

A survey of Mathematics Anxiety and Mathematical Resilience among existing apprentices

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“avoidance is the ultimate
consequence of mathematics
anxiety” (Buckley 2013)

leading to underachievement



Assertions

23% of the national population is underachieving in mathematics

a large proportion of that underachievement is down to mathematics anxiety

This underachievement is a contribution to the lack of apprenticeship recruits



The presence and extent of mathematics anxiety as a significant phenomenon amongst apprentices is demonstrated in this report.



(RQ1): to what extent are STEM and nonSTEM apprentices affected by mathematics anxiety?

(RQ2): to what extent does mathematics anxiety affect choice of apprenticeship?

(RQ3): to what extent are STEM and nonSTEM apprentices mathematically resilient?

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We used the shorter 10-item Mathematics Anxiety Scale (MAS; Betz, 1978), which was deemed most suitable to UK apprentices.



Math Anxiety

‘I have usually been at ease in mathematics courses’

‘Mathematics makes me feel uncomfortable and nervous’



We also used the Mathematical Resilience Scale (MRS) a 23-item scale, measuring value, struggle and growth mindset.



Value

‘Knowing maths contributes greatly to achieving my goals.’

‘Maths develops good thinking skills that are necessary to succeed in any career.’

‘Thinking mathematically can help me with things that matter to me.’

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Struggle

Everyone makes mistakes at times when doing math.'

'Struggle is a normal part of working on math.'

'Making mistakes is necessary to get good at math.'



Growth mindset

Maths can be learned by anyone'

'If someone is not a maths person, they won't be able to learn much maths'
negatively scored

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RQ1

Our results suggest that mathematics anxiety among apprentices is comparable with reported school and college populations

About 30% of apprentices are likely to be visibly anxious about mathematics



RQ1

...higher levels of mathematics anxiety amongst apprentices are associated with lower mathematics achievement



RQ1

...mathematics anxiety is more likely to occur amongst female apprentices than among male apprentices



RQ1

...significant presence of mathematics anxiety in both STEM and non-STEM groups.

We found it interesting that there were some very anxious individuals in the STEM group.



RQ1

...mathematics anxiety is more prevalent amongst nonSTEM apprentices than amongst STEM apprentices.

nonSTEM

37% visibly anxious

15% tendency to be anxious

STEM

17% visibly anxious

24% tendency to be anxious



RQ2

females with higher mathematics anxiety choose nonSTEM apprenticeships.

apprentices who have underachieved at mathematics in school are more likely to choose nonSTEM apprenticeships.



RQ2

for some, the mathematics they encounter is significantly different from school mathematics.

the contextual nature of apprenticeship mathematics is much appreciated.

higher levels of mathematics anxiety are associated with apprentices who experience harder mathematics than expected.

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RQ3

On average, STEM apprentices are marginally more mathematically resilient than nonSTEM

There is large variation in resilience scores amongst both STEM and nonSTEM apprentices.



RQ3

On average, male apprentices are more mathematically resilient than female apprentices.

There is large variation in resilience scores amongst both male and female apprentices.



RQ3

On average, apprentices with only Level 1 mathematics qualifications are less mathematically resilient than other apprentices.

There is large variation in resilience scores amongst apprentices at each level of HMQ.



Addressing mathematics anxiety in the pre- or early-apprentice population may increase the pool of potential STEM apprentices by:

making progression *possible*:

making progression more *probable*:



“Best educational practices for enhancing math competency in HMAs is not to generate costly math courses specifically for the HMAs (Gresham 2007) nor is the best method likely to be one that focuses solely on eliminating one’s initial anxiety response (for a review of these and other approaches, see especially Hembree 1990).”

Classroom practices that help students learn how to marshal cognitive control resources and effectively check one's math-related anxiety response once it occurs—but before it has a chance to reduce actual math performance—will likely be the most successful avenue for reducing anxiety-related math deficits.

(Lyons and Beilock 2013)



“Educational interventions emphasizing control of negative emotional responses to math stimuli (rather than merely additional math training) will be most effective in revealing a population of mathematically competent individuals, who might otherwise go undiscovered.”

(Lyons and Beilock, 2013)



Thank you



Strand A

- Promoting Mathematical Resilience in Learners

Kath Grant

- Parenting and Teaching for Mathematical Resilience; National Numeracy approach

Sarah-Jane Gay

Els de Geest

Strand B

- Coaching for Mathematical Resilience
Liz Garton
- Parenting for Mathematical Resilience
*Dr Janet Goodall/
Dr Rosemary Russell*

- ... But first coffee and tea

