

## **Adults (19+) studying GCSE mathematics in Further Education: Self-efficacy, anxiety and examination grades**

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Adults return to mathematics learning up to level 2 (GCSE) fully funded by the government. They may return for intrinsic or extrinsic reasons, such as a change of career, a desire to enroll for an undergraduate course at a university, to help children with homework, or to challenge their perceptions of their abilities. This qualitative study was conducted with adults in FE (n=21) using a mixed methods approach. Findings indicate that self-efficacy was a marginally better indicator for examination success than anxiety levels, as judged by responses to attitude scales. However, whilst most learners who displayed higher self-efficacy and lower anxiety than the median average for the group, there were adults who fell into that category who did not pass, and equally those who displayed low self-efficacy and high anxiety who did pass with a grade 4 or better. A larger study of this under-researched group is recommended.

**Keywords: adult learners; GCSE mathematics; self-efficacy; anxiety**

### **Introduction**

A GCSE in mathematics is a high stakes examination, because it is often a marker examination for Higher Education (HE) opportunities, in conjunction with either Advanced (A) level qualifications or Access to HE courses. At my college in the East Midlands many of the adults (19+) on GCSE mathematics courses were also studying Access to HE courses, often to study nursing or teaching at university, although these were not the only motivations expressed by adults joining the courses (Bélanger, 2015; Tennant, 2006). Adults were assessed for the one-year GCSE courses by an initial assessment; those with lower skills were signposted to Functional Skills. Initial assessments are followed by diagnostic assessments once learners have started.

In 2020 there were approximately 30,650 adults enrolled to take the GCSE mathematics examinations in England, which represented about 10% of the total number (Gov.UK (1), 2020). Data was collected on both the age and gender of adult learners: in 2020, 45% were 19 to 24 years old, and 55% were 25 years or older; two thirds were female and one third male (Gov.UK (3), 2020). The 55% who were 25 years or older are those who can be described as lifelong learners, as they have probably returned after a break in education (Bélanger, 2015) and may be on non-traditional pathways in education.

The aims of the research were to establish an understanding of participants' self-efficacy and anxiety about mathematics and examinations and whether there was a correlation between those perceptions and their grades in the final examinations.

The aims of the research were extended into the following research questions: What were the perceptions of adult learners when they engage with GCSE mathematics classes in colleges? Did these perceptions differ by age, gender or whether the learner is a first language English speaker, or not? Was a positive level of self-efficacy necessary for or related to examination success? Were the anxiety levels

expressed by participants linked to examination success? And finally, what other findings emerged from the data?

## **Literature Review**

As explained in the previous section, adults in GCSE mathematics classes may either be on traditional or non-traditional pathways in education or may have joined the classes for other reasons. However, they have all chosen to re-engage with their mathematics learning, as once learners are 19+ mathematics is no longer a compulsory subject if they have not already achieved a pass grade, although learners may perceive it as compulsory if their onward journeys in education depend upon it.

Adults' motivations combined with the non-compulsory nature of the courses mean that they can be interpreted as requiring different teaching and learning approaches from those on traditional pathways, which led to the development of andragogy, rather than pedagogy, as a way of describing the differences that may be present for these learners (Knowles, Holton, & Swanson, 2015).

In addition to the consideration of adults' motivations, there is a vast body of work on the psychological aspects of studying mathematics, especially if one is unsuccessful in the attempt. For instance, there are exploration of individual's self-efficacy, by which is meant confidence in their ability to perform specified tasks, both in FE (Swan, 2006) and in Secondary schools for 11 to 18 year olds (Foster, 2016), on anxiety and the impact it could have on the ability to function in tasks (Ashcraft & Moore, 2009), and how general disaffection with mathematics can lead to disengaging, which FE environments can help to mitigate (Dalby, 2021; Evans, 2000).

In terms of learners' characteristics, research suggests that generally older learners are more anxious than younger ones (Betz, 1978; Watts, 2011), females are more anxious than males (Hunt et al, 2011; Szucs et al, 2017), and that there can be a deficit view of LX learners compared to their English speaking peers due to a language barrier (Woolley, 2013). I have labelled non-first language English speakers as LX in this publication to protect their identity (Dewaele, 2018).

## **Methodology, methods and sample**

The research was a Mixed Methods Research (MMR) study, as it used a questionnaire to gather data on two attitude scales, one for self-efficacy and one for anxiety, and allocated numbers from 1 to 5 to each response on the scales. These techniques represent the quantitative part of the study. In addition, for the qualitative part, comments were collected on each statement, both on the self-efficacy and anxiety scales, at the end of the questionnaire in an open section, and through one online interview (Creswell, 2015; Creswell & Plano Clark, 2018).

The questionnaire consisted of 15 statements, nine of which were drawn from the Abbreviated Math Anxiety Scale from the USA, slightly amended and anglicised (Hopko et al, 2003), e.g., the statement 'taking an examination in a math course' has been adapted to 'taking the maths GCSE exams at the end of the course'. Six statements were added, based on the feedback from the pilot study, the literature review (Evans, 2000; Hunt, Clark-Carter, & Sheffield, 2011; Swan, 2006) and my teaching experience. These were 'drawing charts and graphs', 'working out 12% of £42', 'working out  $\frac{2}{3}$  of £42', 'working on word problems, such as if it takes 3 people 5 days to fit a kitchen, how long will it take 2 people?', 'taking any GCSE or other exam', and 'asking a question in class about something that you have not understood'. Three of these are original to this research: drawing charts and graphs,

rather than interpreting them, working on word problems, identified as challenging in FE classes, and taking any other exam, included to evaluate whether it was mathematics or all examinations that were identified as challenging.

The self-efficacy scale ranged from 'very confident' to 'I definitely can't do this' (Swan, 2006), and the anxiety scale from Hopko et al (2003), 'low anxiety' to 'high anxiety' but with one change as 'low anxiety' was changed to 'no anxiety'.

Data were analysed using thematic analysis, after the work of Braun and Clarke (2006; 2013), by three main themes, namely course content, classroom dynamics and assessment. Sub themes were based on individual statements from the questionnaire, and emergent themes came from the comments made by participants.

The participants (n=21) were drawn from at least two colleges, and from two academic years, namely 2020/21 and 2021/22. In the first year of data collection participants (n=5) were all taught by teachers other than myself; in the second year (n=16) some participants were my own students, in addition to some taught by other teachers in my own and other colleges. It is impossible to be more specific as many participants used their personal email addresses, rather than college ones.

The characteristics of the participants were:

- Age: four participants were 19 to 24 years old; 17 were 25 years old or more
- Gender: three males participated; 18 out of the 21 participants were female
- First language: four participants identified as LX; 17 were L1 speakers

## **Findings and discussion**

### ***Learners' perceptions***

The perceptions of the adults joining GCSE mathematics classes varied very widely in some respects, but cohered in others, for instance in the theme of course content sub-themes of drawing charts and graphs, algebra and word problems were explored. Some participants liked drawing graphs and charts, but others did not, but all participants showed more anxiety and less self-efficacy for the word problem than any of the other topics, greater even than the responses to algebra. Ten indicated moderate to high anxiety, and thirteen from 'don't know' to 'I definitely can't do this' in self-efficacy. This may indicate an issue with word problems, in terms of interpretation, decisions on which calculations are most appropriate and what the final answer might look like.

In the theme of classroom dynamics, one sub-theme was a statement on asking a question in class. Four participants out of the 21 were unable to ask a question in class, even the most able participant as judged by the examination results, and all four expressed 'quite a bit' to 'high anxiety'.

Responses to the assessment section of the questionnaire showed lower self-efficacy and higher anxiety overall than any other main theme, with the sub-themes of tests ranked as equally challenging as the sub-theme of examinations. This may be due to the high stakes' nature of the GCSE examination and the perceived importance for onward journeys into HE.

### ***Findings by participant's characteristics***

Pass rates for the participants in GCSE mathematics examination overall were that 13 out of the 21 passed with a grade 4 or better, and the remaining 6 failed with a grade 3 or lower. Two participants withdrew before the examinations. By gender, two out of three males passed, and ten out of 18 females. Two females withdrew from the course

before the examinations. Males were just as anxious as females and all three made comments, but all four of those who could not ask a question in class, a sub-theme of classroom dynamics, were female.

Three out of the four LX learners passed, the other withdrew, and 10 out of 17 L1 learners passed, also with one withdrawal, thus the pass rates for the LX participants were higher. Additionally, the participant with the highest self-efficacy and the lowest anxiety was an LX learner. By age, only one of the four 19- to 24-year-olds passed, but 11 out of 17, 25 years or older passed, thus the younger participants had lower pass rates. They were also more anxious than their older peers and had lower self-efficacy. None of the younger participants made comments.

Whilst it is impossible to generalise from this small sample, it is interesting that these outcomes do not conform to previous UK research findings, which if substantiated by a larger study may highlight further differences between those in compulsory vs non-compulsory education (Hunt et al, 2011; Szucs et al, 2017; Woolley, 2013). The results on gender did agree with the findings from USA research based on community college learners, a similar provision to this (Clarke, 2021; Watts, 2011). In addition, if supported by a larger study, they may add to the argument for an andragogical approach for these learners (Knowles et al, 2015).

### ***Findings for self-efficacy and anxiety***

For this group of learners, self-efficacy and anxiety were compared using the median values for the whole group (n=21), and self-efficacy was a marginally better marker for pass rates than anxiety, but results were mixed, as might be expected in a small sample. For instance, all of those with a grade 5+, so top pass grades had high self-efficacy (n=5), and four of the five had low anxiety, but some with high self-efficacy and low anxiety did not pass (n=2). In addition, some of the participants with low self-efficacy, as judged by the median value did not pass (n=4), and whilst three of those four had high anxiety, one did not.

However, both of the participants who withdrew from the course had low self-efficacy and high anxiety, which may imply a link between levels of self-efficacy and anxiety and retention on courses for adults, if supported by a larger study.

### ***Emergent themes: findings from comments***

Other findings that emerged from the comments made by participants, mainly within the assessment theme, showed that some participants retained a belief in innate ability in mathematics, demonstrated a fatalistic approach to examinations with a belief that they had little control over the results, and were aware of the negative impact of time pressure on their thinking in both tests and final examinations. Participants who passed and failed were equally represented in these comments.

In addition, a sense of community was mentioned by some participants as important, with comments such as “we are all in this together”.

### **Limitations and discussion**

Limitations include the small sample size of participants, and those participants all self-selected, which could indicate volunteer bias (Spiegelhalter, 2019). In addition, this research was conducted during the Covid 19 pandemic which may have influenced perceptions.

A few participants (n=2) made errors in their interpretation of the statement on times table grids, a sub-theme of ‘course content’, which is known because they made comments which showed that they had confused this with the grid method of multiplication. This indicates a need in future research to clarify statements in questionnaires with an example.

Finally, the research could have been improved by collecting participants’ reasons for studying GCSE mathematics, and also who was taking other examinations, as this could have informed the assessment discussion of perceptions.

## Conclusions

There were a number of important outcomes to this research which have contributed to our understanding of this diverse and under-researched group of adult learners. For instance, the concerns expressed by all about word problems in the ‘course content’ theme makes an original contribution to our understanding. Discussions around word problems occur in self-help publications (Betz, 1978), in teacher guidance for LX students (Barwell, 2009), and in publications for FE (Swan, 2006), but they are not seen in other research scales, such as those from Hunt et al, conducted with HE rather than FE students (Hunt et al, 2011; Hunt et al, 2019).

The variation of responses on topics such as drawing charts and graphs, also a sub theme in course content, indicated that spiky profiles were present for these participants. If substantiated by a larger study, teachers may find it useful to use the skills of some learners to improve the experience of others by using peer support in the classroom, if the high self-efficacy is justified. Peer support from those with high self-efficacy could also be useful, as these participants were most likely to pass.

From these findings, it would seem a short questionnaire given to learners, to establish which topics are likely to need the most work in class, such as word problems and algebra, and to establish who is likely to need additional support as the examinations approach, in terms of controlling their anxiety and maximising their chances of success. Psychologically it may help learners to know the outcomes of this research: that whilst high self-efficacy and low anxiety were markers for success in the examinations, some of those with low self-efficacy and high anxiety also passed.

## Acknowledgements

Thanks go to my doctoral supervisors, Dr Iain Garner and Dr Peter Rowlett, and my participants, who engaged so freely with this project.

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