What are the learners' needs to reduce perceived apprehensions and improve engagement in resit Mathematics learners at FE College?

Mariam Siddiqa Rashid

Staffordshire University

Over the past few decades, learners' perceived apprehensions in resit Mathematics lessons at Further Education (FE) college gained much attention in the England. Resit Mathematics learners are those who did not achieve Mathematics at school leaving age. Moreover, research in Mathematics education globally revealed different aspects of Mathematics-related apprehensions, especially in younger generations. However, there has not been much work done on understanding resit Mathematics learners' apprehensions and their learning needs to improve the situation. This paper explored learners' beliefs about Mathematics using Implicit Theories. Resit Mathematics learners' experiences were explored to understand their learning needs at FE college. I used Focus Group Interviews with Mathematics learners from different vocational areas at FE college. These interviews helped them recall their Mathematics experiences and encouraged them to compare and share in the discussion. Initial data analysis identified that most of the resit Mathematics learners' experiences were mainly negative at secondary school.

Keywords: resit mathematics; further education; apprehensions; engagement

Background and introduction

The importance of science and Mathematics to the new generation's future progress has been discussed as one of the major concerns in the UK and emphasised at different levels (Coughlan, 2016). The UK's future progress in advanced fields of research and technology demands good mathematical skills. As a compulsory part of education for young people without acceptable Mathematics qualifications at school, leaving age is an extra burden on the UK economy (Mansell, 2010; Johnston-Wilder et al. 2021). However, around half of the young learners aged between 16 to 19 cannot attain passing grades in GCSE Mathematics at school leaving age. Later, three-quarters of these non-achievers join a vocational course at our FE colleges with an obligatory GCSE Mathematics resit course (Russell, 2014). Nearest to a quarter of resit GCSE Mathematics learners hit just a minimum passing grade (Smith, 2017). In addition, Noyes et al. (2020) highlighted that resit Mathematics learners at FE colleges show little progress compared to other institutions (like sixth form colleges). Thus, practical solutions are required to improve learners' behaviour and achievement in Mathematics by minimising the impact of different apprehensions faced by Mathematics learners.

This study used the term apprehension as a broader term to identify the feelings of known and unknown fears of Mathematics learners (Ashcraft, 2002). These fears include Mathematics anxiety, withdrawal feelings, engagement issues,

underestimating Mathematics learning and application, and low progress and achievement (Higton et al. 2017). Similarly, Carey et al. (2019) explained that Mathematics apprehensions create a withdrawal feeling in many individuals from any context involving numbers and calculation. Therefore, learners' perceived apprehensions and resulting low engagement in Mathematics activities are threatening learners' future progress opportunities and passing on in generations as a social trend (Dowker et al. 2016; Johnston-Wilder et al. 2021).

The epistemological criteria for this study were developed utilising my eight years of experience teaching Mathematics at FE college. Mathematics teachers at FE colleges highlighted common reasons for resit failure of Mathematics learners': their attitudes, low engagement, and learning gaps. I observed many students are not receiving appropriate intervening support to improve their Mathematics beliefs and performance. As a result, continuous failure further reinforces their Mathematics apprehensions (Johnston-Wilder et al. 2015)

Theoretical stance

All learners have natural growth and development capacity, but it requires a suitable environment to flourish (Cousins et al. 2019). The concept of unconditional positive regard emphasised that understanding and accepting differences in people in a Mathematics learning environment requires support instead of tagging differences (Patterson & Joseph, 2013). To understand an individual's elementary beliefs, I studied implicit theories. Implicit theories are based on self-control and self-concept (Dweck et al. 1988). Upon comparing previous research findings in general, individuals with entity beliefs are likely to adopt performance goals to prove their abilities to others. For example, in Mathematics lessons asking for help or putting in any extra effort is perceived to show others the lack of self-ability. Such learners miss learning and progressing opportunities, while learners with incremental beliefs set goals with adaptable attributes towards success. It is more critical for learners to pursue opportunities and improve skills rather than proving abilities to others (Dweck 2012; Yeager et al. 2014)

Research questions

This study was based on understanding Mathematics learners' perceived apprehensions and finding possible interventions to improve the situation. Resit Mathematics learners are key participants in my investigation. Participants' responses were expected to demonstrate their experience with Mathematics and judged using Implicit theories. Research questions investigated background factors impacting Mathematics learners' cognitions and resulting beliefs.

1. How do learners describe their experiences of learning GCSE Mathematics?
2. What factors contribute to learners' engagement and motivation in learning Mathematics?

The present study

Qualitative research methods were used to gain inter-subjective knowledge to explore learners' pleasure and problems in learning and understanding Mathematics (Thomas, 2017). This study used the humanistic approach of the interpretative paradigms. This approach described the problem's personal, interactive, and contextual dimensions

(Angus et al. 2015). Participants were provided with a chance to reflect on their relationship with Mathematics learning and its influence.

Furthermore, I used an ethnographic strategy to understand learners' Mathematics-related apprehensions and reasons for their point of view (Denscombe, 2017). This approach assisted my study in learning about the participants as a part of the investigation instead of studying them (Jones et al. 2017). The qualitative research method was facilitated to gain insight into participants' Mathematics experience and how meanings might be shaped (Cohen et al. 2013).

Participants' selection

After fulfilling the ethical requirement and all prerequisites for the study, I used a purposive strategy to select the most pertinent candidates for this study to ensure research questions criteria were met (Liamputtong, 2011). All selected learners were from GCSE Mathematics resit courses and doing compulsory Mathematics as a part of their vocational course after failing GCSE Mathematics at school. Participants were aged between 16 and 19. I contacted around 50 learners, and 16 learners agreed to participate in my study.

Focus group interviews

I planned three focus group interviews and recruited 4 to 6 participants in each group. Each group was invited to attend two sessions at different agreed times to address the demands of the focused area and research questions. The focused area was set into three dimensions to explore Mathematics experiences and their impact on participants' beliefs using Implicit Theories. I included the impact of past Mathematics experience at secondary school, parents and social influence, and compulsory Mathematics. It was also more practical for young participants because they would quickly lose focus with one very long session. Therefore, I divided one focus group interview into two 40-minute sessions for each group.

Initially, it seemed a risk that learners may not return or refuse to participate in the second session after the first session. However, in reality, learners enjoyed their experience in the first session and commented that they needed to have this kind of session for reflection and awareness. I kept these learners involved during the focus group interview by making sessions enjoyable and engaging. I used PowerPoint, which included an introduction to my study and the aims of the session. I provided printed interview questions and picture activities on the smartboard. I observed participants and recorded their expressions and emotions. Participants were given the choice of writing their experiences and responses if they found them hard to say.

Data analysis

Focus group interview sessions were audio-recorded and transcribed verbatim by me. Data transcription was completed soon after the interviews were conducted. The transcription process allowed me to listen to the interviews actively and equally remain focused on non-verbal communication (Gray, 2014). I became familiarised with the data during the transcription process (Basit, 2010). I used content analysis (Cohen et al. 2013) to understand, evaluate the sample relevance, associate the problems with experiences, and develop themes. The content analysis of the open-ended interview data supported my study to focus on the research questions. It helped me interrelate obvious traits to identify the entity and incremental beliefs. Thus, this

retained the process of synthesising, interpreting, writing, reporting, and reflecting to check whether the research objectives were met.

The use of thematic analysis maintained the focus on data in numerous ways. It helped me to look for initial semantic meaning and later interrogate the area for an explicit purpose (Braun & Clarke, 2014)

Emerged findings

I categorise data into intrinsic and extrinsic antecedents based on the emerging themes from the data. I used three terms to describe the resit Mathematics learners. These groups were a disengaged group, a non-disengaged group with an entity belief, and a non-disengaged with an incremental belief. The disengaged group rarely attends Mathematics lessons. The non-disengaged group with entity belief attends Mathematics lessons for compulsory attendance but avoids effort. The non-disengaged group with an incremental belief seemed to take chances and respond to positive reinforcement. However, all three groups experienced mainly negative experiences at secondary school primarily due to factors involving Mathematics teachers and the Mathematics classroom environment.

In general, the non-disengaged group with an incremental belief tried to justify that Mathematics teachers' inability to control the class behaviour impacted learning quality. The disengaged and non-disengaged groups with entity belief responded to failure by focusing on self in detriment and helplessness. I gave learners different ways to express their Mathematics inabilities using various activities to explore this further. For example, a list of words to describe Mathematics, pictures of classroom environment, teachers' class support, the personality of Mathematics teachers and their teaching skills, and some information about the Mathematics course content.

These activities aided my understanding of the learners' current beliefs and state of mind towards the Mathematics course. Based on their answers, I identified learners were moderately despondent and expressed primarily negative experiences with Mathematics. Most of them experienced negative Mathematics learning due to teaching and learning experiences at secondary school. They reported that their Mathematics teachers were strict, insensitive, and lacked teaching/subject knowledge. It appeared that due to negative Mathematics learning experiences, learners found Mathematics content boring, pointless, frustrating, irrelevant, and pressurising.

Conclusion

The Implicit theories supported my study in understanding learners' responses identified learners holding entity beliefs and incremental beliefs. Most of the learners with entity beliefs expressed a lack of ability rather than a lack of effort. The possible highlighted reasons were cultural and social influences on academic mindset. The learners with incremental beliefs showed more tendency towards improvement. The disengaged group of learners showed hopelessness attached to any number of activities. They lost hope and even stopped trying because they perceived the accepted Mathematics was not for them. This behaviour seemed to be a protection from another failure for them.

To improve the situation, the learning environment provided by the teachers plays an important role. At FE colleges, learners need to be streamed in study groups according to their learning needs by understanding their past experiences. Most Mathematics learners' situations can be rectified through teachers' persistent approach to quality teaching and equal opportunities at FE college.

References

Angus, L., Watson, J. C., Elliott, R., Schneider, K., & Timulak, L. (2015). Humanistic psychotherapy research 1990–2015: From methodological innovation to evidence-supported treatment outcomes and beyond. *Psychotherapy Research*, *25*(3), 330-347.

Ashcraft, M. (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science, 11*(5), 181-185.

Basit, T.N. (2010). *Conducting research in educational contexts*. Continuum.

Braun, V., & Clarke, V. (2014). What can "thematic analysis" offer health and wellbeing researchers?. *International Journal of Qualitative Studies on Health and Wellbeing*, *9*(1), 26152. DOI: 10.3402/qhw.v9.26152

Carey, E., Devine, A., Hill, F., Dowker, A., McLellan, R., & Szucs, D. (2019). Understanding mathematics anxiety: investigating the experiences of UK primary and secondary school students. https://doi.org/10.17863/CAM.37744

Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education* (7th ed). Taylor and Francis.

Coughlan, S. (2016, December 6). *Pisa tests: UK lags behind in global school rankings.* https://www.bbc.co.uk/news/education-38157811

Cousins, S., Johnston-Wilder, S., & Baker, J. K. (2019). Mathematics: A place of loving kindness and resilience-building. *Journal of the Canadian Association for Curriculum Studies*, *17*(1), 111-126.

Denscombe, M. (2017). *The good research guide: For small-scale social research projects*. McGraw-Hill Education.

Dowker, A., Sarkar, A., & Looi, C. Y. (2016). Mathematics anxiety: What have we learned in 60 years?. *Frontiers in psychology*, *7*(508) https://doi.org/10.3389/fpsyg.2016.00508

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological review*, *95*(2), 256-273.

Dweck, C. S. (2012). Mindsets and human nature: Promoting change in the Middle East, the schoolyard, the racial divide, and willpower. *American Psychologist*, *67*(8), 614-622.

Gray, D. E. (2014) *Doing Research in the Real World* (3rd ed). Sage.

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.

Johnston-Wilder, S., Lee, C., Brindley, J., & Garton, E. (2015). Developing peer coaching for mathematical resilience in post-16 students who are encountering mathematics in other subjects. In *Iceri2015: 8th International Conference of Education, Research and Innovation* (pp.6002-11).

Johnston-Wilder, S., Lee, C., & Mackrell, K. (2021). Addressing mathematics anxiety through developing resilience: Building on self-determination theory. *Creative Education*, *12*(9), 2098-2115. https://doi.org/10.4236/ce.2021.129161

Jones, S. M., & Kahn, J. (2017). The evidence base for how we learn: Supporting students' social, emotional, and academic development. Consensus statements of evidence from the council of distinguished scientists. *Aspen Institute*.

Liamputtong, P. (2011). *Focus group methodology: Principles and practice*. SAGE Publications Ltd https://dx.doi.org/10.4135/9781473957657

Mansell, W. (2010. Dec 14). *Students taking maths post-16: Japan 85%, UK 14%.* https://www.theguardian.com/education/2010/dec/14/maths-post-16-uk-poor-performance

Noyes, A., Dalby, D., & Smith, R. (2020). *Mathematics in further education: student progress over time.* https://www.nottingham.ac.uk/research/groups/crme/documents/mifec/final-report.pdf

Patterson, T. G., & Joseph, S. (2013). Unconditional positive self-regard. In M. E. Bernard (Ed.), *The strength of self-acceptance: Theory, practice and research* (pp. 93–106). Springer Science + Business Media. https://doi.org/10.1007/978-1-4614-6806-6_6

Russell, D. (2014). *Effective practices in post-16 vocational maths final report*. https://www.et-foundation.co.uk/wp-content/uploads/2014/12/Effective-Practices-in-Post-16-Vocational-Maths-v4-0.pdf

Smith, A. (2017). *Report of Professor Sir Adrian Smith's review of post-16 mathematics.* Department for Education.

Yeager, D. S., & Dweck, C. S. (2012). Mindsets that promote resilience: When students believe that personal characteristics can be developed. *Educational psychologist*, *47*(4), 302-314. https://doi.org/10.1080/00461520.2012.722805

Yeager, D. S., Johnson, R., Spitzer, B. J., Trzesniewski, K. H., Powers, J., & Dweck, C. S. (2014). The far-reaching effects of believing people can change: implicit theories of personality shape stress, health, and achievement during adolescence. *Journal of personality and social psychology*, *106*(6), 867–884. https://doi.org/10.1037/a0036335