanical engineering].*

We see, however, that Manjit identifies strongly with mathematics, which she repeatedly tells us that she finds "*so much fun*", we also see that this is double edged, her love of mathematics is not wholly intrinsic and she also capitalises in gaining some comfort that her parents approve of this: as we have shown earlier being perceived as good at maths also carries some kudos for her within her family, which we are left wondering may then perpetuate her identification and participation in mathematics (she likes being good in class for example). She tells us about her engineering A level, which she transferred to in year 2 at 6$^{th}$ form College:

*M: In the designs and all the product making and stuff, you have to learn about different formulas and different techniques of building. Finding areas, dimensions and stuff like that. It's really quite fun to actually see the maths behind it, it's kind of like physics in a way, which I like. It has a lot of maths which is quite fun to do. Usually I'm*

*one of the first people who gets it in class so that's fun as well. It's just so much fun. It's a different kind of maths, it's more algebra which is what I enjoy more than statistics, I've never really been good at it and I really don't..it's not really my choice to do but algebra links to more of what I'm doing. That's why I prefer algebra and doing it, physics and engineering is quite good.*

*Interviewer: Is physics more fun or maths more fun?*

*M: It's all kind of good. The physics bit gives you the kind of the world is all physics and the maths as well, it can be very hard but it's really interesting. The waves that you have to learn about is quite good maths there. You have to learn about the waves and halve the amplitude which is quite fun to do. The formulas you have to learn, it's mad, but so much fun.*

We see Manjit's negotiation of her future as complicated, as she juggles various relations. We note that Ahmad, (2001) concludes that "*various notions of 'agency' have been expressed that are characteristic of the ongoing complex assessments made by these* [Muslim] *women in relation to both perceived familial obligations and their own aspirations. Their articulations suggest that higher education is increasingly viewed as a necessary asset in maintaining and gaining social prestige*" (p. 137). Manjit's story of identity negotiation is taken further in Davis et al, working paper a.

On the other hand, unlike Manjit, Mohamed is conforming with a family tradition in accountancy, one he belongs too, and his troubles are overcome by having some extra time to get there and taking an extra year in 6th form college, a decision which carries the support of his family, although in his third interview he begins to tell us that if he felt he could get higher grades he would consider law instead, and we are reminded that decision-making is complex, and for some students very much mediated by family expectations.

*MP: Which one* [AS levels] *do you like most?*
*M: I like to do? It's Law. Law is exciting and it's easy.*
*MP: Is this the first time you are doing Law?*
*M: First time, yeah.*
*MP: So you find it exciting? And do you think you might decide to do it as an option* [for university degree]?
*M: For that you need three As. So it's harder.*
*MP: Oh right, so it's not an option because of the grades?*
*M: Yeah. Otherwise I would.*
*MP: You would?*
*M: Yeah. I want to be in a good university, I don't want to be ..*
*MP: But as I mean as a career decision you..?*
*M: I enjoy Law as well,* ***but all my family are Accountancy from the start****, so …Well my mum actually wants me to be a lawyer, but my dad and everyone, Accountant. And I want to be an Accountant, so.*

We could also show that Diepe who we see persisting to become a medic and Christopher who we see persisting to become a mathematician (he wants to do a Ph.D. in mathematics) also have strongly designated identities that appear to give them a motive to overcome difficulties.

We have shown how students draw upon discourses of performativity when justifying their university degree subject choices, and that these may be in relation to their perceived future performance in a market place of meritocracy. These students sometimes hold a cultural model of mathematics as hard and therefore conferring on them a means to distinguish themselves and get ahead. They sometimes hold a cultural model of performing for their family, for example, as Punab says, "he wants to make his parents be proud of him".

We suggest that students across the dataset, (including those in the majority category "*steady as they go*", which we do not draw on so much in this paper) also hold (or identify with) a number of cultural models that mediate a complex field of performance. We have shown how these cultural models mediate their decision making in their figured worlds about university and career subject choice. We identified a number of cultural models that students have repeatedly drawn upon, either as models to conform to or to resist in their negotiation of the production of themselves, " *a woman's role is still to serve a man/family"* (e.g. Charlotte juxtapositions against Manjit), "*you have to play the game to get ahead* " (e.g. David, Amanda, Paul, Punab etc) "*its in my bones/culture to become a….."* (e.g. Gemma, Manjit & Mohamed *versus* Sabir and Paul) However, this shouldn't be seen as a definitive set of cultural models, but simply some that seem important when it comes to how students' negotiate their decision-making and how they realise their futures. Indeed, all these narratives we see as being alive, for example, they are expressed in popular culture, and widely celebrated in numerous songs and in the media. We also suggest it is notable that designated identities amongst the "aspirations adjust" students are perhaps by definition more malleable. Thus, it appears that some students (as are in the "*I persist*" category) may negotiate various cultural models, but be led by visions of designated future identities e.g. *I will become a mechanical engineer.* We have referred to this happening elsewhere in the project as a "leading identity" - see Black et al, op. cit, Williams et al, op cit, and also Davis & Farnsworth, 2007 & in press). Whereas, others align themselves more closely with one or more other values and so their goals may be alignment with these, rather than with a specific career, for which they may experience some degree of liminality.

**Conclusion**

In conclusion, we have shown that students sometimes experience troubles during their two years prior to university and that they negotiated these in different ways. We have detailed the outcome space of trajectories for our interview sample and provided this in summary form. We have shown that students' value mathematics in different ways and that sometimes mathematics is valued for its potential exchange as a means to "look good" rather than for its intrinsic value. We have shown that for some students their figured worlds about their future careers is also tied up with values of performativity and of the gaining of social status and financial reward. We have also shown that some students have already a sense of their nascent professional selves that are bounded by certain, sometimes so called, designated identities as goals. We have shown that students' degree and career decision-making is complex, and mediated by various cultural models, that are played out in narratives that are themselves culturally and historically situated. Finally, we have shown that an analysis of "troubles" can be a potentially powerful analytic tool.

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