

Mathematics but and yet: Undergraduates narratives about decision making

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Abstract: This paper draws on research from the ESRC-funded project Understanding Participation rates in post-16 Mathematics And Physics (UPMAP) and draws on the strand of this project that has interviewed undergraduates about their choice of university course. These interviews were conducted in a ‘narrative-style’ and their construction and analysis were informed by psychoanalytical theory and practice that acknowledges unconscious influences on decision-making. The focus here is on narratives from undergraduates who are reading mathematics with other subjects of study. The questions ‘why is this person studying mathematics?’ and ‘what is the role of the minor or joint subject?’ are both considered. The observation is made that while mathematics functions as a place where results are definite – a notion cited by many students in the study – the minor or joint subject functions as a place for fantasies or is used as defence.

Keywords: Undergraduate, affect, participation

Introduction

From the perspective of mathematics education, it is intrinsically interesting to consider reasons for participation in mathematics at all stages of education. Of course, the average child throughout the UK is required to study mathematics until 15 or 16 as part of their compulsory education and in most other ‘developed’ countries there is a requirement to study mathematics for longer (Nuffield 2010). Within UK contexts, there is a decision point for students with mathematics-gate-keeper qualifications in post-compulsory education as to whether to continue the subject or to ‘drop’ it. From this even smaller pool, some students again opt for mathematics to study at university some of whom are also studying a joint or minor subject. This paper presents stories from students with an aim of getting closer to why ‘mathematics but and yet’.

To ask ‘who chooses maths?’ could prompt perusal of applicant data on the UCAS site and reply with a statistic. For a prospective undergraduate, ‘choosing a course’ in that context would be to follow the directions through [ucas.com\students](http://ucas.com/students). But there is much involved in course selection that is particular to the life of the prospective undergraduate before this actual application procedure is enacted and there will be influences that operate beneath his/her conscious awareness. To attempt to make sense of such influences, this paper draws on concepts from the psychodynamic field (mainly from Melanie Klein and associates (Waddell 1998)) as psychoanalysis provides tools to detect and analyse unconscious forces.

The research is part of a longitudinal (2008-2011) project, Understanding Participation in Mathematics and Physics (UPMAP), that has been investigating participation patterns in both mathematics and physics using a range of methods (Reiss *et al.* 2011). In this part of the UPMAP study interviews were conducted with about 50 first year undergraduates – who were qualified to read either mathematics or physics – at one of four UK universities. Of these undergraduates, nine were reading

mathematics with a joint or minor subject; these students were distributed over the four universities involved. Their minor or joint subjects were: computer science, French (two undergraduates at different universities), physics, management, statistics with finance, finance, accounting, Spanish and Arabic.

The outline of the rest of this paper is as follows: firstly, initial extracts from interviews that are examples of ‘mathematics but and yet’ are presented (together with brief biographical details about the undergraduate who spoke the words) and methods of interviewing and approaches to analysis are explained briefly. Then, using both the initial and also further data extracts, the psychoanalytic notions used in this particular paper are outlined and exemplified together with analyses that reflect on why these undergraduates are on a mathematics with joint/minor subject course.

Interview extracts

In this section, illustrative extracts are presented that come from interview transcripts from five undergraduates who are reading mathematics with another subject. These extracts have been selected in order to clarify the observation that when mathematics functions as a place where results are definite or the relationship with mathematics is secure, minor or joint subjects function as places for fantasies or are used as defence.

Evan² is reading mathematics with Spanish and Arabic at a Russell group university. He went to a co-educational private school in the North West of England.

Evan – I just think there’s this image that people have of mathematicians and they think they’re all really nerdy and don’t have fun and they are quite intense students. *I – where does this image come from?* E – not sure, the media but yeah I’m not sure, erm, I have to say I was worried that’s why I chose to do languages as well cos I thought these people are going to be intense students and I’m going to need some sort of release from the intensity and I’m not sure where the image comes from I just think, I don’t know, they are definitely determined people, a lot of people I have met just do work really, really hard and cos it is a difficult subject I think and there’s less freedom to have your own creativity which if you compromise on creativity then that just blows your personality in a sense I mean I’m not sure but.

Trish is reading mathematics and management at another Russell group university. She was a scholarship student at a small private girls’ school in the North East of England.

Trish – I didn’t just want to do straight maths cos I wanted to do something different. I’ve always done 101 things and I didn’t just want to come and do one and I thought it would be harder as well and I like the sort of businessy thing although I didn’t like my [business studies] class [at GCSE] that much and I didn’t like the syllabus it was the management part I preferred and I don’t know, I’ve no idea. I had maths with Artificial Intelligence on one of my [UCAS] options, I had maths with criminology as another one.

Lee is reading mathematics and statistics and finance at a pre-1992 university. He went to a boys’ 11-16 comprehensive and a catholic sixth form college in London.

Lee – I thought with the maths and stats and finance degree maybe become a banker or some sort of trader, stock trader or something like that. And it’s a lot of money if you know what you’re doing. I come from a kind of under-privileged background and I just want to make myself a better person you know, just have a better lifestyle. So, you’ve got to work hard for it and you know, earn money, earn money’s important, very important. So, you know I thought maybe that’s why I

² Pseudonyms that preserve gender are used.

chose this degree as opposed to something that's straight maths or something.
Yeah. A lot of money.

Chloe attended a selective maintained girls' school in the midlands and is reading mathematics and French at a Russell group university:

Chloe – I like the logic that goes with maths, where you can see there's a proof, you're working its way through and you get to English and it's all subjective ... My mum's a French teacher but I don't think that that really affects why I am doing French erm although I don't know cos obviously my Mum's always been a French teacher so I wouldn't know what it'll be like if she wasn't.

Laura, who comes from the same region of the country as Chloe and also attended the same type of school as Chloe, is reading mathematics and French at a post-1992 university:

Laura – Essay writing, you can be kind of correct but still not do very well. Like, it's too subjective for my liking. Em, like obviously I do maths cos it, it's either right or it's wrong and I find that better than something where I have to like, argue or, yeah, just think like, essay writing. ... *em, just cos I wanted, I, like a language is useful and I probably want to do another ski season when I'm done em, and if I had, if I could speak French it would be easier. Obviously in the Alps and things.

Undergraduates were introduced to the UPMAP project through electronic communication from their university. From those who expressed interest in being interviewed, undergraduates forming a purposive sample - covering a range of subjects, backgrounds and universities - were invited to come to talk with one of the interviewing team about their "choice of course" (the quotation is from the invitation's email header). The audio-recorded interview was conducted in a relaxed and conversational manner in a comfortable environment in the undergraduate's university. The transcription and the audio file were used as texts for analysis of the 'narrative-style' interview co-constructed between undergraduate and interviewer. Further details about the interviewing methodology has been presented and discussed elsewhere (Reiss *et al.* 2011). There were three different interviewers (including the author) for the interviews that have been used in this paper.

Defences and phantasies: concepts from psychoanalysis

In a short paper such as this, there is insufficient space to discuss psychoanalytical concepts in any detail. So to give a flavour both of the theory and of how it has been used, a very brief and limited introduction to the particular psychoanalytic concepts of 'defence' and 'phantasy' is given through interpretation of some of the interview data. Firstly, data illustrating Evan's and Trish's 'defences' are presented then Lee's, Chloe's and Laura's stories are used to communicate how fantasy/phantasy has been understood.

Defence mechanisms were originally posited by Sigmund Freud as the way the psyche deals with anxieties by protecting the self and the notion of defence employed here follows Melanie Klein's understanding which was developed from Freud. Well-known mechanisms of defence include denial, repression and displacement and these operate from the unconscious. While there is a sense of negativity that surrounds the word 'defence' in everyday language this is not the case in psychoanalytic contexts including the discussion here. In particular, Klein's

* '...' indicates a portion of transcript text has been cut.

approach to defence mechanisms was based on her work with very young children and Klein theorised that defence mechanisms are a central part of mental development: mind comes into being in infancy by defending and coping with consequences of defending (Wadell, *op. cit.*).

What defence mechanisms can be discerned in the undergraduates' interviews that are relevant to their studying mathematics and another subject? Jacques Nimier (1993) posited that mathematics – as a discipline – can be used as a (manic) defence which can have an influence on subject choice (Rodd 2011). In Evan's extract given above, where mathematics itself is positioned as the potential destroyer of "personality", Evan articulates that he perceives a psychic danger of "blowing your personality" and also of a social danger of perceived "nerdiness" and this is the reason he cites for doing languages as part of his degree. But, and yet he does do mathematics. To get an idea of why mathematics is still useful to his psyche – despite the risks he can voice – it is useful to know that Evan is the younger of two brothers and his elder brother went to – in Evan's words – a "state school"

he didn't really reach his potential and yeah he would have done a lot better in private school ... I think he could have done a lot better but he just didn't have the enthusiasm he wasn't pushed at school whereas at the school I went to you were pushed the whole time, not threatened but they say if you don't get your GCSEs if you don't get straight As then you won't get in to university and if you don't do A levels you won't get anywhere in life and you'll fail miserably but I don't think that's the case.

In a subsequent part of the interview, Evan explains that he did further mathematics A level in six months and received A grade – a course that will indeed have entailed his being 'pushed'! In the passage directly above, Evan expresses his uncertainty as to whether or not "intense" (his word from the first extract) pushing is what is needed for him not to "fail miserably" as his older brother did. An interpretation is that Evan's loyalty to and identification with his brother both allows and necessitates the release from the intensity that is experienced when the self is manically defended with mathematics (Nimier, *op. cit.*). In other words, to defend his young self who looked up to a big brother as well as his family's integrity, an outlet from intensity is needed. The conduit of release in languages, Spanish and Arabic, is a psychically skilful route: Evan had already excelled in Spanish at school and Arabic is a new venture.

Quite a different story comes from Trish. Trish is the elder child of a single mother who is a fulltime carer of Trish's half-brother (who has disabilities associated with ADHD and autism). Trish says of her biological father:

It just kind of drifted off and I got to the stage where I was just, well if he's not bothered I'm not bothered. But my brother has a different Dad and he's my Dad basically but he doesn't live with my Mum he lives separately. He's who I class as Dad. My brother goes to his dad's every weekend and I might go see him.

And generally positions herself away from her family:

I'm the first person to go to university which was quite difficult because they didn't know anything about it, nothing and didn't know what to expect. Other friends and things their parents know all about it cos they've all been there, especially at a private school, the majority have degrees and even PhDs so I'm a little bit different in that respect, my Mum still doesn't have any idea.

Her school has supported Trish not only financially through scholarships, but also by providing reliability and constant 'feeding':

My school was brilliant, especially my maths teachers and even like when the exams were on and stuff they were always like there and they were always like come and see me and I'll go through this or something like all the time and I would not hesitate to in lunch time or something if I was doing some maths questions and I was stuck on something I'd go to the staff room and they would be there.

There is a sense that the school is Trish's parent, that school contains and protects her. In particular, her maths teachers were available whenever she wanted and her maths attainment kept her buoyant there. In her final year (Y13), the school provided board and lodging for Trish in exchange for her having responsibilities for younger girls in their boarding house. When Trish refers to 'we' it is the school. Trish's choice of mathematics is consonant with defending the relationship with her 'parent-school' and she defends herself by repressing the importance of her actual parents. What does her choice of management signal? Recall the previous quotation from Trish's interview that she had put a different minor subject down for each of her UCAS choices; later in the interview she says:

I didn't really just want to do straight maths so that's why I chose management cos I don't know why I chose management, just for fun!

Such utterances raise the possibility that the minor subject is serving as a place for imaginings, or, in psychoanalytic terms fantasies or phantasies (Wadell, *op. cit.*).

The dual spelling of fantasy/phantasy signals the distinction between conscious *fantasy* like Lee's "lot of money" and unconscious *phantasy* that can only (if ever) be read 'between the lines'. Using Lee's story to illustrate this distinction, it is useful to know that when Lee was five, his biological father left Lee, his brother (two years older) and his mother who had come to London from mainland China at the age of 18 less than ten years before; Lee's mother soon remarried a social worker, originally from Hong Kong. The following extract is early in the interview:

Lee – Maths, I've always been good at it. I remember back in year 1 or something like that, I was quite stupid, not stupid, but somehow all the other kids seemed to shine. Then my Dad made me learn my times tables and then after I did, suddenly maths, anything about maths seemed to make sense, anything, and then that's how I got better and better I'm not sure why he made me learn the times tables. ... I guess my Dad just wanted me to just be on the ball. That's it, that's why. And it paid off really well.

Much later in the interview, 'Dad' turns out to be Lee's Stepfather who:

does as much as he can to encourage me. He is quite, he is a decent man, he is. He's quite a well-paid social worker, probably a high senior manager for H. Council. So, yeah he's definitely qualified anyway, he's probably got a Masters, I'm not quite sure, but something ... I – *And your Dad?* L – My Dad, my real Dad? I haven't seen my real Dad in years so I don't know anything about him right now. I live with my Stepdad. My Stepdad's the social worker. So, yeah.

While there are always multiple interpretations for any given text, the quotations above have been chosen to encourage the reader to imagine Lee's unconscious motivation to please his Stepdad, to receive his teachings and even to be in competition with him. We cannot fully know even our own phantasies, but part of the human project is to mind-read others and imagine their deep desires and fears. Lee's conscious motivation to study mathematics, statistics and finance is money, but even in these brief quotations it is possible to sense unconscious motivations, that surround his relationships with his family, that subliminally direct him to finance, to '*fa cai*' ('create wealth' – the standard Chinese New Year greeting) and to be grateful for his Stepfather's giving him an entry in mathematics.

The two young women reading mathematics and French both like the definiteness they believe is characteristic of mathematics yet their stories around their option of French are quite different. Chloe seems to be still attached to her mother and possibly had been unconsciously acting out her mother's wishes:

Chloe – Mum wanted to do maths like at her A level thing but then she couldn't because of how her timetable went out and she said she was always annoyed that she could never do maths to A level. Umm and I don't know whether that's sort of, so Mum definitely likes maths.

Whereas Laura enlivens a fantasy that French opens up skiing and a world of holiday!

Conclusion

Making a choice of university course is not an easy step to take in a young person's life so it is reasonable to conjecture that a prospective undergraduate might spread their risk over more than one subject. Analysis of the small sample of interviews with first year undergraduates gathered as part of the UPMAP project does not support the conjecture that reading a second subject is to hedge bets of because of lack of commitment. Analysis suggests that while there were articulations that single subject mathematics would be too "intense" (Evan and Chloe), undergraduates' relationships with mathematics were rather secure, either because of attainment, or because of perceived lack of subjectivity in mathematics as a discipline. With this security in the relationship with mathematics, the undergraduate used another subject for fantasy or phantasy or to defend themselves in some way.

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