



Maths Learning Centre



LIBRARIES AND LEARNING

Developing Maths Confidence

Maths Learning Centre (MLC)

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Do you avoid maths?

When people find out that I teach and learn maths a more common response is:

I enjoyed maths

I failed my maths so many times!

I hated maths!

I was good at maths

I skipped my maths classes

I wasn't very good at maths!

Possible causes

- Poor past experiences of maths
- Hierarchical, abstract and conceptual nature of learning maths
- Maths anxiety

Overview

- Maths anxiety
 - Understanding it
 - Identifying it
- Review results of Identification
- Using the Growth Zone
- Some strategies

Starter Activity

- What would you have said to me about maths?
- Write down your best or worst experience of maths teaching so far
- Discuss with your neighbour(s)
- Feedback

Past experiences

- Reluctant or uninspiring teaching
- Loss of interest and engagement
- Misunderstanding
- Loss of connection with surrounding

Past experiences

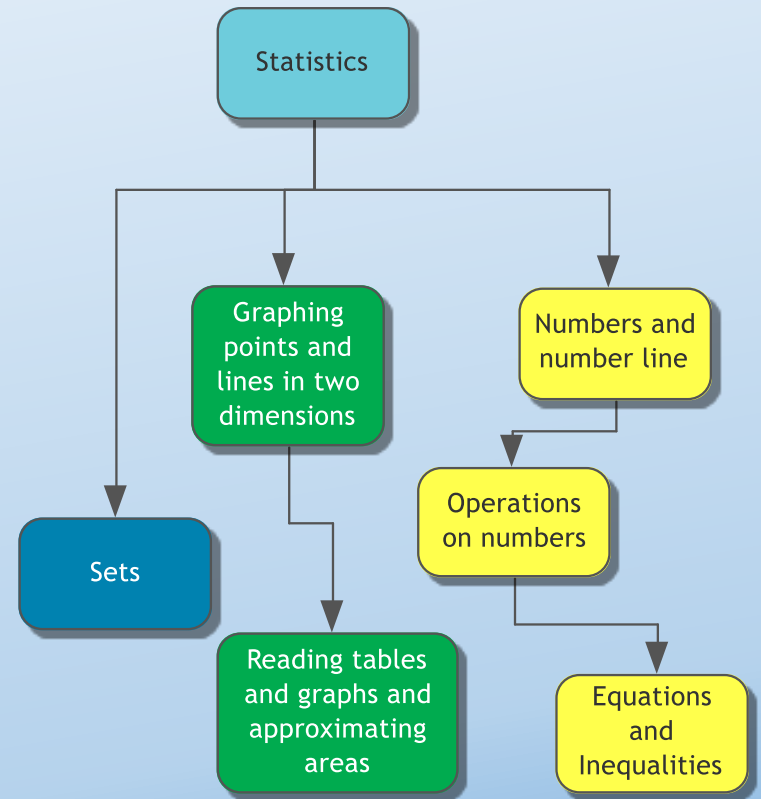
Leading to gaps in understanding and skills

Overcome by:

- Engage with lifelong learning
- Inspiring encouraging teachers

Hierarchical maths

- Fluency with fundamental skills is crucial
- Concepts around measure, proportions and representation
- Big impact of Gaps and /or misunderstanding due to breaks



Statistics Course Example

Hierarchical maths

Leading to missing blocks and gaps in understanding and skills

Overcome by:

- Lectures and seminars
- Personal tutorials
- Maths Learning Centre


Maths anxiety

“Mathematics anxiety (MA) is the irrational dread of mathematics that interferes with manipulating numbers and solving mathematics problems within a variety of everyday life and academic situations.”

- Manifests akin to a mild form of post-traumatic stress disorder (PTSD)

Maths anxiety

It is thought to affect a large proportion of the population.

- Jones (2001) found that 26% of 9000 American students had a moderate to high levels of maths anxiety
- Perry (2004) found that 85% of students in introductory maths classes claimed to experience at least mild maths anxiety
- *Maths Anxiety*  *Poor performance*

Resulting Symptoms

Emotional

- Feeling of helplessness
- Lack of confidence
- Nervous about being put on the spot
- Embarrassment
- Feeling of hollowness in stomach

Resulting Symptoms

Physical Symptoms

- Irregular heartbeat and breathing
- Sweatiness
- Shakiness
- Nausea

Resulting Symptoms

Mental Symptoms

- Frustration from trying and not being successful
- Not knowing where to start
- Never getting the right answer
- Very stressed before and during exams

Resulting Symptoms

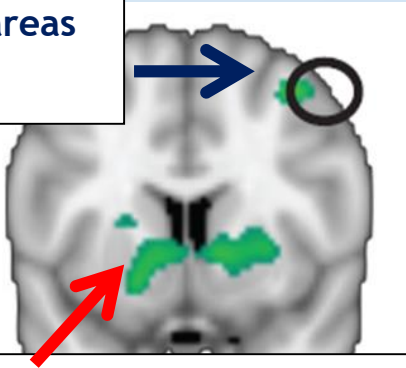
Behavioural Symptoms

- Biting nails and/or fidgeting
- Begin to shut down, and stop listening
- Just wanting to quit and go home
- Falling asleep

Identifiable

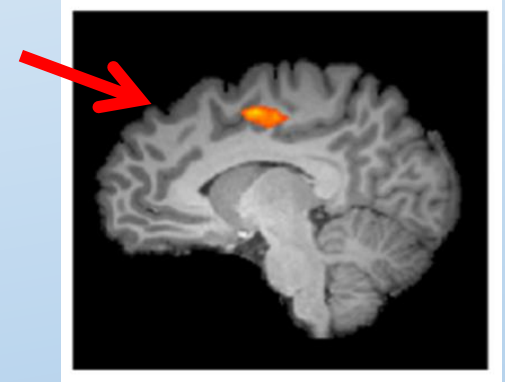
By MRI brain scanners have shown that maths anxiety has measurable effects on parts of the brain used to understand maths.

Working memory areas
needed for maths



Anxiety **reduces** brain power in them

Pain region activated when
thinking about maths



Measured by the Mathematics Anxiety Rating Scale (MARS) [1]

Hinders Working Memory

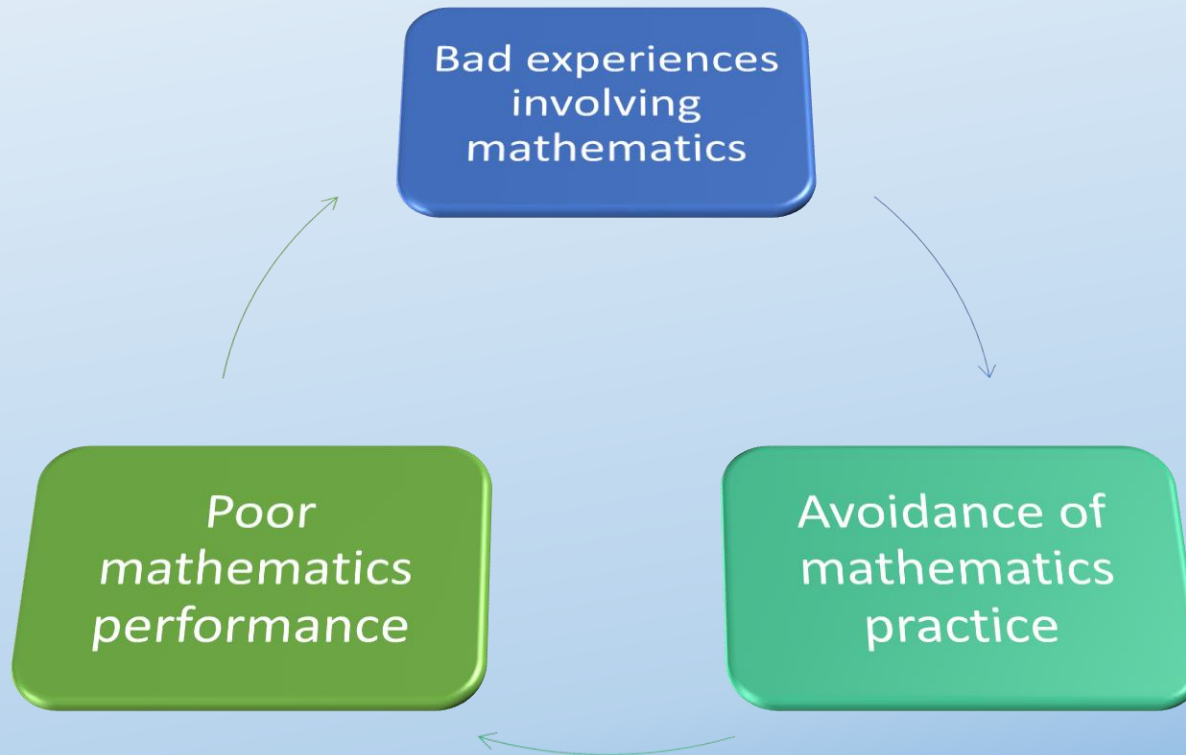
The pain region is activated in MA student when doing even thinking about maths

Working memory is reduced

Need working memory to problem solve and do maths

Maths Anxiety exists!

Negative Cycle of the Maths Problem



Timed - fast snappy decisions!



Consider the symptoms

Reflective Activity:

- Think about the last time you felt these kinds of symptoms and ask yourself how that related to the last time you did maths.
- No open discussion here do relax - but happy to talk to anyone individually if necessary.

Identifying MA

Maths Anxiety Ratings Scale (MARS)

The Mathematics Anxiety Rating Scale—Revised (MARS—R; Plake & Parker, 1982)

1=Not Anxious; 2=Little Anxious; 3=Neutral; 4=Anxious; 5=Highly Anxious						
#	Question	1	2	3	4	5
1	Getting ready to study for a maths test.					
2	Reading the work "Statistics".					
3	Being told how to interpret probability statements.					
4	Reading and interpreting graphs or charts.					
5	Taking an examination (final) in a maths course.					
6	Picking up a maths textbook to begin working on a homework assignment.					
7	Starting a new chapter in a maths book.					
8	Waiting to get a maths test returned in which you expected to do well.					
9	Reading a formula in chemistry.					
10	Being given a homework assignment of many difficult problems which is due the next class meeting.					
11	Being given a "pop" quiz in a maths class.					

Identifying MA

Maths Anxiety Ratings Scale (MARS)

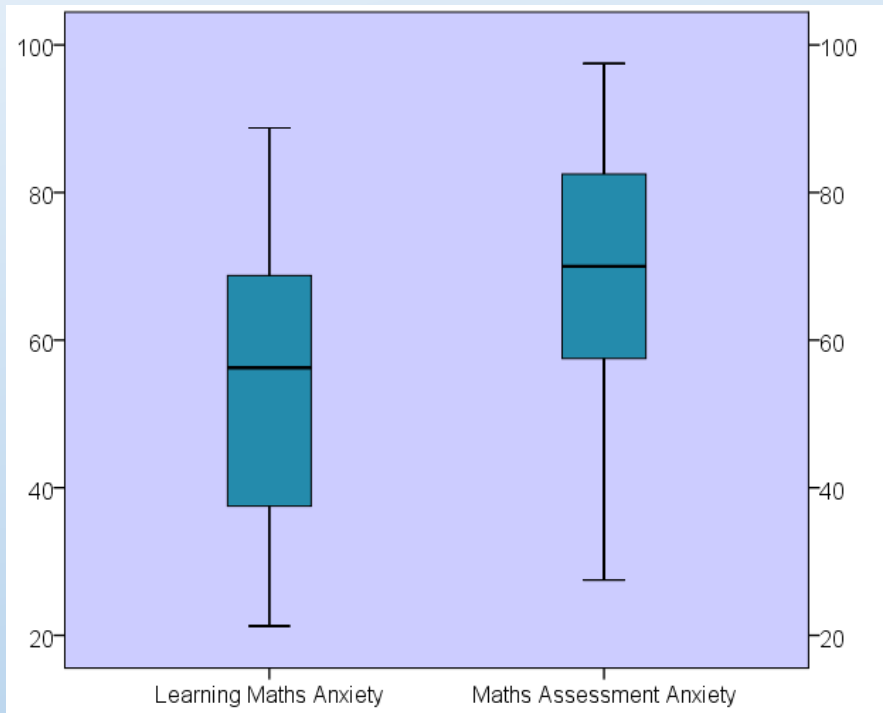
Area	Questions	Total Score
Maths Learning Anxiety	2, 3, 4, 6, 7, 9, 12, 14, 16, 17, 18, 20, 21, 22, 23, 24	40/80
Maths Assessment Anxiety	1, 5, 8, 10, 11, 13, 15, 19,	20/40

Over 50% on either scales indicate Maths Anxiety

Remember context/need for maths ability.

Identifying MA

Maths Anxiety Ratings Scale (MARS)

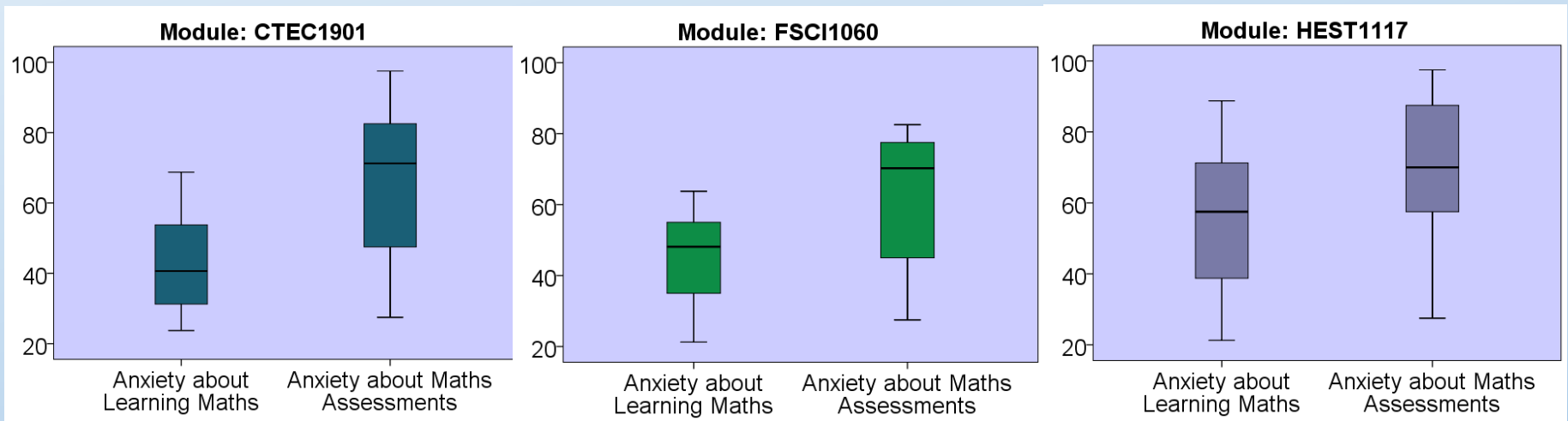


Area	Maths Learning Anxiety	Maths Assessment Anxiety
Median	56.35%	70.00%
IQR	31.56%	26.88%

Over 50% on either scales indicate Maths Anxiety

Identifying MA

Maths Anxiety Ratings Scale (MARS)



Entry: GCSE Maths C

Entry: GCSE Maths C

Entry: No Maths

Using Identification of MA

The following regression models gives an indication of the relationship between assessment anxiety and engagement with learning; (Intercept/constants is not sig., the coefficients are sig.).

CTEC1901: $13.500 + 0.447 (\text{Asst Anxiety}) = \text{Learning Anxiety}$

FSCI1060: $4.011 + 0.640 (\text{Asst Anxiety}) = \text{Learning Anxiety}$

HEST1117: $-3.830 + 0.851 (\text{Asst Anxiety}) = \text{Learning Anxiety}$

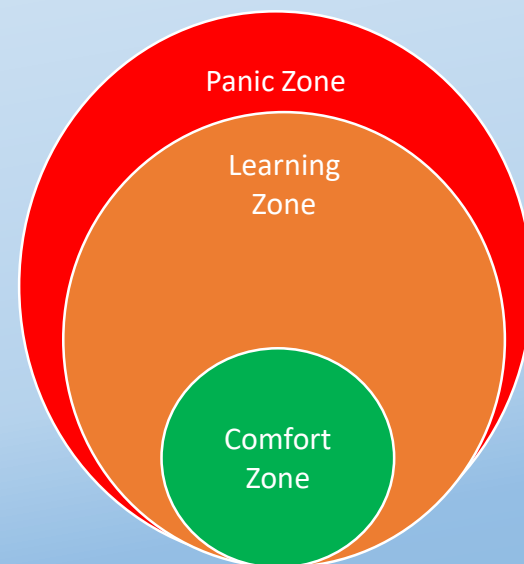
Can this information be deployed to increase engagement

The Growth Zone Model

Growth zones: Comfort, Learning and Panic

Ref: S. Johnson-Wilder

- the green Comfort Zone represents a place where you are confident about your skills and ability
- the amber Learning Zone is a place where you can learn and develop with some help and
- the red Panic Zone is where you are not confident or comfortable and causes you distress



Taming MA

Some Strategies

- Don't avoid doing the maths!
- Maths anxiety awareness
- Self-belief
- Practice, practice, practice!
- Understand rather than memorise
- One-to-one support
- Peer learning

Taming MA

Some Strategies

- Use online materials that suit you
- Test yourself!
- De-stress - look out for Mindfulness classes
- Do the easy questions first in exams
- Write down your fears - narrow down what the concern is

Taming MA

Develop Practical Strategies e.g.

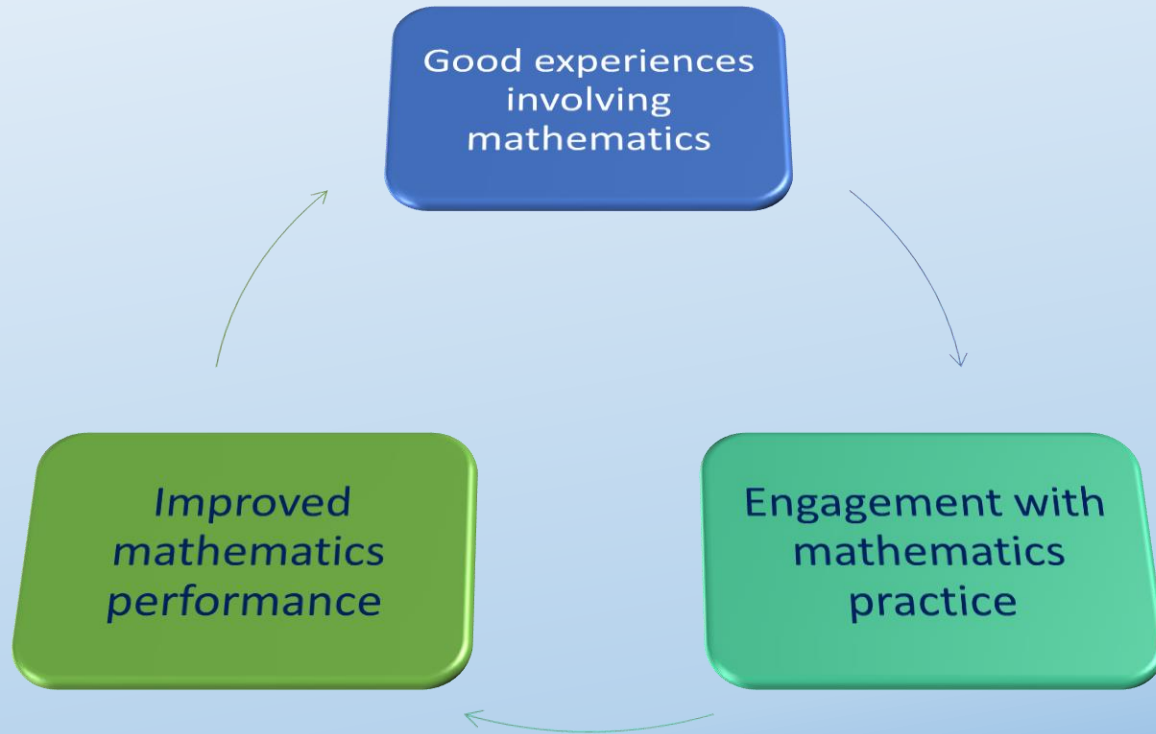
- Not knowing where to start
 - Read the question and highlight what is asked for: e.g. units, solve for x
 - Highlight what method/operation to be made use of: e.g. addition, division

Considering your strategies

Discussion Activity:

- Consider an approach or strategy you have used in an anxious or stressful situation.
- Discuss as much as possible with your neighbor the situation and your approach.

Turning it around - Positive Cycle



Review

- *The Maths solution*
- Past experiences of maths
 - Giving students a positive experience to help re-engage
- Nature of learning maths
 - Developing problem solving skills - for life-long learning
- Maths anxiety
 - As per talk

References

1. Marshall, E.M., Wilson, D.A., and Mann, V.E. (2018). Evaluating the effectiveness of maths anxiety awareness workshops. *Journal of Learning Development in Higher Education*.
2. Vygotsky L.S. 1981. The genesis of higher mental functions. In *The Concept of Activity in Soviet Psychology*, (ed.) J.V. Wertsch, Armonk, NY, Sharpe.
3. <http://www.mathematicalresilience.org/>
4. <https://nrich.maths.org/resilience>