Active learning to support engagement and conceptual understanding in Civil Engineering

Student feedback was very positive, particularly highlighting teaching in small groups, the contextualisation of problems and the support provided.

Area of Focus

Innovative changes to a level four module to increase engagement, satisfaction and learning in a difficult subject area.

Context

Level four Civil Engineering students typically find the content of this module – which includes analysis of the forces on frames, beams and columns – challenging because it is very different to anything learnt previously. The module focuses on theory as well as practice, including safety in design. Further challenges were posed by the practice of streaming students into groups based on prior attainment; and the mode of delivery for the module: two hours lecture and a one-hour seminar every fortnight.

Approach

Due to the low EvaSys satisfaction score of 3.7 the module leader reviewed student feedback. Themes which emerged included students wanting more explanation of the content; and finding lectures to be of limited use due to too large group sizes and not enough interaction. The module leader used this insight to make significant changes and interventions to the module, making it much more inclusive and engaging for all students.

Interventions

1. Delivery style
   For 2017/18, the module leader redesigned the mode of delivery to one with seminars only. Adopting a much more interactive approach, the lecturer mixes lecture content and workshop activity, allowing for a more flexible learning process. Students sense check each other's work and learn from each other as well as the lecturer.

2. Group formation
   The group formations of students continues to be based upon their mathematical knowledge, but smaller class sizes allow for more time for problem-solving and question and answer sessions. The lecturer now also sets 'stretch activities' for students ho need a challenge. These stretch activities are designed to further deepen the learning of the content through analytical and critical tasks, rather than practising the same skills through repetitive questions using different input numbers for the calculations.

3. Assessment design
   Assessment has also changed since 2016/17 to focus more on the learning and development process rather than testing knowledge with a "quiz" assessment. Now the students are set an exam question and are told the topic beforehand but sit the assessment in exam conditions. The lecturer gives the students the marking scheme for them to self-assess their progress. This is followed by a reflective and motivational exercise facilitated by the lecturer focussing on how to use logic to approach the problem, rather than relying on rote learning steps to achieve the answer. Students are encouraged to see that real-world problems vary, and individual steps are easily forgotten if the deeper understanding is missing. Through timely delivery—directly after the exam assessment—this message has a greater impact on students.

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The lab assessments have also been modified to align more closely to the module learning outcomes. Required outputs now vary between written lab reports, group posters, and submission of raw data, to give students the opportunity to work with their data in different ways.

The final area of assessment is a project week where students design a structure and test until breakage. For all designed structures, students are asked to analyse why the structure failed, all the while understanding that the structures with the biggest failures could result in better grades for students because they have more to comment on regarding how to improve next time. The group work is closely monitored during this week to ensure all students are present and engaged, and attendance is generally very high, even amongst typically disengaged students.

Initial Outcomes

For 2017/18 the EvaSys score increased to 4.5, and in the first exam board 76% of students passed without referral (compared to 66% in 2016/17). The grade profile also showed improvement, and student feedback was very positive, particularly highlighting teaching in small groups, the contextualisation of problems and the support provided. Students also appreciated the use of labs and project week to reinforce design principles.

Challenges and next steps

For 2018/19 further refinements were made to the course, with a resulting EvaSys score of 4.7. Challenges remain around staff time and timetabling, as the session is delivered three times rather than in a large lecture.

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