

## Student strategies for overcoming maths anxiety

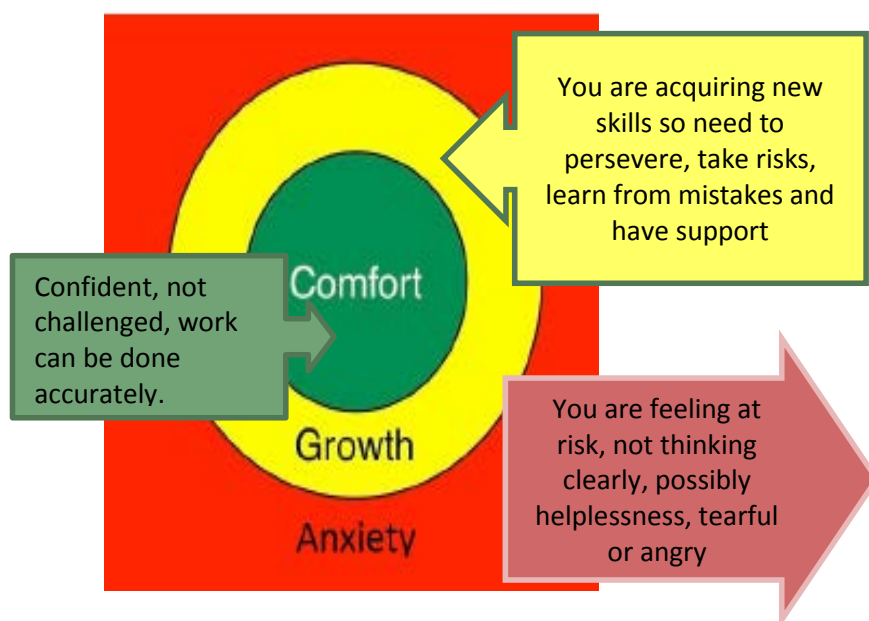
Linked sheet: **What is maths anxiety?**

Most people with maths anxiety have had negative, stressful or excluding maths experiences such as embarrassment or humiliation from failure, teachers who are insensitive or may appear uncaring, negative attitudes about maths from peers or family, and traditional rote learning rather than understanding the processes. Mathematical situations therefore trigger negative thoughts and memories, a feeling of mathematical helplessness or the 'fight or flight' response in the brain. Therefore maths avoidance is common with many students opting out of any subject they think may contain maths as soon as possible and this includes statistics courses. However, it is becoming increasingly difficult to avoid statistics in particular with most disciplines expecting students to use or understand quantitative analysis. Maths anxiety is an acquired anxiety which can have a big impact on learning but it is treatable. A number of strategies can be used to address maths anxiety and enable students to move from a position of mathematical helplessness to mathematically resilient learners. Mathematical resilience is a term used to describe a positive stance towards mathematics where students overcome their barriers to learning, are motivated to persevere with maths and acknowledge that mistakes are part of the learning process (Johnston-Wilder et al, 2014).

The Growth Zone model (Johnston-Wilder et al, 2014) is a useful framework for understanding different learning experiences and the feelings associated with each. Everyone encounters some maths and statistics in daily life which they are

comfortable with; for you this might include working out which is the best offer in the supermarket or thinking about which team might win a forthcoming fixture based on past performance; you may be comfortable with understanding percentages and charts used in newspapers. '**Comfort zone**' activities are activities where you feel confident about your abilities and do not require help.

However, at University, you are likely to need to move beyond this comfort zone into the '**Growth zone**' where new learning happens, you may make mistakes and you will need resources and/or help from others. If you are challenged beyond your current level of resilience you may find yourself in the '**Anxiety zone**', where a feeling of helplessness and fear take over, your thinking becomes impaired, you feel 'stupid' and effective learning cannot happen. In order to progress with maths or statistics, you need to move out of that anxiety zone. Ideally you will develop more mathematical resilience and gradually spend more time in your growth zone. Mathematical resilience is the development of confidence, persistence and perseverance (Williams, 2014) to enable learners to stay in the growth zone as long as possible so that more effective learning can take place.



There are four factors for developing mathematical resilience (adapted from Johnston-Wilder, 2015):

1. Belief that everyone can progress with mathematical learning (brain capacity can be grown)
2. Understanding of the personal relevance of mathematics/statistics
3. Understanding of how study mathematics effectively
4. Seeking and accepting help when needed

### **Stage 1: Understand your anxiety and attitudes**

**Reflect:** Think about your previous experiences with maths. How did negative experiences shape the way you feel about maths and your ability? By the time students get to undergraduate level, 93% of students are thought to have had at least one negative or stressful experience with maths (Jackson and Leffingwell, 1999) and 85% are thought to have some form of maths anxiety (Perry, 2004) so talk to your peers about their experiences and feelings.

**Challenge unhelpful beliefs:** There are many misconceptions and a negative peer culture about maths. It is very common for people to state that they are bad at maths and that they do not have a 'mathematical brain'. Almost everyone is born with the ability to do some maths and everyone is capable of increasing their mathematical knowledge. Unhelpful beliefs result in people lacking motivation and persistence with maths or statistics and often feeling that there is no point in trying.

**Improve self-efficacy:** Self-efficacy is the belief that you are capable of successfully performing a task and several studies have shown that high scores of self-efficacy are related to good exam performance. If you believe that you can do it, you are more likely to put the effort in, will be more motivated to do maths and persevere with questions which results in better maths scores. If you find yourself having negative thoughts such as, "I can't do it", "I'm terrible at maths", "I'll never pass", etc, recognise that the worries are taking up valuable brain power and stopping you from even reading the question; try to replace them with positive thoughts such as "I can do it if I am properly supported", and "If I practice, I can pass".

**De-stressing:** You will need to recognise when you are in the 'Anxiety zone' and develop methods which help you to return to the growth zone. Distraction techniques such as writing down how you feel and leaving the room to do another activity briefly can help. One student has a particular music video she likes to watch to calm her down and in situations where she can't watch the video e.g. exams, she replays the tune in her head. Breathing techniques where you breathe out for 7 seconds and in for 5 or any techniques suggested for reducing state anxiety generally can help. It can also be helpful to remind yourself of what you can do and return to a question you can do (comfort zone) before attempting something slightly harder again.

**Relevance:** At school, maths is often taught in an abstract way and students often do not realise the value of maths or how it can be applied in day to day life. Most employers want 'Numerate' graduates and almost all disciplines expect quantitative research so avoiding maths or statistics will exclude you from career options. Websites such as <http://www.bbc.co.uk/skillswise/maths> use practical applications of maths and examples of how mathematical techniques are used in day to day life. Many students find they understand statistics better when applying techniques to their own data.

## Stage 2: Learning strategies (for when you are in your growth or comfort zone)

**Practice:** The key strategy is not to put off learning the maths or statistics content, revision for an exam or starting your coursework as no-one becomes good at maths overnight. Maths requires practice in the comfort zone just like a language; if you were studying Russian, you wouldn't start two days before the exam but maths anxious students who are avoiding studying often do this and then blame stupidity rather than lack of work for poor performance. You need to master the building blocks at the beginning of your course before you can progress to the harder stuff.

**Understand rather than memorise:** You are less likely to remember how to do something if you don't understand the process. If you have been shown a calculation in class, go over it again at home and re-write it in steps you understand. This will make it easier to progress to different questions and you will have good notes for revision. It is also important to remember that there may be more than one method for coming to the right answer. Use the method that suits you best.

**One-to-one support:** Receiving one-to-one support has been shown to have the greatest impact on reducing maths anxiety. There are maths and statistics help centres (MSC's) in almost all Universities e.g. [MASH](#)<sup>1</sup> at Sheffield University, which offer free individual and group support with any aspect of your maths or statistics courses or projects. In this environment, you are able to ask questions without fear of humiliation and have explanations tailored to your learning style. It also enables feedback on your understanding which is crucial for building your confidence. To get the greatest benefit, start going at the beginning of your course and attend regularly throughout to build up your knowledge slowly.

**Peer learning:** A common misconception for anxious students is that everyone else in the class can easily do the work but this is rarely the case. Given 26% of students are thought to have moderate to high levels of maths anxiety, and that maths or statistics are often the most challenging, as well as well as the most fear-inducing, modules students have to study, it's likely that you are not alone. It is also common for University classes to move at a very fast rate particularly for statistics, and many lecturers are unaware that students are being overloaded or unaware of the effects of maths anxiety. Research suggests that collaborative learning, in which groups work together to construct methods for approaching problems and get feedback on their ideas from their peers, increases confidence and reduces anxiety. Setting aside a time each week to work with a couple of friends can help ensure you keep on top of the work. You could meet anywhere but if you are working in the maths support area, there will be a tutor available to answer any questions.

**Using online materials:** Online learning can be beneficial to anxious students as the fear of looking stupid in front of their peers is removed. Students have also found that reading lecture material in advance helps reduce anxiety in the class and some do this at the maths support centre so they feel fully prepared. If you are not sure about something you learnt in class, use online materials such as videos or worksheets which may explain things in a different way. The national maths and statistics support centre websites [mathcentre](#) and [statstutor](#) contain a variety of trustworthy resources as well as your own maths support centre webpages.

**Test yourself!** Doing unassessed tests/getting feedback will build your confidence slowly, so look for online quizzes or check your understanding with your peers or asking a maths support tutor. If you have not tested yourself until the main exam you will be very anxious. Low levels of anxiety are normal prior to tests but high anxiety levels have been shown to be the strongest predictor of poor performance in exams.

## Tips for exams:

1. **Have clear notes:** It is important to make good organised summary notes for yourself during the term so that you have clear guidance written by you on how to approach different questions.
2. **Past exam papers:** Past papers are a really good way of seeing the kind of questions that may be on the exam. The first time you do one, do as much as you can and then go back to your notes to revise anything you are not sure of. Then write up all the questions clearly and correctly as a guide for yourself. Closer to the time of the exam, try the paper again allowing yourself the same amount of time as in the exams and without using notes as a practice run.
3. **Use 1:1 support:** Work in the maths support area when revising so you get immediate feedback on your methods and can ask for help whenever you get stuck. This is more efficient than struggling for hours on your own.
4. **Write down your fears:** If you are very anxious prior to an maths exam, try writing down how you are feeling or just writing anything for 10 mins as you are waiting to go in. You need to deactivate the anxiety section of your brain so that your working memory can function fully. Anything that distracts you from this rumination will help.
5. **Method marks:** You get marks for correct workings in maths exams even if you get the wrong answer so it is really important to show the process used during your calculation as this is where most of the marks go. It doesn't matter which method you use as long as it's clear what you have done.
6. **Do the easy questions first in exams:** As long as you clearly label the questions, it doesn't matter what order you do the questions in so do the easy questions first and then go back to questions you are not sure of. This will build your confidence and reduce anxiety which will make you more receptive to more challenging questions. It doesn't matter if you can't do every question – the main thing is that you pass and anything above that is a bonus!
7. **Anxiety:** Recognise when your anxiety is having an impact on your work and use any techniques you have found to helpful in the past.

<sup>1</sup> For Sheffield University students, MASH is situated in the *301 Student Skills and Development Centre* and the key MASH contact for this project is Ellen Marshall ([ellen.marshall@sheffield.ac.uk](mailto:ellen.marshall@sheffield.ac.uk)) who is happy to discuss the strategies for overcoming maths anxiety. Students of any university can also access learning material via the MASH website <http://www.sheffield.ac.uk/mash>. For students of other universities, locate the Maths Support Centre at your university for individual support.

## References

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- Johnston-Wilder, S., Lee, C., Garton, E., Brindley, J. (2014). Developing teaching for mathematical resilience in further education. *7th International Conference of Education, Research and Innovation, ICERI2014, Seville (SPAIN), 17th - 19th of November, 2014*.
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- Williams, G. (2014). *Optimistic problem-solving activity: enacting confidence, persistence and perseverance*. *ZDM*. 46(3) pp. 407-422.

**Websites** <http://www.sheffield.ac.uk/mash/anxiety> <http://mathematicalresilience.org/>

Marshall, E., Mann, V., Wilson, D., & Staddon, R. (2017). Learning and teaching toolkit: Maths anxiety