

GCSE Mathematics resit students' narratives of their relationship with mathematics.

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A number of recent studies have focused on the widespread disengagement that Further Education (FE) GCSE Mathematics students in England often show and have introduced approaches to improving attainment. However, few of these evidence students' prior experiences to any extent. I report on a study which gives FE students the opportunity to explore their experiences with mathematics through their previous schooling and provides the researcher the ground to understand the factors that shaped their current engagement with the subject. Seven GCSE Mathematics resit students were interviewed using a narrative approach. Using semi-structured prompt questions, students were able to reach back to their previous experiences with mathematics and tell their stories. Early data analysis shows that key factors in shaping students' engagement with mathematics were a) their relationship with the teacher, b) teenage class distraction, and c) the ability to transfer mathematical function from classroom to examination.

Keywords: GCSE mathematics resits; further education; engagement; narrative approach; students' learning experiences.

Background and rationale

In England, a significant link has been found between low levels of numeracy and unemployment (Parsons & Bynner, 2005; Wolf, 2011). In response, a range of post-16 initiatives have been introduced or developed to address the mathematical skills of vocational students, with a concentration on mathematics used in life and work (Greatbatch & Tate, 2018). Since 2015, continued study of mathematics is a condition of funding for everyone in FE who does not hold a GCSE grade 4 or over (Schulz, 2013). Despite the fact that there is a variety of mathematics qualifications available for such students, GCSE mathematics attracts higher status and recognition among employers and provides greater funding for FE colleges (ESFA, 2019).

My four years of experience in teaching for such GCSE mathematics resits have taught me that the two main issues my colleagues and I face are students' low engagement and the large number of knowledge gaps these students show. These are some of challenges that contribute in low attainment and poor success rates (about 20-25% grade 4+ in GCSE Mathematics resits nationally and about 12-16% within my institution yearly). The term engagement refers to the level of attention, interest and enthusiasm that students show during the learning process which extends to the degree of motivation they have for further learning and progress in education. A report by Higton et al. (2017) shows that FE GCSE mathematics resit students tend to have low levels of motivation, low confidence and poor understanding of the subject. A large proportion of these students has already experienced repeated failure in previous mathematics examinations (Dalby, 2013), and the idea that GCSE

mathematics is ‘irrelevant’ and ‘boring’ appears to be widespread among FE learners (Smith, 2017). This can be seen partly a result of students’ previous experiences and the way teaching is conducted in FE, both factors that can result in high disengagement towards the subject. Ofsted (2012) shows that having only about 30 weeks of teaching for a resit, the majority of FE teachers choose to focus their lessons on tackling ‘popular’ examination topics to increase students’ chances of achieving at least a grade 4. Memorizing mathematical facts and learning basic mathematical procedures seem to be considered the key tools for passing the examination. Many of the resit students do not manage to improve their GCSE performance and develop a feeling of continuous failure that reinforces negative dispositions towards the subject and its future use (Johnson-Wilder et al., 2015).

With the recent increase in resit students (about 180,000 entries in 2019), significant efforts have been made to address the teaching of GCSE mathematics in FE and learners’ low engagement. These efforts aim at two FE groups: the teachers and the students. Training courses and educational projects to enhance subject knowledge for teachers and improve pedagogical approaches targeting FE students have been offered to FE institutions all over the country (NCETM, 2014; Johnston-Wilder et al, 2016; CfEM, 2019). This was an essential effort as a large proportion of the FE mathematics workforce is non-specialist (Noyes et al., 2018). On the other hand, a number of recent studies and reports have tried to understand the reasons behind resit students’ disengagement with mathematics (Smith, 2014; Dalby & Noyes, 2015; Hough et al., 2017). Bellamy (2017), for instance, tried to understand the effects that ‘forced’ GCSE mathematics resits have had on students and their lives by making students’ voices heard. Through her 30 interviews, students had the chance to express their views on GCSE resits and to refer also to some previous experiences with mathematics. Velthuis et al. (2018), investigated what might be the common characteristics of those students who end up resitting GCSE mathematics by focusing their exploration on a range of demographic variables. Finally, Nixon & Cooper (2020) explore the experiences of FE mathematics students aiming to understand students’ views on what it means to be good at maths, what a good maths curriculum looks like and identify the ‘enablers’ and ‘barriers’ of being a successful mathematics student.

The heart of all these studies remains within the ‘now’ of students’ FE experience with mathematics and lacks the investigation of the deeper ‘why’ behind their disengagement with the subject. Those numerous individual learners already have a mathematics story before entering further education. I, therefore argue that understanding how those experiences have shaped their current dispositions might help us understand why there is this huge disengagement with the subject and suggest tools for tackling the issue.

Research questions

I report on the early stages of a study which aims to harness students’ narratives of their longitudinal experiences with mathematics, so as to better understand the factors that shaped the dispositions they hold towards mathematics and any characteristics of those narratives that might be common. Research questions ask:

1. What are further education students’ stories about their relationship with mathematics?
2. What do they perceive to be the critical events that shaped their engagement with mathematics?

The study

The study adopts a narrative research approach, which is situated within a qualitative or interpretive tradition (Moen, 2006) and uses participants' own stories as a basis for interpretation of the phenomenon under examination. Drawing on Vygotsky (1978) and Bakhtin's (1986) theories, Moen (2006) claims that when investigating human behaviours it is important to examine how their behaviours or actions are related to the circumstances under which they occur and how they have been developed through the years. A narrative approach to analysis, therefore, provides the grounds for avoiding the "pitfalls of individualistic and societal reductionism" (2006, p.59).

I am interested, therefore, to understand how individuals give meaning to their experiences and which parts of those experiences are emphasised more through the stories they narrate. I chose this approach because it gives voice to the individual learners: the researcher has the opportunity to actively involve the participants in the inquiry as it evolves, and it provides a chronology of each participant's experiences.

Recruitment and selection

In February 2020, expression of interest forms were shared with one of my six GCSE resit classes. I chose to start with that group because I felt that I had built a solid relationship with them during the year and this would provide the means for an extensive narration of their experiences with mathematics. In the interest forms it was explained in detail the purpose, aim and process of the study. Out of the 40 students, 12 expressed an interest in participation. Initially I had intended to involve all 12 students but due to the covid-19 lockdown only seven managed to participate. The other five were facing limited access to hardware, space or bandwidth. However, I did encourage later participation if their circumstance change. At the end of the interviews, each participant received a small voucher in recognition of their time. Ethical approval was obtained from my institution.

Participants

Table 1 presents an overview of participants' main demographic characteristics. The group from which participants were selected was consisted of students studying either Creative Media or Health & Social Care, all in their first year of the relevant course. The number of times that each participant had sat GCSE mathematics before this year varies from one to five times.

Participants	Gender	Age	Ethnicity	Course of Study	Number of times has sat GCSE maths before
Renatro	M	19	Arab	L3 Creative Media	1 (+ 2 years of Functional Skills Maths)
Gerald	M	17	N/A	L3 Creative Media	1
Naomi	F	18	African	L3 Health & Social Care	2
Tasmina	F	17	Pakistani	L3 Health & Social Care	1

Regina	F	18	Caribbean	L3 Health & Social Care	3
Smiley	F	20	Caribbean	L3 Creative Media	5
Kayla	F	19	Caribbean	L3 Creative Media	3

Table 1: Participants' demographic characteristics

Interviews

Seven semi-structured interviews were conducted in March and April. The first three were conducted face-to-face and the last four remotely by webinar (due to covid-19 lockdown). Initially, participants were asked to talk about anything they could remember regarding their mathematics journey. Later, semi-structured prompt questions were used to help them expand, clarify or add to what had already been said. Interviews were audio recorded and automatically transcribed, and lasted between 20 to 45 minutes.

Initial analysis

I started the analysis by, firstly, editing the transcriptions whilst listening the recordings to eradicate digital transcription errors. Then I printed each transcription and open coded while reading and listening at the same time focusing on what each participant was saying as well as to the sound and expression. I, then, identified common themes relating to engagement with mathematics during the different stages of their schooling grounded in my open coding, using colours to highlight on-script, and on a later stage I focused on exploring potential sub-themes. Essentially, I was seeking the underlying meaning in participants' words and possible similarities between their narratives.

Initial findings

Based on participants' narratives, I divided the data into two main categories, *experiences before college* and *experiences while in college*. Although the focus of the interviews was to explore previous schooling experiences with mathematics, most of the participants would make comparisons with their current learning in FE. In the first category, factors that shaped participants' dispositions and relationship with mathematics were expressed through their stories. In the second category, views on the importance of mathematics for future use and recognition of self-responsibility were demonstrated. For the purpose of this paper, the focus will be at the experiences before college.

Experiences before college

Five factors that contributed to shaping their relationships with mathematics have so far emerged. Firstly, the relationship they had with their primary and later with their secondary mathematics teacher seemed to be the most important factor affecting their engagement and effort, both in a positive or a negative way. Second, in perceived importance, the classroom environment and teenage peer disruption were thought to impact their learning attitude in lessons. Group setting was another issue that made some of the participants feel that they were stuck in a specific (usually low) set and could not progress. The transition from primary to secondary school played a crucial

role in the further building of mathematical attitudes and this was enhanced by the amount of ‘mathematical knowledge’ that they felt had to be memorized. Finally, at least three of the participants would find it difficult to transfer mathematical function from classroom to exam. Finally, all participants showed some recognition of self-responsibility for what might have gone wrong during their mathematical learning journey.

“The teacher wasn’t good as well...they didn’t make me understand fully how to do the equations” (Renatro)

“I think, obviously, it's hard [when moved to Secondary] because you're learning more, you have to like memorise things for the exam. [...] I think exams are not for me. Like, I feel like, normal day I remember what to do, but it’s like in the exam... it’s you're in a blank box like you just have a paper in front of you and determines a grade.” (Regina)

“I had one [primary teacher] that I didn't have a really good relationship with because she was quite strict so I didn't really like her. [...] [some other primary teachers I had] they [were] more interacting, they were more... nicer so you can engage with the work more” (Kayla).

“[In primary] I was in the third set... I didn’t feel great about it... yeah, I know, I could do better. But, yeah, I did try to work hard. [...]I don't know why, but it's just the [low] grades that make me think that I can't do this [in maths]” (Kayla).

Conclusion

This study contributes to the further development of GCSE mathematics teaching and learning in further education, and particularly my own, by beginning to identify mathematical experiences that underlie FE students’ attitudes. The research methods used and the study’s concrete outcomes are expected to lead further in this direction through the harnessing of outcomes to the development of alternative pedagogical approaches to teaching mathematics to GCSE resit students, and so disrupt the miserable cycle of these young people’s repeated GCSE failure and poor confidence and limited meaning-making in relation to their mathematical functioning.

References

- Bakhtin, M. M. (1986). *Speech genres and other late essays*. Austin, Texas: University of Texas Press.
- Bellamy, A. (2017). Forced GCSE mathematics resits: Students’ voices. *Proceedings of the British Society for Research into Learning Mathematics*, 37(1).
- CfEM. (2019). Centre for Excellence in Maths. Retrieved from <https://www.et-foundation.co.uk/supporting/support-practitioners/maths-and-english/cfem/>
- Dalby, D. (2013). An alternative destination for post-16 mathematics: views from the perspective of vocational students. *Proceedings for the British Society into Learning Mathematics*, 33(3).
- Dalby, D.M. and Noyes, A. (2015). Connecting mathematics teaching with vocational learning. *Adults Learning Mathematics*, 10(1), 40-49.
- Education and Skills Funding Agency (ESFA) (2019). *Guidance: 16 to 19 funding: maths and English condition of funding*. Retrieved from <https://www.gov.uk/guidance/16-to-19-funding-maths-and-english-condition-of-funding#grade-d-requirement-to-the-condition-of-funding>
- Greatbatch, D. and Tate, S. (2018). *Teaching, leadership and governance in Further Education*. Retrieved from

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/680306/Teaching_leadership_and_governance_in_Further_Education.pdf

- Higton J., Archer R., Dalby D., Robinson S., Birkin G., Stutz A., Smith R., & Duckworth V. (2017). *Effective practice in the delivery and teaching of English and Mathematics to 16-18 year olds*. Department for Education.
- Hough, S., Solomon, Y.J., Dickinson, P. and Gough, S. (2017). Investigating the impact of a Realistic Mathematics Education approach on achievement and attitudes in Post-16 GCSE re-sit classes. Retrieved from <https://e-space.mmu.ac.uk/619428/1/MMU2370%20Full%20Hough%20report.pdf>
- Johnston-Wilder, S., Lee, C., Brindley, J. and Garton, E. (2015). Developing mathematical resilience in school-students who have experienced repeated failure. In *8th annual International Conference of Education, Research and Innovation (ICERI2015), Seville, Spain*, 16-18.
- Johnston-Wilder, S., Pardoe, S., Marsh, J., Almehrzi, H., Evans, B. and Richards, S. (2017). Developing teaching for mathematical resilience in further education: Development and evaluation of a 4-day course. *ICERI 2017 Proceedings*, 6128-6136.
- Moen, T. (2006). Reflections on the narrative research approach. *International Journal of Qualitative Methods*, 5(4), 56-69.
- NCTM, (2014). *The NCTM FE GCSE Mathematics Enhancement Programme*. Retrieved from <https://www.nctm.org.uk/resources/41310>
- Nixon, L. and Cooper, J.B. (2020). Less but Better? Teaching Maths in Further Education and Collateral Growth. *Education Sciences*, 10(3), 61.
- Noyes, A., Dalby, D. and Lavis, Y. (2018). A survey of teachers of mathematics in England's Further Education Colleges. The Mathematics in Further Education Colleges Project: Interim report. Retrieved from <https://www.nottingham.ac.uk/research/groups/crme/documents/mifec/interim-report.pdf>
- Ofsted. (2012). *Made to Measure*. Retrieved from <https://www.gov.uk/government/publications/mathematics-made-to-measure>
- Parsons, S., & Bynner, J. (2005). Does Numeracy Matter More?. *National Research and Development Centre for Adult Literacy and Numeracy*. London: NRDC.
- Schoenfeld, A. H. (1985). *Mathematical problem solving*. San Diego, CA: Academic Press.
- Schulz, M., (2013). *Compulsory English and Maths in Further Education Part 1*. Retrieved from <https://www.ool.co.uk/blog/compulsory-gcse-english-and-maths-in-further-education-part>, Oxford: Open Learning.
- Smith, A. (2017). *Report of Professor Sir Adrian Smith's review of post-16 mathematics*. London: Department for Education.
- Velthuis, S., Lupton, R., Thomson, S. and Unwin, L. (2018). *The characteristics and post-16 transitions of GCSE 'lower attainers'*. Retrieved from https://hummedia.manchester.ac.uk/institutes/mui/igau/lower_attainers_working_paper_oct2018.pdf
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard university press.
- Wolf, A. (2011). *Review of vocational education- The Wolf report*. London: Department for Education.