Maths anxiety teaching strategies case study: Maths and Statistics in the Department for Lifelong Learning

Linked sheets: '**What is maths anxiety?**', '**Student strategies for overcoming maths anxiety'**, and '**Teaching strategies for helping students overcome maths anxiety'**

The Department for Lifelong Learning (DLL) at the University of Sheffield provides Foundation courses, primarily for mature students wishing to study at the University of Sheffield. All students have to undertake a compulsory maths and statistics module and maths anxiety was identified as an issue affecting attainment and progression. The module leader worked closely with the Maths and Statistics Help centre (MASH) to develop a Maths and Statistics module designed to reduce maths anxiety in students using the strategies proposed. A flipped learning model was chosen as many elements of flipped learning have been shown to reduce maths anxiety. This also gives students higher flexibility, and provides additional support for students. This is just one example of how lecturers could alter the learning environment to reduce maths anxiety, increase confidence and engage students with maths.

Structure:
Flipped learning materials – students do before the lesson
Interactive 'lecture' – 1 hour
Tutorial – 1 hour
Additional materials: Online tests and alternative sources of information

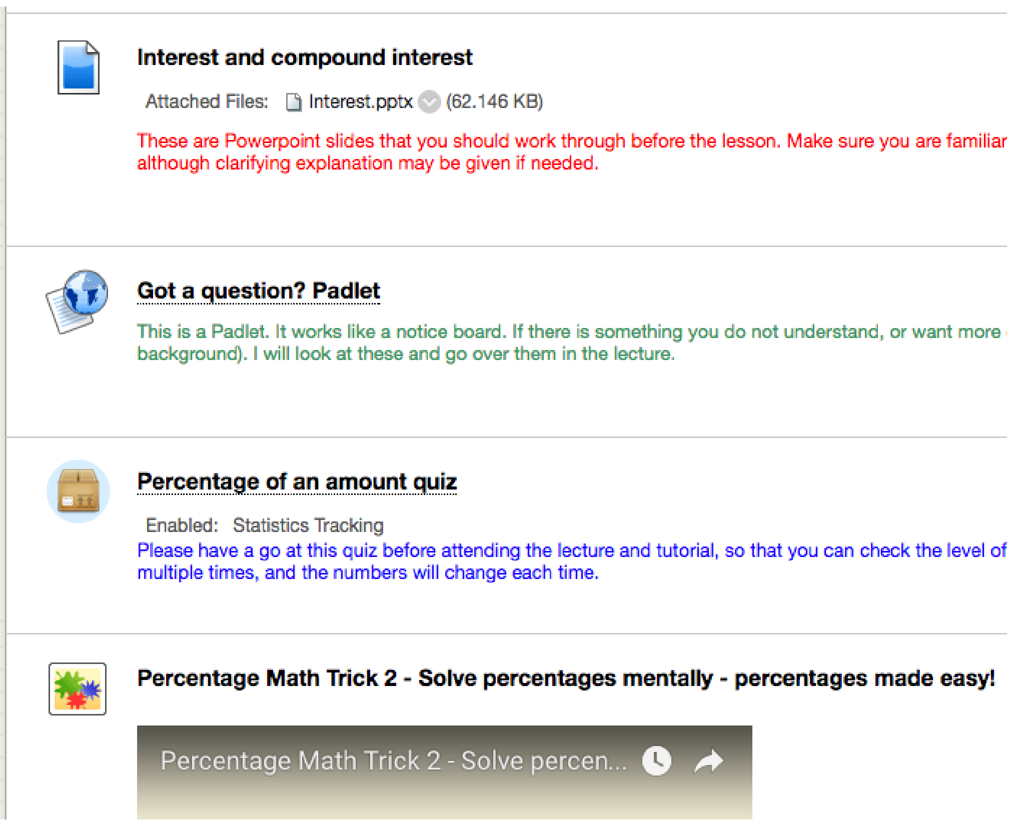
Flipped learning materials:
These materials have been designed or curated by the module convenor, and are presented on MOLE. They are given to students two weeks before each lesson so that students have plenty of time to familiarise themselves with the material. Instructions are given each week telling students that they should only use what they personally find useful.

PowerPoints and other lesson materials designed by the tutor to explain concepts and walk through examples

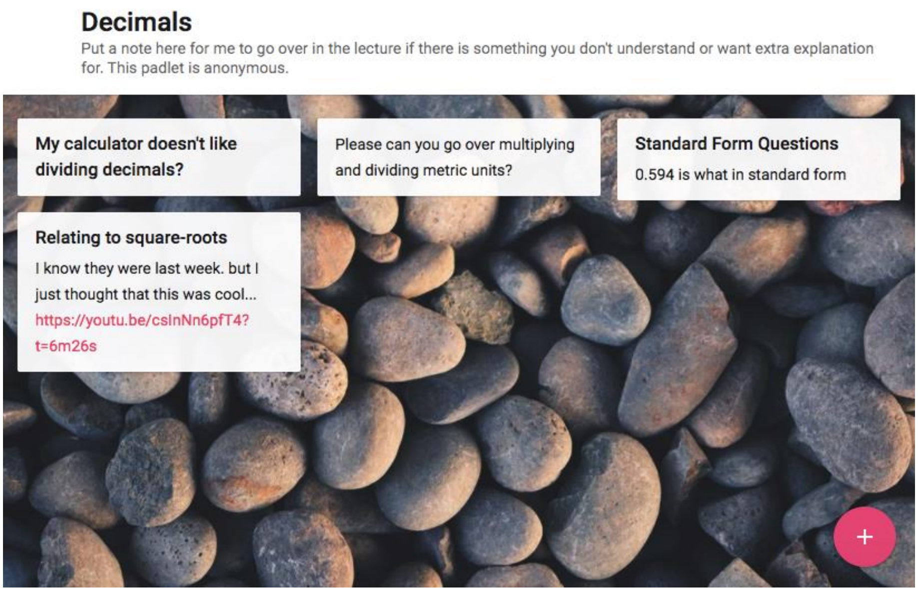
Padlet used for anonymous question posting to be covered in the interactive lecture (tutor can de-anonymise if desired)

Untimed, formative online quizzes for students to check their own understanding using **Numbas** (can track statistics)

Alternative materials for a different explanation and further examples – YouTube videos, BBC Bitesize, Khan Academy, etc.

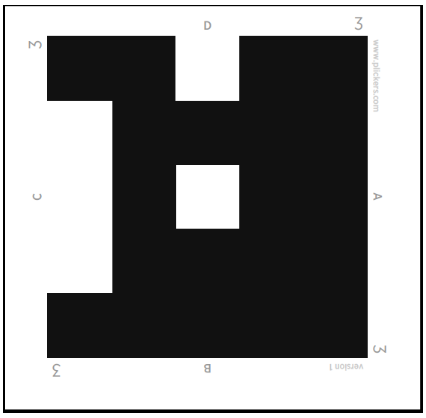


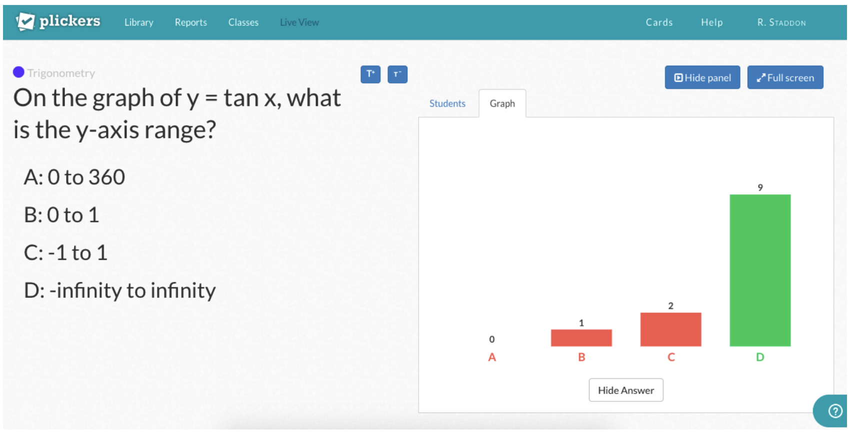
Interactive lecture:
Tutor responds to questions and issues about the content raised on the Padlet, and asks if students have any additional questions. The Padlet (an electronic notice board) is anonymous so that students can ask anything, including 'stupid' questions that they might be embarassed asking in person.



This is followed by a formative, multiple-choice quiz using Plickers. This is a quiz system where students use QR codes on card (provided by the lecturer) to answer questions. Each QR code is different, so students can answer without their peers seeing which option they have chosen. A real-time graph of how many students have chosen which option is collected using a scanning facility on the tutor's smartphone or other device, with the ability to reveal which answer is correct. Students do not need their own technology for this, so it is perfect as a low-tech option. Feedback on this aspect has been excellent, with students enjoying the gamification.

Using Plickers gives immediate feedback to students on whether they are correct, and the tutor then goes over model answers on the board. This also gives tutors immediate checks on the understanding of the whole class, and they can react accordingly.



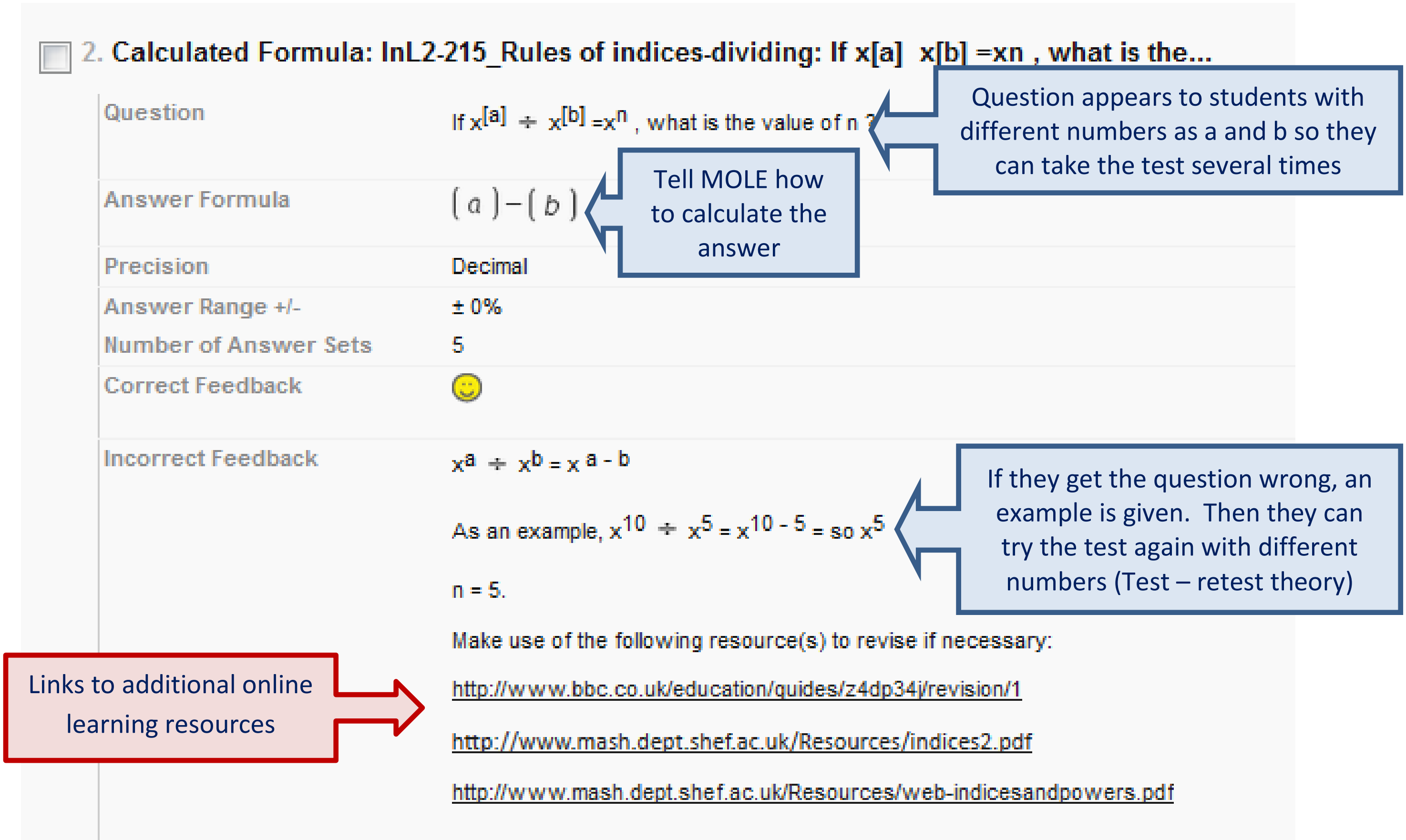


Tutorials:
Worksheets of exam-style questions are given in the tutorials. This allows students to build on their knowledge and learning from the flipped materials and interactive lecture. Students are encouraged to work in small groups or individually, as per their preference, to answer the questions given. The tutor circulates and helps where necessary. Partway through the lesson, volunteers are asked to share their solutions with the whole group, so that different methods are shared. Worked answers to all of the sheets are released on MOLE at the end of the week, after all students have attended one tutorial.

There are also extra sign-up sessions for the tutorials, so that if students are finding one lesson particularly hard, they can sign up to attend multiple tutorials.

Online tests: Using unassessed formative online tests allows students to check their understanding on weekly topics. Tests which allow the student to take a second attempt with different numbers enable students to revise the topic and try again. This is beneficial for addressing past experiences of failure and monitoring improvement which builds confidence. Feedback of any form is useful including just the test score but adding an example of how to do a similar question or a link to an alternative resource is more helpful. Online tests addressing all these aspects can be designed in MOLE (see below) but for more flexibility, a different package such as Numbas https://www.numbas.org.uk/ can be used. There are many tests created by others using Numbas which can be used freely or adapted for your own use.

Setting up the question in MOLE:



Student view of question: