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Voices of resistance: young people and the subjects they study¹

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Tamjid Mujtaba, Melissa Rodd, Michael Reiss

Institute of Education, University of London

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1 Rationale and methodology

This is the third of three papers conducted as part of the Understanding Participation rates in post-16 Mathematics And Physics (UPMAP) project. The question ‘How do young people make the subject choices they do?’ is central to our project: Understanding Participation rates in post-16 Mathematics And Physics (UPMAP). In this paper, we make the claim that young people can and do resist expectations and make unexpected or even unwelcome subject choices at 16 or at 18 years of age. The paper is organised around analysis of interview data from two strands of the UPMAP project: from Strand 2, where academically successful 14-16 year-olds are asked about their intentions for their subject choice post-16, and from Strand 3 where 18-20 year-old undergraduates are invited to talk about their reasons for their choice of course of study at university. The central point to this paper is to understand students’ educational trajectories in relation to the inter-dependant influences of life experiences, factors and psychological traits, and how this relates to students switching onto or moving away from maths and physics. For this paper, we have located in our interview database examples of young people’s interviews where we can discern evidence of ‘resistance’. By ‘resistance’ we mean making unusual or unwelcome decisions, relative to school, family or wider community’s expectations. We explain below how we make judgments as to whether the young person’s talk indicates resistance.

UPMAP Strand 3 consists of 51 interviews from first year undergraduates under the age of 21, all of whom have mathematics or physics A (advanced) level (or equivalent), about half of whom are reading STEM subjects. The interviews were narrative style and interpretation employed the psychoanalytic notion of the ‘defended subject’ (e.g. Waddell, 1998) as well as a form of grounded theorising we have called ‘face value’. UPMAP strand 2 consists of 100 interviewees from 12 schools. The data presented in this paper is based on 2 interviewees from 2/6 schools, the data for which appeared in paper 2 (52 students in 6 schools).

Our method for strand 3 and strand 2 involved interviewing the undergraduates individually and then analysing the resulting audio-transcribed text. Each of the undergraduate interviewees was informed about the project: their invitation was via a website or an email which explicitly said “please come and talk to us about your choice of course”. In part because the undergraduates knew why they were being interviewed, asking questions like “why did you choose study mathematics?” might produce rehearsed, standard responses like “I enjoy it” or “It’s my best subject” and, thus, underlying reasons for decision-making that arise from the individuals’ subjectivities might remain hidden. It was these reasons which we aimed to uncover and make sense of. For the younger students of strand 2, they were invited via a special invitation that went through their schools after the students and the schools met certain research criteria (e.g. uptake position of maths at school level or potential grade at student level).

For this paper we took as a theoretical underpinning a Kleinian-based psychoanalytical model. Melanie Klein (1882-1960) was among the early post-Freudian psychoanalysts. Her theories of human development derived from her meticulous clinical work with young children (Mitchell, 1986). Key to her thinking is the notion that the developing child splits good and bad into separate ‘objects’ (a technical term than includes people as well as inanimate objects). So, for example, the child who, when hungry, receives satisfaction through breast (or bottle) feeding perceives the breast as good. However, the hungry child who is not fed (or fails to feed successfully) perceives the breast as bad. This splitting of a single object (in this case the breast) into good and bad is key to Klein’s thinking. As the

child develops it normally realises that the good breast and the bad breast are one – and this is true of other objects too. So, as adults, most of us realise that the overwhelming majority of people we know are not ‘good’ or ‘bad’ – they contain both bad and good within them. Of course, when we are thinking non-rationally (e.g. when deeply in love or in the middle of a flaming row) we may see another person either through rose-tinted spectacles or whatever the opposite of these are.

Klein, along with other psychoanalysts theorises that all persons defend against anxieties, thus taking as a principle that there are unconscious and subconscious influences on individuals’ decision-making about critical life events. These influences, while not separable from the cultural, gender and socio-economic positioning people experience, are not as well-defined as these sociological categories of ‘race, class and gender’. We aim to uncover complexities of decision-making that go deeper than the standard contextual background of students, recognising that individuals are not consciously aware of all of the reasons for decisions.

2 Elizabeth (year 10/11 student)

In her first interview Elizabeth had reported that she was intent on studying Physics, maths, chemistry which changed to Physics, maths, politics and RMT in her second interview 9 months later. Physics and maths are constants across the 9 month period. Elizabeth’s story enforces the idea that simply taking a face value account of her reasons for choice cannot on its own explain students’ decision making processes, though defended subject is more able to give a better account of her decision making. In Elizabeth’s story we were able to analyse two transcripts and provide a longitudinal dimension to the data. Elizabeth appears to be more mature than her peers, an introvert (as suggested by her own self-description and mannerisms), and quite serious during her two interviews. She attends a grammar school on the outskirts of London and is in top sets for both mathematics and physics. Ethnographic data showed that she was a part of the ‘elite’ group who was told that maths is more or less a ‘must’ if one is to succeed in life by the Head of maths. Elizabeth at the time of her first interview was 15 years old, a predicted ‘A grade’ GCSE student in maths, physics, chemistry and ‘B’ for most others. The school is high-performing, with above average post-16 participation rates in maths and physics. She studies at a school that ostensibly supports girls wanting to stay on in post-16 physics:

Girls are better at physics, we sit them at the front of the class so that they are not disrupted or put off by the boys around them. We want to increase the number of girls who continue with physics through to year 13 and do well in them. (Head of Science & Physics)

However, this espoused aim appears to vary from the practice observed during the ethnography. Aspiring to government targets may be emphasised over considering the rounded development of students. This quote was taken when discussing the education trajectory of one of the top performing students (at GCSE Physics) a year 12 student (Amber) who had opted to take physics and was currently planning to drop it (as she finds the lessons un-engaging though she had expressed great enthusiasm in year 11). Elizabeth is a year below Amber and, like her, expressed much passion about physics throughout her interview.

Both of Elizabeth's parents work for customs at Heathrow airport; her father began an engineering degree but dropped it at the end of his first year. This information was only shared with the interviewer during her second interview, though Elizabeth also touched upon the same topic in her first interview which suggests that this is important to her. During her first interview she says she wants to study Physics because she enjoys it (intrinsic reason) and to get into the Army Air Cadets (extrinsic reason). During her first interview she states she will only do A-Levels (i.e. rather than continuing into higher education) and then enlist into the Air Force. However, by her second interview she says she is looking into degree courses (and physics/engineering related ones), though speaks of this rather resentfully as she does not want to waste her time with a degree, given she has decided upon a career in the Air Force; her parents appear to be pushing her to do a degree. The interviewee found her first interview a little difficult to elicit responses from Elizabeth as she appeared to be quite reluctant in expanding on her answers. The only answers where she 'came to life' were during those few instances where she was specifically asked about physics.

When Elizabeth is asked during her first interview if her parents have influenced her possible subject choices, she confirms that they have:

A little bit; my Dad's very interested in planes and stuff, so I went to a lot of the air shows and things [since the age of 5 or 6], so that probably influenced me a bit. Most years I go to at least once.

She does not mention at this stage that her dad began an engineering degree nor that her parents were pushing her in this direction. During her first interview she is careful not to paint her parents in a less positive/neutral light but during her second interview she says:

I don't want to [go to university] I probably won't, to be honest. My parents want me to but ... Last year when I wasn't sure I wanted to see how long I'd be studying for, what you'd be studying – but it just didn't seem relevant. We've had that discussion [about not going to university] several times. I think they're starting to take me seriously now. I don't want to spend three years studying something I don't need a qualification for. I looked at all the Engineering ones – Chemical, Aeronautical and Civil – because my Dad started a Civil one but gave up halfway through. And I looked at Physics as well and it might've been something to do with Applied Physics in Industry.

It appears that her plans to go straight into the Air Force are now wavering as uncertainty about her future plans has seeped into her language. Elizabeth is very unlike other students who were interviewed as she gives the impression of being very confident (she makes her own choices) but the confidence is marked with an air of sombreness and distance. The interviewee picked up on this with both of her interviews, though during her second interview, when she spoke of her father, his degree and her parents' insistence of her doing a degree, her frustration appeared evident through her body language. From a defended subject reading of the above text combined with data from her first interview about being influenced by her father, it appears that her relationship with physics is somehow mirroring that of her father's. She looks at the same degree course as him, has the same fascination with planes and appears to have taken on his (assumed/possible) anxieties about starting a degree and having given up.

Interview 1: I want to join the RAF when I leave school ... I'm not sure if I'm going to go to university, but I'm definitely doing A-Levels ... I need it [maths] for what I want to do in the RAF, maths, and physics. But I like Physics.

Interview 2: Even if I don't get into the Air Force it'll probably be something technical so you need Maths for anything like that. And, I'm not thinking of University, but you need that as well because most places say that the subject that you're studying there, that it's usually Maths ... places don't take you seriously unless you've done ... A-Level for Maths ... Well, I've looked at Engineering courses at University and they always say Maths, Physics and then maybe another A-Level of your choice.

Prior to being told by the interviewee about bursaries that existed for approved degrees for RAF employees she had maintained that there was still no reason why she would study for a degree even if it were paid for. Post being told about the bursary, Elizabeth mentioned she had spoken to one of the teachers who had put her in touch with Connexions, who had given her some useful advice about degrees that could possibly be helpful in having a career with the RAF. In May 2010, Elizabeth was also in the process of getting in touch with the RAF in order to gather more information about bursaries and approved degrees. However, neither conversation seemed to indicate a sense of elation (which the interviewer had expected to observe), and her responses were similar to the reactions she had given during her two interviews. The interviewer briefly asked her what her parents thought of her new positioning with further education, and she reported it was her dad who had pushed her to seek help from her teachers (upon finding out that the RAF have approved degree courses).

In terms of using Klein's defended subject approach we see that Elizabeth has an undercurrent of resistance against the aspiring cultural capital of her home. The resistance appears to be related to the way she perceives and/or feels about her father. Her father is the one who features within both interviews, and we sense that he is a positive force in her life. Her ambivalent attitude to go on to further education may be related to feeling that she would not do very well at university (like her dad) and let him down. Or it could be that she feels uncomfortable knowing that successful completion of a higher education course would mean she managed to do something her dad did not and thus risk damaging the close bond they have. An awareness that may not be entirely conscious.

In Elizabeth's interview we can also see that she draws on certain cultural models about the usefulness of maths which help reinforce her idea about maths, though she is not able to justify the same point about physics, though of course this is in contrast to her intrinsic value of both subjects (she likes physics, but this is not really the case with maths). So why does she choose physics and why does she choose maths? They are both chosen for very different reasons. Though she dislikes maths and has a low self concept of her ability in maths, she internalises much of the jargon fed to students in the top set of maths (as recorded by ethnographic observations) and repeats throughout her interviews views about the usefulness of maths (as we discuss in our first paper, the exchange value of maths). She is trying to resist the norm of her peers to continue on with higher education. Similarly she is trying to resist the culture capital of the home, which is in line with the cultural capital of society (continue on with higher education). Despite such resistance she identifies with her father via her possible degree choices and fascination of planes. The identification with her father is a smooth process. The defended subject approach is more helpful in explaining Elizabeth's choices.

3 Nasrine (undergraduate)

Nasrine (18 yrs old, Asian origin, open during the interview) at the time of the interview was a first year undergraduate at a redbrick university (pre 1994). Of all the interviewees (51 s3+ 100 s2) Nasrine was the only student who had an extended need to talk, with many of her sentences spoken longer than we would expect from our experience. Her interview felt to the interviewer like she needed to get things off her chest, perhaps because she had no one else to speak to. Her mother is a software developer, newly married with a baby as she divorced Nasrine's dad two years earlier. Her dad has been unemployed most of his life. Both Nasrine's maternal and paternal extended family have individuals who went on in medicine. This is important to state because generally those of Asian origin have/live in tight-knit family communities and so family influences do not stop within the nuclear family. The values of the home was predominantly 'South Asian' in nature (for a large part of her life), for instance, valuing sons over daughters (as reported by Nasrine), ensuring children study professional subjects such as law or medicine. Her mother worked her way up as a working mother with little support from Nasrine's dad, who (according to Nasrine) had/tendency to violent outbursts. The atmosphere of this home it seems was initially and predominately dominated by the father and it appears that Nasrine's mother began the resistance (which we believe Nasrine used as a role model either consciously or unconsciously). The cultural capital of the middle-class extended family (to do a traditional law or medical degree) was extremely important to the development of resistance in Nasrine and to the development of her self-identity.

Nasrine at the time of the interview was studying physics though her parents (her father in particular) wanted her to do medicine. Nasrine's preference would have been to do an Art degree and work as a freelance artist though she took up physics as a compromise. She took her English and Maths GCSEs early. She did her A-Levels at the same school she took her GCSEs, though this was after having started A-Levels at a grammar school that she had pined after for many years (after failing to get into it for her 11+) but returned to her secondary school after finding that she did not like the grammar school. She took Maths, Physics, Chemistry and Art though dropped Art after AS, which is interesting given that Art is her favourite subject (as reported within her interview). During year 10 she developed depression (and had no problems admitting it to the interview team). She had hoped to go to a top London university, lost her place and turned down a foundation year with another top university (outside of London). Her self image is dependent on how others perceive her and how she perceives herself by measuring herself against others. This is very important to her and to the analysis of this interview. A strong re-occurring undercurrent was her ability, how others perceived her ability and how she felt she was very different to everyone else (intellectually).

Nasrine has a projected self-image of being clever which she uses as both a defence (against others that threaten her emotional well being) and as. She uses her intelligence as a defence against her inability to form meaningful relationships with others. She tells the interviewer that she managed to succeed despite the odds. She barely mentions any friends she has unless it is to enhance her self-image and intellectual status;

when I was first applying to secondary schools erm in my primary school there was two top students and I was one of them and the other one was my best friend.

Problems in her life are all created by 'others'. Nasrine's self image is in part created by the competitiveness she feels towards her extended family on her paternal side which stems from her father's expectations of his offspring achieving better than his family. Her need to be clever is fuelled by her need to want to be better than others whether these are her peers or her cousins.

just sitting there and not knowing what you are supposed to be doing in a class, I just hate that feeling, of being, it just makes me feel slightly inferior to anyone else

it's like he [pushes his kids so hard to do academics. I don't know why I feel like it's because of me as well cos all the time I've been better than my other cousins, just like the natural ability. My cousin has to work a lot ... it's an unspoken rivalry between us two. I don't want it to be there but my cousin is always sitting there saying I got this in my test and I say like I'm not even trying. I don't want them to achieve it to be better than me. I do think they are doing that. But at the end of the day my Dad is like you've got to be better than them you've got to show that people don't have to be extra special,

Thus because her cousins went to grammar school, Nasrine spent her entire secondary schooling trying to figure out a way to get into the school she felt she should've been in and once she did (for 6th form) left after a week. She left because she could not cope with not having any social support networks, losing the familiarity, losing the support though told the interviewer,

all along I thought that I could do better at a grammar school but now that I thought that I would just have to go just to get myself, show myself, prove to myself that I actually got in and I could actually work on the same level as these kids and then I realised that 'year I could' but I am not sacrificing my individuality for it so I ended up coming back to regular secondary school

Nasrine needed support and was unable to cope alone which is why she went back to the supportive teachers in her old school. Requiring help and support to be able to reach her potential, re-occurs in Nasrine's school life several times. And as our analysis will show, the support or lack of support given by teachers can turn students towards or away from a subject. She is keen to portray that she is different and better than the rest of her peer group. She was better than the students in her primary school, should never have been in the (non selective) secondary school she was in (as she deserved the grammar school place) and of the grammar school she felt that she was too good for that.

it's just something that I needed to prove to myself because at school I was always like the smart one and you know, it just, it didn't really take that much away from me when I got into my secondary but there was always this little nagging voice inside me thinking 'you could have done better if you did this' and I don't want to live thinking, you know, regretting one decision I made, so

it was just really to prove to myself that I could do it and I was on par with these children and that I don't need it to be honest

Though she still continues to talk about not getting into grammar school and goes on to say that students that were accepted into the secondary school she did attend were not on par with her

I got pretty much all level 5 at the top so, so they were all like, you know she is [very good student], cos they were accepting students a lot lower than that with 4s and 3s ... and that really showed everybody that obviously I wasn't really supposed to be there

Telling herself that she is different and better than others was used as a mechanism to protect Nasrine against feelings of isolation. She does not mention any close friendships with people at school (silences are a defence) and portrays how she was victimised by both the staff (for not participating in class or for being overly clever) and by her peers (for being more clever than them).

cos there was a lot of competition between the students, because of them didn't like me cos I had such good grades [she fails to mention here how she felt about her participation in such competition though later of her own free will mentions that being in constant competitive state is shallow]

On several occasions Nasrine seems to think that teachers and peers (especially) would all either pick on her for being intelligent or be interested in how well she was doing and fails to understand that her academic achievements would have been of little or no importance to peers compared to their own achievements (to the extent to which she thinks others are focused on her achievements). She appears almost to be paranoid (in the everyday, non-technical sense of the term) about protecting her intellectual self and/or others acting in a malicious way because of her intelligence.

On the one hand she portrays on countless occasions that she is better than everyone else but when she was asked by the interviewer about how she felt about wanting to be competitive she responds by not answering whether she is competitive but by contradicting everything she has just said about being clever:

To be honest, I am not very, I don't mind like, to me like everybody's like you are naturally smart and I'm like you can't really be naturally smart, you do work at it, but a lot of people say that, you know, cos I don't have to work at things a lot more than they do, and they get quite jealous of that, and I don't like that as it creates rift between me and my friends or my family, and that's why I used to really keep all my grades and everything quite quiet so that no one used to know but, everybody just used to sort of take it as an invitation, just to, you know, 'oh I've got to be better than that, ohh I have got to do that and do this' and I was like 'oh gosh I don't want really to have this all the time' so I kept a lot of my grades quiet

Again a clear contradiction because obviously she believes she is naturally smart! Though by this part of the interview it is clear that Nasrine is also fixated on working hard. Why is working hard so important to her?

I just didn't want to be, like not really hated, but I just didn't want to be disliked because of something I couldn't really help

And again, she says she decided to do physics A-level as she would find that a challenge given that:

physics to me was more of a challenge than anything because I didn't like having, you know, people having to say 'ohh you know you're ace-ing every subject' because to me that just got boring as well just sitting there 'yes I know this, I know that' so it was quite, to be honest the biggest thing that made me pick was just because it was a challenge at the end of the day and it was something that I wasn't really particularly good at

Nasrine was brought up by a strong mother, who worked hard to get an education, whilst raising three children, working full-time and living life with a troubled marriage. Nasrine wants to identify with her mother. She craves challenges (hence her need to better herself in physics), she wants to mirror her strong-willed mother.

my Mum worked her way up from nothing to very comfortable house even now I see people in situations at school and I think I was like that. My mum got us out of it [it being a low standard of living]

In addition she felt her father spent much of her childhood not paying her much attention, not believing in her and not having any ambitions in life for himself. According to Nasrine he wasn't very good at 'basic maths' either.

He maybe thought my academics aren't good so maybe thought they weren't important, I think that's probably why he didn't bother much.

Nasrine's fixation with maths was used as a defence against the uncertainties in her parental home (abusive distant father, mother who couldn't quite break away from him, her lack of social bonds with significant others). With maths she knew where she was, she could work out the answers unlike her life.

Maths, it was kind of like a given. All the time I'm doing maths like it's just one of those things that you're just good at and that I think, you know to me it just makes a lot of sense, it's never any ifs or buts, it's just this is the answer, that's the bottom line. If you can't find that answer then you can always work towards it ... It's just everything is just concrete and that's what really makes me do maths.

In addition maths was a tool that was used (in her primary school) to enable Nasrine to get some quality time with her mother.

It was the way my Mum came in and tutored me in it a little so I didn't sit there and and sorry. I just didn't want her to think bad of me for cheating and I just wanted her to understand that I didn't do it because you know because I'm trying to get better grades than everybody else [Nasrine had cheated in one of her maths tests and her mother then spent time improving Nasrine's

maths, we feel this was perhaps an unconscious motive on her part to spend time with her mum/].

The bonding that Nasrine felt with her mother fuelled her interest in maths and then maths in its own right became another subject for Nasrine to ensure she did well in.

Nasrine appeared to lack any social networks within school (of her own age) and did not talk about any outside of school, which may perhaps have contributed to her depression. She perceived her friends as being jealous of her abilities and was untrusting of them:

Well they used to stop talking to me sometimes and they would like, if I missed a class and I wanted to copy up some notes or something they would be very reluctant to hand me their books and things and they would be like 'ohh but the teachers got it' and I would end up going to the teachers to get the notes afterwards and after that I knew they were obviously did not want me to do well at all, cos it's just notes

At this point of the interview it was quite apparent that during her secondary school years Nasrine was quite isolated (socially) and had failed to mention anything about her home life (again a defence against factors she felt uncomfortable/painful with). Given that her parents divorced in the middle of A-levels, clearly things must not have been right at home either. The interviewer went on to ask about friends outside of school

Not really, not much— Umm not until A level no

Her social life at home was not any better. She was angry at her mother for ruining her chances getting into grammar school and there were alleged violent arguments with her father from the age of 14-16. Her father appeared to be controlling about what she could do and her mother protective of her husband and so shouldered the blame thus Nasrine's anger was directed at her mother. Though she paints an awful picture of her dad, she feels protective of him:

they [paternal extended family] never stuck up for my dad so it was like quite weird because nobody used to ummm care for him, they used to care for my mum thinking that she was the victim out of the situation ... he needs support. So nobody really supported him after that and he really realised that, the only people that did come [to support him] were me, my brother and sister, he really, really, it touched him when, you know, we were the only ones that were always there for him and I did end up getting more a lot response more, because I had to pick up a lot of other adult responsibilities

After almost convincing the interviewer that she started to form a bond with someone, her father, as to date she did not appear to have any she says of her friends:

After that I ended up getting a bit more mature than most of my friends and then I kind of outgrew them and then I didn't really associate with them so much ... a lot of my friends they were just, they were still children to me and I was just, I didn't blame them for it, I was a bit envious to be honest because like you know you still need to live out your childhood,

So any friends that showed her support during her parents' breakup (and her depression) were met with Nasrine again feeling that she was feeling better than them.

The impact of individual teachers

Some of our analysis explains how her projected identity was extremely important in Nasrine's case and how this relates to her maths. How her projected identity was related to the cultural capital of the home, which itself was in a state of flux. Nasrine and her mother aspired to the culture capital of broader society, the importance of being independent, the importance of women being thinking, rational important beings. Her identity is very relevant to what then happened with physics and her interactions with teachers at school. Her year 10 teacher clearly switched Nasrine off physics (according to Nasrine) and the teacher's attitude in essence left her feeling even more alienated than what she already felt and as a consequence Nasrine took a large time off from her physics lessons. This is where her depression began to kick in and Nasrine began to avoid going to her physics lessons as she felt her teacher was picking on her and bringing her down 'a peg or two' for being clever. Nasrine perhaps is unable to see that perhaps she came across as big-headed or conceited and as a result that is why she was being 'picked on' by teachers and students. But we see that Nasrine needed to believe in herself, to hold on to something that she had control over to get through the experiences at home. Nasrine spent a part of her year 10 working on her physics at home. She used that to channel all of her negative emotions about school and her father in order to create a positive outcome. Rather than continue with what was expected (get into medicine) we see that she uses physics as a way of resisting against expectations and enhancing her self-image by carving out her own academic associations.

Physics is more, if you can understand this you can apply it to anything kind of thing. That's my outlook on life, it's easier to have a small set of rules and apply them to everything but obviously different rules for different things but the majority you don't have to memorise a rule for every little thing, not every thing is restricted like that, that's why I do physics cos that's what I base my life on, I don't want to be restricted by the rules so I want them to set the rules themselves but don't set too many, just have your own set and apply them to everything.

In converse to the year 10 teacher who was the reason Nasrine kept away from physics lessons, her year 11 teacher completely turned her life around. He was the teacher at the Grammar school she had once aspired to be in (he had moved from the grammar school to her current school) she does mention he was her cousin's ex-teacher, which we feel was another relevant (unconscious) influence, otherwise she would not have mentioned it.

She says of her year 11 teacher that:

He ended up showing a lot of misconceptions that everybody had had from the last year and the last teacher ... I actually enjoyed attending, I loved going to his classes, it was amazing, he had a very hands on approach to everything, it was quite, it was more like 'you don't know this? Oh gosh' then he'll explain everything and it was like 'you've got to remember all this' or else, you know we would have a little joke and say he'll smack you or something and we know he wouldn't really smack us but we were just, you know, joking around, and it was, it was, his classes were very entertaining as well as informative, but the

way he used to put everything across, he used to physically get up and show us everything so I found it easier to learn as well, It felt much more alive, it just really renewed my interest in physics and interest in science, it really did, it was like starting a new school again, after the first year it was just, he was very direct in what you had to know, what you had to do, he didn't really beat about the bush, you know, 'you should know this for the exams, this you should know by heart regardless, this in life will make you' ... he's obviously a very good teacher that's why I really re-kindled my interest of science and physics, physics mostly.

Interviewer: So he re-kindled your interest, so prior to that point you hadn't thought of taking it at A level

S: No

Interviewer: Really so it's all this teacher then

S: Yes he was a genius

It is quite clear that this teacher (who had also come to her home to teach her privately) drew Nasrine back into physics. Nasrine had until this point lacked close bonds with people at home (mother too busy working, father uninterested) and she'd managed to alienate people at school. She had not spoken or expressed such warmth about anyone else till this point and quite possibly she had a crush on her science teacher. Prior to his lessons she would never participate in class and now not only was she participating but she actually enjoyed it. Nasrine identified with the teacher,

he was always so sure of himself,

A trait that appealed to her as she comes across as being self-confident. Though from our reading of the text the teacher wasn't the only reason Nasrine decided to do physics. Prior to year 11 she had spent the year in self study. But why was physics so important? Physics helped her break away from the cultural capital of the environment she was brought up in (her role model being her mother who began to create the idea of independent woman). Physics was her way of bridging the expectations of her heritage background and the values of the dominant society (freedom of the individual to make their own way in life). We note that on her mother's side of the family there were two physicists, which again shows Nasrine trying to align her ideals with that of her mother's or those warmly associated with her mother. The competition, the medics, the stifling culture capital that she was resisting, was emanating from her father:

it's just sort of competition in the family like if you're good at academics you do academics you don't do what you want you do what you're good at. All my cousins, one is a lawyer, two are physicists, one is an accountant. That's my mum's side. On my Dad's there is a pharmacist, some doctors, you know it's like you've got to be something that's notable. You can't say I'm just a freelance artist [which is what she would prefer to do] ... You don't want to hurt your parents for anything and I think if you're good at it [meaning physics] why not carry it on. They wanted me to do be a doctor at the beginning, I did kind of break out of that a little. I did lie a bit, I said you had to do the UCAT test and you have to apply before this day etc. I said I'd gone over it by a day and I felt bad for doing that but it wasn't something I wanted to do and I wasn't going to put myself through six years work for my parents ... that's why I thought ok, I'll compromise.

4 Emira (year 10/11 student)

As with Nasrine's story, Emira's enforces the idea that face value accounts given by students cannot on their own explain students' decision making processes. The success of some ethnic groups has been linked to high family aspirations and familial encouragement and support (Crozier et al., 2004; 2005; Modood, 1997; Bradley & Taylor, 2004; Connor et al., 2004; Middleton et al., 2005). Muslim families (particularly those that are of new migrant status) do place an important emphasis on education (OFSTED, 2004), although language barriers and not understanding the education system can obstruct any support they may be able to offer their children (Crozier et al. 2005). There is evidence to suggest that students' parents who were of Chinese or South Asian origin suffered downward social mobility on entry to Britain as they were only able to access jobs that were below their qualification level. In such cases the education and cultural capital of the student home can be high even though the economic capital as reflected by parental occupation is depressed (Madood et al., 1997). This is the case of one of our interviewees, Emira. She is a second generation Muslim Kosovan refugee who came to England at the age of 3 in refugee status. In Kosovo her mum was a doctor and it took quite a few years until her mother managed to get a job in England as a gynaecologist. Her father graduated in physics or geology though the only jobs open to him were those below his qualification level. Her parents worked very hard to ensure that the family were able to rebuild themselves in the UK in order to restore the social class level they enjoyed before migration. This meant her father had to take on working in restaurants as a waiter though at the time of the interview he had managed to create a business in buying and renting out homes in Albania and Bulgaria as well as owning restaurants in England. Her parents are not conservative and/or religious Muslims; nor do they have strict cultural ideals though both her interviews indicate that they have strict rules (according to Emira) about how she should progress in life. From their perspective they are right, as within 12 years they have managed to move from refugee status to being two very successful people. Emira attends a Church of England school, which has a high proportion of minority ethnic students. Looking at the qualification levels of her parents we can see that their occupational class in England (when they first arrived) did not reflect the culture capital of the home (whilst Emira was younger) and thus we see (through Emira's eyes) their attitudes to education seem to be more stringent than those of Elizabeth's parents. They worked extremely hard to ensure (as Emira recognises) that their professional occupations were on a par with their aspirations and expectations (for themselves and not just for Emira). Her mother was the deciding force behind what subject choices Emira took for year 9, though we see that for post-16 education, Emira begins to resist against being told what is good for her (though not without guilt).

The type of family influence of students from certain minority backgrounds can be seen as being more 'pressured' and thus has resulted in the coding of family influences as being 'resistant' as opposed to 'strong' and we have discussed this in our first paper. Our first paper detailed how Emira shows characteristics that manifest a resistant attitude to social influence, the social influence of her home rather than of wider society. Here we will develop this further and show how unconscious forces relate to her resistant attitude and her relationship with physics and maths.

I've just decided that I want to do Law but before I've always wanted to do, like, Doctor or something, Dentistry or something. It's just really interesting. And the chemicals. And my mum as well, being a Doctor and everything, kind

of like it's around me usually. Yeah. And it's kind of – I want to have something in common with her, in a way

This passage indicates to us that up until recently (interview June 2009) Emira was complying with her parents' wishes by continuing in subjects that they wished her to take. The compliance, though, served her need of wanting to identify with her mother.

I love English and my grades are really good; Well, I think Maths I'm quite good at – Like, personally, I dunno, when I find something difficult it makes me feel like I'm not good at them, and German and PE I'm not feeling at the moment. And Maths, I like it 'cause in Science and Maths I'm kind of the same in grades and everything. Maths – I wanna do it and help me in my Higher Education and personally my children as well; I want them to achieve well and have good grades in Maths ... I like English, Maths, Science ... it's not the fact that I just like them but I feel like I need to know them 'cause it's gonna take me somewhere in life ... I was thinking of taking Maths because it's like a really important subject and most jobs look for that.

Emira's first interview indicates that her relationship with most subjects is through relative performance, though with maths she appears to have an additional extrinsic reason for wanting to choose it (like many students) based essentially in its exchangeability in society. Even though her first interview referred to the exchange value of maths by the time we came to conduct her second interview we see that she has distanced herself from maths (we explain how school influences manage to do this). Emira uses the discourse of the extrinsic value of maths in her first interview in summer 2009 to explain why she wants to do maths further:

And I was thinking of taking maths because its like a really important subject most jobs look for that.

And again:

You need maths. It's like there and it looks good on your CV if you got an A or something

The other key discourse prevalent in both of her interviews is being good at maths to either explain her possible choice in continuing with it or not apply for it at A-level.

Interview June 2009: My personal achievement will be to get an A or an A. If I get a B I would probably be upset but I will still continue it. I don't think I'll continue if I got a C, I would just think I was kind of not good at it.*

Interview May 2009: I am predicated an A. So that's quite good but I don't know. So you know when you just get a feeling 'that I am not sure about it', but I will think if I get a good grade at the end and I think I can I will choose it.

Informal conversation July 2009: If I get a B I will not continue with maths, doesn't matter about physics, I don't need it, it's not for me.

At face value it sounds perfectly reasonable for Emira to state that she will continue with maths if she performs well enough in her exams. A defended subject approach would indicate that Emira is performance driven (a trait that has arisen in her due to the way her parents interacted with her, the culture capital of the home) and thus she does not want to take maths (or physics) if she does not get that A, obtaining a grade lower than that fills her with uncertainties about her own self, her own self-identity, her ability. Her first interview raises on x occasions about how 'being good' at any subject (with good being defined as an A grade) is important. Being good, being successful is what she has been brought up with:

My parents don't accept anything under an A; they'll be like 'what are you doing? And so they're strict on education and they say ... they're like 'you're not going to get anywhere with that, do you need to use that' and they're kind of right in a way ... They're like 'you get anything underneath an A you know you're not gonna go out ...'

When asked her about clubs held for students at the school and whether she attended, her response was:

No, not really. There's Maths after school but that's usually for people that are struggling and things.

Clearly Emira sees herself as intelligent and will resist anything that threatens that. She needs to be intelligent and successful because her parents are and her parents instil that within her. A defended subjects' approach would also indicate that Emira is afraid of meeting the high expectations of her parents (which she talks about in the interview) and so rather than untablise the relationship with her parents she won't take maths or physics if she doesn't do well enough at GCSE as this is an indicator (according to her) of not being able to do well at A-Level. However, for physics she had never stated a real intention to study this further and we expand on why further on. Emira talks at length about her parents, their refugee status some 12 years earlier and how presently they are extremely successful (mother doctor, father businessman).

Taking the quote in conjunction with the part of the interview that talks about her parents' expectations we can see that from an early age Emira was moulded to identify with maths (in particular). Given that her mother is a gynaecologist, Emira consciously and sub-consciously feels the pressure to be as good as her mother. Emira's narrative indicates that her maths identity is dependent on performance and that the association she makes between performance and maths was fused when she was a child.

Although by her second interview Emira still remains undecided as to whether to continue with maths post-16, English remains a constant, definite subject across her two interviews. If maths is straightforward to her, and as she acknowledges the exchange value of maths, why is she still undecided? If English is complex with no one right answer, why does that appeal to her? A defended subject explanation would suggest that this may be because English allows her the freedom to explore (in contradistinction to her parents who insist on doing things in a particular way) and maths (at least as Emira has experienced it) does not allow the freedom of exploration. Choosing English is a manifestation of resistance against the rigid structures of her world (whether these are physical or emotional). Her relationship with English is her own special bond, one in which she can be who she wants and express what she wants. A bond which her parents cannot share, given that they are immigrants and, unlike maths and the

sciences, her parents are, in comparison with Emira, far less fluent at English. The only point at which Emira indicated confidence with respect to her dealings with her parents was when she spoke of encouraging her mother to take a test within her profession which was related to her competency in English and her mother was the one who lacked confidence:

She continued her profession [she says about her mother] but now she has to do the test or something cause of English. She's still not doing them, like, 'do it', she's like 'no, I don't know it', I was like 'yes you do'. She's best scared about it.

Emira does have a maths identity (not all students do) but this identity is unstable (based on performance which stems from her parents' expectations); thus her maths identity is one that creates anxiety. Her narrative indicates that her parents from very early on in life intended on strengthening her maths competencies though her narrative also indicates that the process of her parents testing her maths knowledge during her childhood evoked uncomfortable feelings: 'Oh God, don't make me get it wrong'. Our interpretation of her anxiety-induced identification with maths suggests that it is closely related to her relationship with her parents. Her relationship with her parents, in particular her mother, creates much anxiety for Emira:

My mum wants me to do sciences like physics, chemistry, 'cause she's a doctor but ... I don't know ... my mum is a doctor and so that is quite a big influence in my life and she kind of encourages me to do that. But, at the same time, I personally like and enjoy my subjects like maths, physics, chemistry, biology, I enjoy them. These kinds of things are factually based.

Her use of the term 'factually based' indicates that she is trying to assert a relationship with subjects that do involve her mother but she is trying to convince herself that her feelings towards these subject are not tainted by her upbringing. It is quite apparent that Emira perceives her mum to think 'she is her' and this perception drives Emira both towards her mum and away from her. She perceives her mother to be controlling and protecting:

My mum she said she wants me to get As and everything but she said PE – 'I don't mind what you get'. She kind of puts pressure on but it's like ... she doesn't ... I'm not like – she thinks I'm her in a way, like she thinks I'm more academic. Like, personally I am 'cause that's what works for me well but, I don't know, if I was given an option I probably would've been like dance, performing arts and more ... I'm not a guinea pig, 'm not science experiment.

However, in another part of the interview with Emira it is quite apparent that it is actually Emira who wants to be like her mum; her conversation shows how choosing sciences and being like her mother are two sides of the same coin. Emira craves identification though evidently she also wants to resist it. Unlike the other interviewees within this paper who do not outwardly express an internal conflict, we can see in Emira that she is resisting her own self-identification as well as her parents' expectations.

Similarly, just as her relationship with maths is confused so is her relationship with her mother:

Maths: *I like maths [and then later] I don't hate it but I don't have a proper liking to it. I would like to do it at A level and everything but that's it ... its just a subject you have to do [again referring to the extrinsic value of maths].*

In contrast to her relationship with maths, with English Emira uses the discourse of enjoyment. English is important as she uses English to work through any anxieties created by other aspects of her life:

I love English and my grades are really good ... and I just like the freedom in writing. You can write about anything ... I'm not really showing my emotions that much, I keep hidden to myself. It's mostly cause the way I was brought up and everything and just not used to showing my emotions, unless it's anger or something, But year ... and it's just kind of free, like a place where I can just let go.

And to emphasise the point about Emira's relationship with English and maths:

It's more like facts and everything, I know. But the thing about maths is it keeps structure and it keeps it simple, but also complicated. But at least you know there's one way – in English there's many ways you can go about it but maths there's one way and it keeps it more straightforward and it's the same in every country so its good ... it's less complicated.

In her first interview there was an indication that there were problems in her maths lessons (though no problems with her physics lessons). In her second interview Emira gave a detailed account of how in year 10 the maths lessons were so awful that she was unable to learn anything. Disruptive students made the working life of a teacher impossible and according to Emira the entire class got left behind in maths since the norm became discussing make-up or anything other than maths. Emira reported that she did try and continue with her learning but it is because she feels she has fallen behind that her chances of continuing with maths are unlikely.

In sum, by summer 2009, Emira chooses to study English because it gives her the freedom to express herself and resist parental influences. She chooses biology and chemistry because she wants to identify with her mother though decides not to do physics as that would be an outward conscious acceptance of what her parents want. Her anxiety with maths is more pronounced as she was openly moulded to be good at it, to continue with it and so for this reason alone, if she does not do well at GCSE she won't continue with it at A-level (and possibly fail) as it will disturb her self-identity as clever, her relationship with maths and her relationship with her parents. It is better not to continue with something and keep the romantic image of being good at it, being possibly successful at it than trying it, failing and damaging the relationship with her mother with whom she desperately wants to identify.

5 Luc (undergraduate)

Luc was interviewed in late August 2009, after receiving his A level results, as he had decided not to take up his place to read physics at a UK Russell group university, deciding instead to go to a European University to study a broad-based humanities degree. Luc has lived his whole life in the South of England, though his family have relatives abroad, and is

the older of two brothers. His father is a retired businessman and his mother is a teacher. Luc has been a scholarship pupil at a boys' boarding schools since he was nine years old. He has been chosen for this analysis as his decision to opt away from science occurred late in the decision-making process. In order to offer a conjecture as to why he switched away from physics, we give extracts of his narrative with some commentary.

Luc speaks of his early interest in mathematics and science and, modestly, of his precocious mathematical skill. His father taught him auxiliary mathematics as a young child and he attended Y6 mathematics lessons from Y1 before transferring to a private ('prep') school at nine years old where he stayed until he was 13 years old before transferring to public school. Luc speaks of his interests while still at prep school:

Em, I've always been very interested in computers, I should mention that because that's in some ways similar, because if you want to understand how those work. Uh, and just the way things work and then, I remember about thirteen, I started reading about Einstein, I thought relativity was really interesting. Uh, and there's a sort of, like, beauty to mathematics and a nice, things can be described in such a precise way and such short equations and, I always found it very amazing that it wasn't a really long equation with thousands of variables but instead a much shorter equation. Uh, it seems very interesting why it should be so. Uh, I was always interested in numbers eh, for example, I always found codes rather interesting. I read books on cryptography I remember when I was thirteen for example. Eh, and number theory was very interesting. Lots of just patterns and relationships in mathematics were very interesting. Eh, and then as a result, eh, physics was also very interesting as well. I had a very, I had a very good physics teacher I think in prep school. Yes, I had an excellent, I had some excellent science teachers at prep school as well so uh, yeah, everything they were teaching seemed really interesting.

This quotation illustrates some of Luc's relationships with the analytical practices of mathematics, science and computing as well as the people that inspired him up to the age of 13. There are several further examples where Luc speaks of his having interests that he develops independently, often after encouragement or inspiration. However, at his upper school (that he attended from the age of 13-18 years):

we only just brushed on say relativity but what we didn't look, for example, was we never looked at sub-atomic particles or anything to do with any complicated form of relativity. It was just a lot of balls falling certain distances and how to calculate the precise trajectories and, eh, which I mean, anybody can tell you that the ball falls down, and you do the basics of some of these equations actually at prep school but it's just that different things are added to them. Also, I found there was a great repeat between mathematics and physics which was very boring as well. Cos in mechanics, we did exactly what we did in physics which I suppose made it easy but it's very boring and it, to do the same thing twice. And there wasn't really any arrangement to sort of if you dump mechanics just to forget about the, the, that part of physics or to do something different. I mean, we never did nuclear physics.

In contradistinction to this, when Luc speaks about the humanities course he is reading at university:

I just really liked their course, it was a combination of economics, languages, politics and history which was a lot of subjects that I'm good at and also I've, I noticed recently that I was just really, quite good at writing for example history essays, and so recently I had a lot of I suppose, encouragement from teachers in these humanities to pursue it further and I've found that I've doing really rather well with them.

It should be noted perhaps that Luc had some unexpected set-backs with respect to participating in physics: he applied to five UK Russell group universities to read physics and only received an offer from one of them even though he was predicted four As and a B for his A levels (he achieved 3 As (maths, physics, history) and 2 Bs (further maths, chemistry); he jokingly blamed the B in further maths on the 'decision maths' module).

Luc talks about 'going off' physics:

I went off physics, let me see why. Yes, I know why. It was the experimentation I think. I find some of the experimentation very dull, particularly when you know the result in advance and you know, you just do it sort of, to go through the motions and a lot, I seemed to spend a lot of time, because I think we were practising for the pracs exam for example, well, it was just eh, it was swinging balls, you know I knew the theory of it very easily, the experimentation was actually, is very boring and also very difficult to get it to actually fit with theory because the thing never follows the right type of motion and stuff. I find experimentation very boring, lots of repeat readings, there's only so many times I can swing the pendulum and I get very bored.

Even so, Luc keeps his physics options open by enrolling in a month-long 'special programme' after his A level exams at an overseas university where he contributes to a research project in quantum physics where:

they had to teach me a lot of stuff for me to understand the quantum physics. I spent two weeks of the month just trying to understand the problem! Ha ha! So, that was interesting.

The quotations presented above are representative of Luc's turning away from what he classes as "boring" and towards that which he calls "interesting". Nevertheless, while he presents himself as being intrinsically motivated, we conjecture that it is significant that he finds "interesting" those subjects where he has had encouragement from teachers (history at sixth form level) or where he refers to the teachers as "excellent" (science teachers at prep school). He also refers to history being a popular subject at his public school whereas mathematics and physics were less valued for their own sake though they were valued instrumentally as qualifications for professions, particularly medicine or finance.

Luc distinguishes clearly between physics of ideas (as "very amazing" quoted above) and the physics of engineering which he disdains. Speaking about an engineering project he did:

it took months of sort of doing testing at laboratories to check static electricity, glue residue, uh and I just thought, if I ever after university did this sort of job, I'd go crazy because I couldn't spend a year working on one machine.

Another aspect of Luc's life that he talks about is playing chess and learning Russian because *"I liked to play chess and the best chess books were in Russian, so that was my original sort of motivation for learning Russian"*. These activities have been supported by his family and have opened up an international view of the world: *"I just find it really good fun to play, it's nice I can take chess all round the world"*, that perhaps made possible the notion of studying at university overseas.

Luc's narrative of choice positions physics as at risk of being technical, repetitive and experimental. He encountered many of the 'big ideas' in physics at an early age and could enjoy wondering about them without having to solve specific (A level type) problems. He presents himself as independent in his seeking of intellectually satisfying ideas and is highly critical of his A level physics syllabus for its lack of challenge and coherence. His more recently-developed ability (relative to that in mathematics and physics) in writing essays supports his choice of studying humanities which he characterise as *"really different each time so there's that appeal"*.

Luc communicates a manic defence in his need to be intellectually absorbed. He also, despite the story of independence, communicates a need to be well-regarded by those he relates to (family, chess players, supportive teachers). He has to defend himself against surprising rejections of his application to read physics from universities for which he had the required grades (both predicted and achieved) and he does this by establishing the story of physics being quasi-technical as opposed to *"very amazing"*.

Conclusions

The analyses of our four interviewees exposes complexities around decision making, which aren't overtly apparent to students themselves. Our analysis indicates that face value accounts are not enough to explain choices and that unconscious forces also play a role. Though it might be supposed that policy cannot do much directly about choices resulting from unconscious forces, we can note what it is that brings about unconscious forces. So, for example, in Emira's example she is anxious about being very good at maths (A grade); anything below will distress her. She decides that she won't do maths as she had not learnt much in her year 11 class. We suggest, firstly, schools need to focus on monitoring students' views/feelings within classes in order to listen and pick up on problematic issues. Without asking or listening carefully, teachers won't have a feel for what is wrong and how to fix it. Secondly, schools can reduce the stress they put on youngsters when they continually try to make them aspire to what is the government's current 'must have'. We need to reduce misconceptions at the school level, e.g. in Emira's case she could not achieve well in maths at A-Level if she ended with a B at GCSE. In Nasrine's case we find that she was switched off and turned back on to physics by respectively bad and good teachers. Teachers need to be aware that students all engage with learning in different ways. The school may not be able to do anything about students' 'background baggage' but it can do something about making students feel comfortable at school and supporting them in making the right choices with the appropriate kinds of support and advice.

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