

Teaching strategies for helping students overcome maths anxiety

Linked sheets: **What is maths anxiety?**, **Student strategies for overcoming maths anxiety** and the case study associated with this resource '**Maths anxiety case study: Department for Lifelong Learning**'

There are various strategies for helping to reduce anxiety around maths and statistics. Iossi (2007), Finlayson (2014) and Onwuegbuzie (2010) provide good background reading. Some of the key strategies which could be implemented are summarised below.

Maths anxiety awareness: Becoming self-aware of one's maths anxiety and the effect that it can have on the brain can assist in its reduction (Uusimaki & Kidman, 2004). Students are not usually aware that maths anxiety is a recognised condition, and making them aware through an introduction in their first lesson or by using the material associated with this sheet, along with strategies for overcoming maths anxiety will help. If students are aware of their negative beliefs and recognise when their anxiety is affecting their performance, they can start to develop methods for addressing the anxiety and approaches to studying maths effectively.

Relevance: Students often don't understand why they are studying maths or statistics. Using real-life applied examples rather than pure maths can help. For statistics, project-based learning demonstrating the full process from study design to the reporting of results will help students relate the teaching to projects involving statistics.

Dispel maths myths: Negative attitudes about maths have an impact on student achievement. For example, many believe that only certain people can do maths and these people do not need to work hard to achieve. Students need to believe that they can all do some maths and with effort everyone is capable of improving their maths knowledge.

Self-belief: Self-efficacy is the belief that one is capable of successfully performing a task and several studies have shown that high scores of self-efficacy are related to good exam performance. It is the impact of self-efficacy on motivation, perseverance and willingness to ask for help when needed which leads to higher exam grades though. Encouragement and positive feedback from peers, lecturers and 1:1 tutors increases self-belief.

Reduce the content: What do you really want your students to understand by the end of the course and what do students already know? The pace of many courses is often too fast for students and doesn't allow enough time on the basics before progressing to harder techniques. Statistics in particular is often seen as an add on and lecturers are under pressure to cover many techniques in a short space of time. If students are given time to really understand the basics, they can then apply this knowledge to a wider range of topics more easily. For statistics, spending more time on producing and interpreting graphs, which is something most people already have some skills in, before slowly moving onto harder techniques (scaffolding) should help increase confidence.

Online learning: Online or distance learning is thought to be beneficial as students don't have the fear of being called on in class to answer questions or worry about looking stupid in front of peers (Taylor and Mohr, 2001). Anxious students often say that reading lecture notes before the class is helpful so releasing notes a week before the lecture is a simple strategy. Some lecturers are using a flipped classroom approach, in which students study the material online, followed by teaching time concentrating on group activities to cement learning.

Activity-based learning: Students benefit from time for discussion and practice rather than memorisation and rote recitation. Research suggests that collaborative learning where groups work together to construct methods for approaching problems and get feedback on their ideas from their peers, increases understanding. Peer learning within and outside the classroom can increase confidence and reduce anxiety if it is a safe, supportive environment where students all feel as if they are contributing.

One-to-one support: University classes often cover a lot of material in a short space of time and therefore do not provide time for the asking of questions (Finlayson, 2014). Most universities now have Maths Support Centres (MSCs) which provide students with relaxing, non-threatening maths experiences in a supportive environment, and Marshall, E., Mann, V., Wilson, D., & Staddon, R. (2017). Learning and teaching toolkit: Maths anxiety

teach at a slower pace, allowing enough time for inquiry and individual development (Woodard, 2004). This is the most effective method for overcoming maths anxiety but an estimated 33% of 'at-risk' students do not use MSC support (O'Sullivan et al., 2014). Encourage the use of such a service at regular intervals during the course.

Low-stakes testing: Having only one opportunity to test knowledge at the end of a course (high stakes testing) will have a very negative impact on students with maths anxiety. Untimed, unassessed (low stakes) tests actually reduce maths and test anxiety as well as increasing confidence and online testing allows people to check their progress without the fear of other people finding out their score. Test-retest theory (Juhler, Rech, From, and Brogan, 1998) is when students can take a similar test again which helps students deal with past feelings of failure and provides a safety net. Online tests where the questions stay the same but the numbers change are ideal.

Feedback: Feedback helps to reduce the negative impact of maths anxiety on academic achievement, which is limited in most courses (Núñez-Peña et al., 2015) but feedback in the form of examples can be added to online tests as well as links to online material which gives students alternative explanations to the lecture notes. Immediate feedback reduces the time it takes for students to achieve a desired level of understanding (Anderson, Conrad, and Corbett, 1989) and students can get this crucial feedback on their understanding by attending 1:1 support or working with peers.

Teacher behaviour: Students respond well to enthusiastic teachers who are confident with maths, and that utilise humour or teaching gimmicks, such as using students as the source of data (Schacht & Stewart, 1990). These also help alleviate anxiety.

Writing about anxiety: Writing for 10-15 minutes before a test means that the brain concentrates on writing rather than worrying (Ramirez & Beilock 2011). Encourage anxious students to write about their anxiety just before going into the exam.

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