

Teaching strategies for helping students overcome maths anxiety

Linked sheets: **What is maths anxiety?** and **Student strategies for overcoming maths anxiety**

There are various strategies for helping reduce anxiety around maths and statistics and 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.

Activity based learning: Students benefit from time for discussion and practice rather than memorisation and rote recitation. Some lecturers are using a flipped classroom approach, in which students study the material online and then teaching time concentrates on group activities to cement 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).

Peer learning: 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 confidence and reduces anxiety. Encourage group work in and out of the classroom.

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 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). Encouraging the use of such a service at regular intervals during the course should encourage attendance.

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.

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 their dissertations.

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.

Desensitisation: This involves progressing very slowly through increasingly difficult problems whilst using breathing techniques associated with lowering anxiety (Sheffield & Hunt, 2006), and encouraging students to practice these techniques at home. For statistics, spending more time on producing and interpreting graphs, which is something most people can already do before moving slowly onto harder techniques should help increase confidence.

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.

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. Students need to accept that effort is needed to pass, get help from peers, or 1:1 support if needed, and believe that they can pass (Perry, 2004). Encouragement and feedback from lecturers and 1:1 tutors increases their self-belief.

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