

Failing GCSE mathematics ‘made me feel like a complete failure’: Exploring narratives from numerate graduates

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This paper presents findings from a study, exploring experiences of numerate graduates who self-identify as struggling, or having struggled, with mathematics. Eight graduates participated, all of whom were working as experienced professionals in fields that require evidence of mathematics or numeracy skills. Creative qualitative methods were used. There were two in-depth interviews with each participant, focused around a personal timeline. Subsequently, Interview Story-Diagrams were created and shared with the participants for verification. Finally, thematic analysis was undertaken, and two global thematic networks were developed entitled ‘Purpose’ and ‘Identity’. Common experiences among the graduates were noted and consequently, with reference to literature, it is argued that dis-empowering and inequitable tendencies within mathematics education are ‘sticky’ in nature and seem to be replicated, or preserved, over many years and in many contexts. The role of graduates as stakeholders in mathematics education is highlighted and recommendations for practice and further research are made.

narrative; thematic networks; graduate stakeholders.

Background

This study formed the basis of my doctoral thesis (Cross, 2018) and reflects a fusion of personal and professional interests. I was seeking to find a connected way to understand more about the entire trajectory of a person’s mathematics education experience, not limited to one particular context.

Through my work in mathematics and statistics skills development in higher education, I was focussed on people who are judged to have succeeded, despite difficulties. Without the resources for a longitudinal study into the progress of individuals or cohorts over many years I turned to people who have already had successful educational trajectories.

The resulting research was, unsurprisingly, an exploratory, person-centred study, using narrative analysis and it focused on a group who are under-represented in mathematics education research.

Participants

The recruitment of professional participants was straightforward because candidates came forward simply by word of mouth, in keeping with similar studies (Coben & Thumpston, 1995). There were simple criteria. The participants must have had a successful post-graduate trajectory demonstrated by five years, or more, in a graduate profession (post qualification) where there is a professional body that requires evidence of mathematical competence. In addition, the participants (see table 1) must self-identify as struggling, or having struggled, with mathematics.

Anne	Primary School Teacher; qualified mid 1990's; classroom-based role.
Ben	Primary School Teacher; qualified mid 2000's; classroom-based role.
Fleur	Nurse; qualified late 1990's; Hospital based ward manager role.
Holly	Health Visitor since late 1990's; qualified as a Nurse early 1990's; community-based role.
Jack	Clinical Psychologist; qualified mid 2000's; acute medicine-based role.
Joy	Radiographer; qualified mid 1990's; MRI specialist role.
Gwen	Nurse Educator since late 1990's; qualified, post-graduate, as mental health nurse late 1980's; university management role.
Ted	Pharmacist; qualified early 1970's, community-based role.

Table 1 - brief summary of the eight participants (pseudonyms are used).

Data

I conducted 16 interviews, two with each participant and each typically lasting about 1 to 1.5 hours in duration, a couple of weeks apart (Hollway & Jefferson, 1997). The interviews were audio recorded and focused on the construction of a personal timeline (Adriansen, 2012) using A2 paper and coloured pens. Prior to producing thematic networks for analysis (Attride-Stirling, 2001) I created a simple method which I called Interview Story-Diagrams. These diagrams were then shared with the participants for feedback, to see how well I had understood and interpreted their stories. To this end I created an Interview Story-Diagram for each participant which collated the key content from their stories into a connected web. One of these is shown in figure 1.

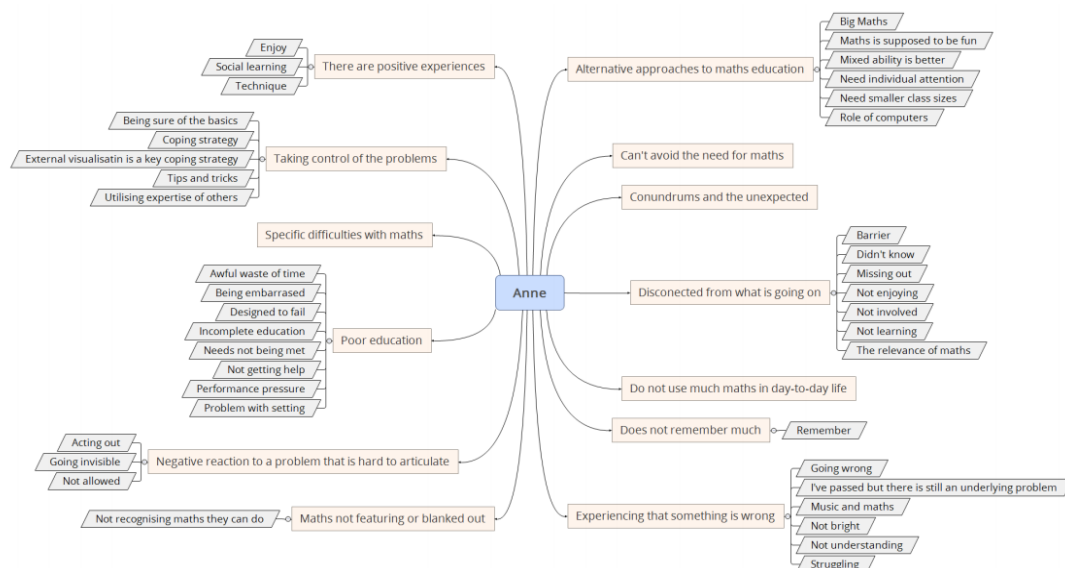


Figure 1 – Anne's Interview-Story Diagram

This proved to be a valuable process and I would encourage other researchers to consider following the same approach. The resulting diagrams were a useful tool, not only for verifying my interpretation with the participants but also to increase my immersion in the participants' stories, and emphasise their importance, before they were combined with the others in the final analysis.

Analysis

The thematic network method was recommended to me and I was struck by its use in a study of men's health issues in prison (Woodall, 2010). There is an immediacy to the network-diagrams which I found engaging and hoped others would too.

In analysing the narratives to create thematic networks, Braun and Clarke's (2006) advice was followed. Initially, they were developed to a greater level of detail (in my case four levels) than required and then they were reduced through further refinement and analysis. I decided on three levels, finally, which are the Global Theme, the Organising Themes and the Basic Themes (see figure 2).

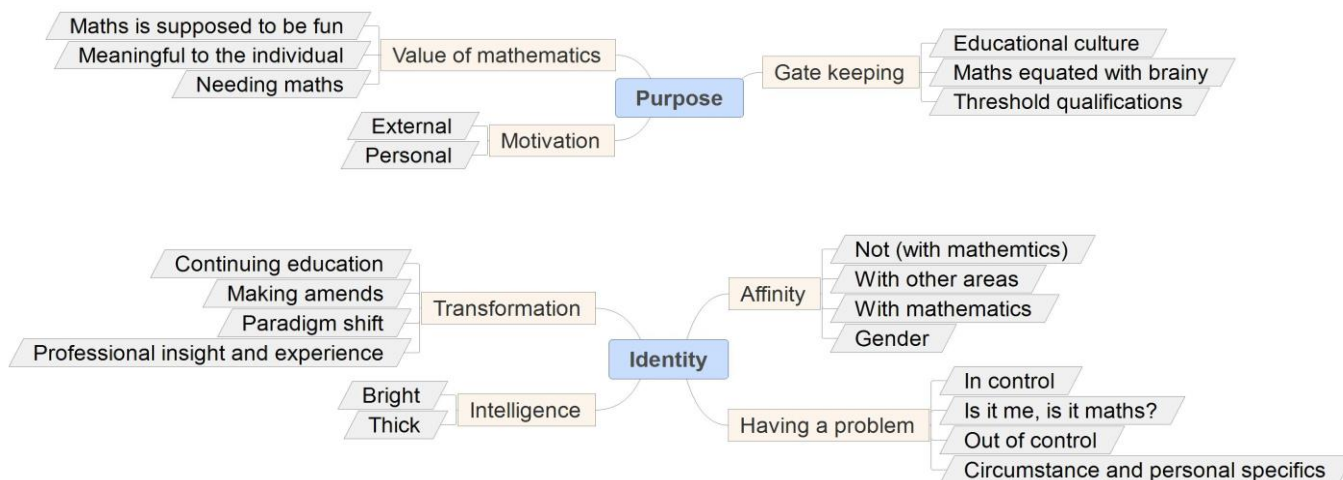


Figure 2 – Final thematic networks

Findings

In the study, each network was examined in detail, emphasising the participants' voices. This section provides a brief summary of some of my subsequent analysis while continuing to maintain a focus on the participants' own words and drawings.

Mathematics education takes its toll

As this was an exploratory study, I was prepared for very tentative outcomes. However, the picture was stark; all the participants were left feeling, at some point, that something was wrong with them due to their mathematics education specifically.

I could overcome it, I can. I know I can, but I can't get rid of 30 years plus of feeling I'm rubbish at maths now 'cause that's with me, and I can't erase that [Holly, Health Visitor]

squashed my mind and sent me yelping like a beaten dog [Jack, Clinical Psychologist]

They were put off mathematics by mathematics education. It was interesting that one of the participants, Joy (Radiologist), took advantage of the opportunity for reflection between interviews and she looked up her school reports. She could not believe that her primary school report identified her highest performing subject was mathematics. It was inconceivable to her. Generally, a contrived but fixed nature to mathematics education proved alienating to the participants.

Four buses leave a depot and one travels at-- well I'm, I'm not a bus driver! [Gwen, Nurse Educator]

I liked doing my own patterns and we weren't really allowed to do that [Anne, Primary School Teacher]

Many of the participants experienced humiliation rituals and subsequent anxiety and embarrassment around mathematics. This could be as simple as not being able to leave a class until a calculation was performed or the more elaborate balloon activity where, as the students learn their multiplication tables, their 'balloons' progress across the wall, or not (see figure 3).

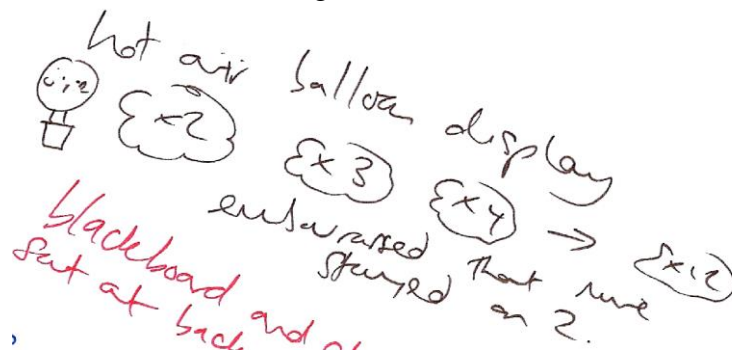


Figure 3 - Anne was embarrassed over many weeks as her balloon failed to progress

16+ threshold examination

The time towards the end of secondary, or high, school was the worst for most of the participants and the negative feelings from that time still abide. Seven of the participants were 'top stream' as children but only Ted, Ann and Ben passed the relevant 16+ threshold exam (GCSE or equivalent) while at school.

I can remember thinking, 'Oh, crap. If I haven't got grade C, I'd be having to resit this, and I think I might actually kill myself' [chuckles]... Because it was awful. I had awful memories [Ben, Primary School Teacher]

The fact that I passed the other eight didn't really matter [Joy, Radiographer]

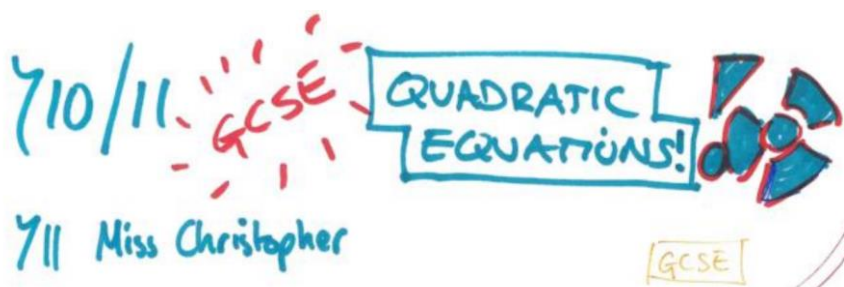


Figure 4 - Ben found GCSE mathematics radioactive

The pressure experienced by the participants around this time together with the perception that the mathematics qualification was higher status than the others all contributed to make this the nadir in their mathematics education experience. Anne is still quite sure that her Music GCSE grade must have been mixed up with her Mathematics grade because she cannot believe she passed. However, subsequently, each participant managed to re-engage with mathematics (or statistics) at further or higher education, to some degree, and progress into their chosen careers as a result.

Gender: Visibility, doubt and resistance

Gendered issues around mathematics education were identified by the participants. They were clearly experienced as routine and pervasive.

(As a girl) you don't ever get called on or have to do anything because you are not seen [Anne, Primary School Teacher]

(As a girl) I'd been given my permission by my mum not to be good at maths [Gwen, Nurse Educator]

These experiences echoed research, where the 'problem' is seen to be "the girls themselves without considering the wider context" (Rodd and Bartholomew, 2006, p. 40). They expressed that they had been made to doubt themselves and discount their own abilities.

Because I think um, I think to myself I must be stupid because I've got to do it this way around... rather than being able to do it straightaway [Joy, Radiographer]

I've always felt actually deep down I'm a fraud [Holly, Health Visitor]

There was a commonality of hard work and resilience and there was also resistance.

I mean the reason I'm so good at DIY is because I firmly believe if a man can do it then I can probably do it [Gwen, Nurse Educator]

Strong accord with literature

The accord between this inquiry and research literature, past and present, was striking. There are too many authors to list but very little seems to have changed over many years in how mathematics education is experienced. The findings of mathematics education research are not easily translated into practice (Jackson and Povey, 2017).

At the point of practice, there seems to be "a fault line between competing discourses of mathematics" (Alderton and Gifford 2018, p.65) reinforcing the perception that there are systemic issues at work, making change difficult to enact. Many issues that have hindered mathematics education historically still exist today (Povey, 2014) and dis-empowering and inequitable tendencies within mathematics education, particularly, appear to be persistent or 'sticky' in nature.

Conclusions, practice and further research

The extent of the accord with existing literature was surprising. At the outset, stories of persistence or overcoming that could be shared with current students seemed a valuable expectation. However, the unchanging nature of mathematics education became a standout feature. A certain performance of mathematics is prevalent, and it tends to be male and, definitively, clever.

I am more strongly convinced that one's own efforts, as an educator, at developing inclusive practice are vital but are also easily undermined, even by oneself. One's own language and behaviour, students', their peers and their families' language and behaviour can all be influenced by pervading, deep-rooted societal norms which can serve to 'other' some learners. These influences may manifest as instinctive ability-thinking, gender bias or, simply valuing a narrow performance of what mathematics is. Furthermore, undertaking this study has reinforced the continued importance, within my practice, of recognising that individual circumstance can have a tremendous bearing on a person's experience and that "learning itself is an emotional activity" (Tangney, 2014, p.273).

The role of graduates from diverse fields as potential stake-holders in mathematics education is highlighted by this inquiry. These professionals demonstrated that they can offer meaningful insight into complex issues in the field of

mathematics education. The challenge is how this can be embraced by future research endeavours.

References

- Adriansen, H.K. (2012). Timeline interviews: A tool for conducting life history research. *Qualitative studies*, 3(1), 40–55.
- Alderton, J., & Gifford, S. (2018). Teaching mathematics to lower attainers: Dilemmas and discourses. *Research in Mathematics Education*, 20(1), 53-69.
- Attride-Stirling, J. (2001). Thematic networks: An analytic tool for qualitative research. *Qualitative Research*, 1(3), 385–405.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Coben, D., & Thumpston, G. (1995). Researching mathematics life histories: A case study. *Proceedings of the Second Conference of ALM: Mathematics with a Human Face. Adults Learning Maths - A Research Forum, 7th–9th July 1995* (ALM-2, pp.39–44). London, UK: Goldsmiths College, University of London.
- Cross, M. (2018). *Graduate voices: Exploring numerate professionals' mathematics education experiences and challenges* (Unpublished doctoral dissertation). Leeds Beckett University, Leeds, UK.
- Hollway, W., & Jefferson, T. (1997). Eliciting narrative through the in-depth interview. *Qualitative Inquiry*, 3(1), 53–70.
- Jackson, C., & Povey, H. (2017) “No, it just didn’t work”: a teacher’s reflections on all attainment teaching. *Proceedings of CERME 10*, Feb 2017. Dublin, Ireland.
- Povey, H. (2014) A pedagogy for attainment for all. In D. Leslie & H. Mendick (Eds.) *Debates in Mathematics Education. Debates in subject teaching* (pp.133-143). London, UK: Routledge.
- Rodd, M., & Bartholomew, H. (2006). Invisible and special: Young women’s experiences as undergraduate mathematics students. *Gender and Education*, 18(1), 35–50.
- Tangney, S. (2014). Student-centred learning: A humanist perspective. *Teaching in Higher Education*, 19(3), 266-275.
- Woodall, J. (2010). *Control and choice in three category-C English prisons: implications for the concept and practice of the health promoting prison* (Unpublished doctoral dissertation). Leeds Metropolitan University, Leeds, UK.