Case Study

Title: Reshaping Computer Aided Design Teaching for Remote Learning

Summary: *In this case study I cover my approach to modifying the module MEC355 (mechanical computer aided design 2) to give students a richer learning experience when remote learning during the COVID pandemic. I discuss my implementation of positive engagement methods in synchronous learning, a wide variety of asynchronous materials, including a detailed video guide library, and, how I altered one of the methods of assessment to engage students more proactively from their homes.*

Keywords: Engagement, Remote-Learning, Computer-Aided-Design

What was done:
Semester 1 of the 2020/2021 academic year was taught remotely due to the circumstances of the COVID pandemic. As such I felt it important to make significant changes to the way MEC355 is taught as very practical subjects and methods don't always translate positively to remote learning. I wanted make changes to the module to improve remote engagement, this included changes to content delivery, both synchronous and asynchronous, and a change to one of the assessments.

The five and fifty priorities this work related to were under the theme Academic Excellence – Teaching Excellence, specifically:

- Developing and delivering innovative curricula using contemporary methods of pedagogy that foster diversity, differentiation, and increased opportunity for access.
- Embrace the opportunities presented through emergent technologies to facilitate and complement teaching and learning practices.

I feel my approach to adapting the delivery and assessment of MEC355 was enhancing on the practice of previous pedagogy surrounding remote/blended learning and engagement as I took inspiration from previous knowledge in the field of remote learning/streaming and adapted it to work for the delivery of Computer Aided Design (CAD).

Motivation and aims:
The driving motivation behind implementing the changes were to tackle and improve engagement with remote computer software teaching during the COVID pandemic. I also teach on the MEC143 module which is the 1st year CAD module, and is taught in semester 2, so we had to pivot entirely to remote teaching when the first lockdown began in March 2020. This gave me an insight into the potential difficulties of engagement when teaching remotely and specifically difficulties teaching this type of module; a module where students typically spend all their time in a computer lab learning and using the software and receiving regular one-to-one help from a lecturer or PGTA.

Implementation:
There were two main changes I made to the module:

- Changes to content delivery to improve engagement with remote learning
- Changes to one of the assessments of the module

In terms of the of changes to content delivery I altered the delivery of synchronous and asynchronous content.

Synchronous:

As part of the synchronous lecture/tutorial delivery I used a piece of software called CamDesk which takes a webcam input and pins a borderless live feed of the webcam above all other apps. This meant that the students could always see my face on the shared screen when I was delivering lecture content or when I was demonstrating practical elements of the software. This approach was partly based upon the growing popularity of online streaming sites like twitch.tv where streamers constantly have their webcam on, usually in a corner of the screen, Figure 1. My reasoning being that students could see my face throughout lessons, and I can look to the camera when working through examples and students feel like I'm addressing them personally, hopefully creating a better connection between educator and student.

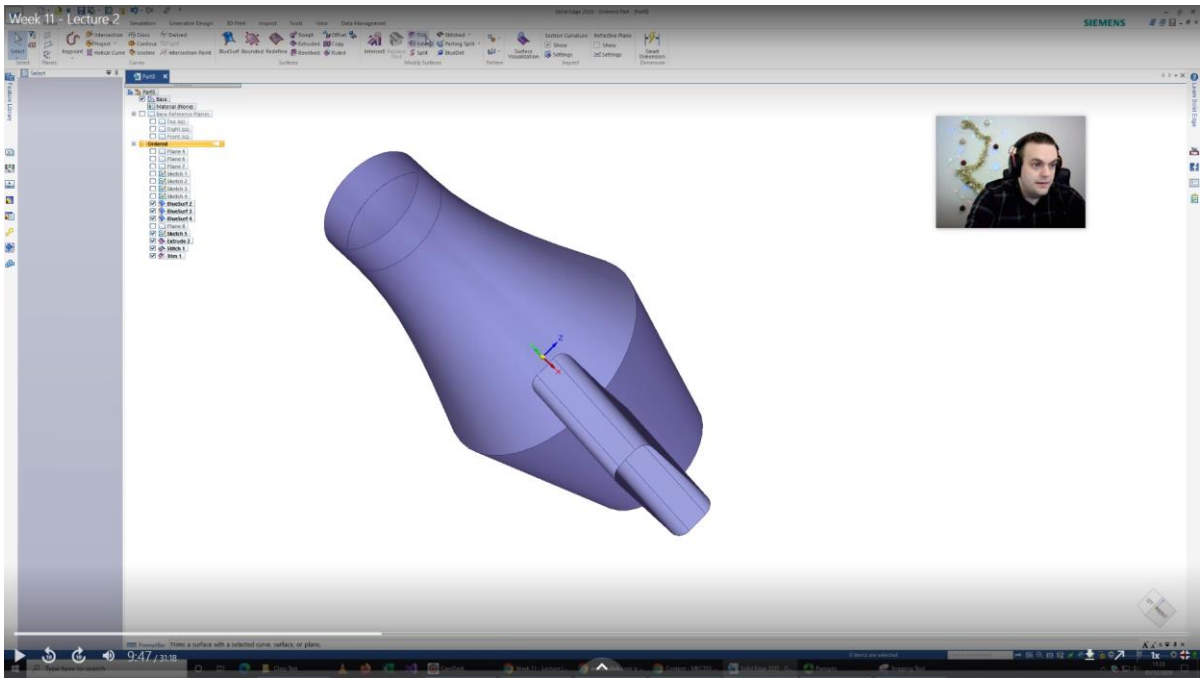

Figure 1 *Screenshot of recorded lecture session showing the use of CamDesk to give students a similar experience akin to streaming sites like twitch.tv*

The online classes were timetabled for three hours which can become dull for students as their attention span wanes significantly after approx. 20 minutes, especially when they are not providing input. So halfway through each three-hour session I implemented a break of 15 - 20 minutes and during that break I would run a short (10 question) Kahoot quiz. Streaming the quiz, students could participate on their phones and see their score at the end. I would mix regular general knowledge quiz questions in with content appropriate questions, and I would try to make it fun and engaging with students when the leader boards were shown between questions contemplating who would win. I would also ask students to comment on how they did in the quizzes in the chat box on BBL collaborate, in the hopes that undertaking the quiz would improve their engagement in class.

Asynchronous:

In terms of asynchronous delivery, I uploaded all the synchronous lecture/tutorial content to BBL as you would expect but I also created and uploaded a library of video guides to common problems and laid these out in their own folders each with simple video thumbnails, to create an easy-to-use set of videos which covers the most common problems users encounter during the module. The following Panopto video shows how the library looks in the BBL structure [1]. As well as these video guides I would try to respond to emailed questions with a personalised video response. The following Panopto video is one of the feedback videos I recorded for a student question [2].

Assessment Change

This module is typically assessed via a class test in week 6 (50%) and class test in week 12 (50%). However, what happened in previous years is that students would engage with the content the week before each test and engage less so otherwise. I also knew that with remote learning it might be difficult to encourage engagement across the full semester, so I wanted to adapt one of the assessments to potentially tackle this issue. I changed the week 6 class test to be a project style assessment which was introduced to students in week 3 and they had to hand-in for week 10. This project assessment was designed so that students had to pick a product which they regularly use and are familiar with, and model it completely within the software, breaking the product down into individual components and creating full engineering drawings for the parts and a completed assembly. The idea behind this was that as I covered the new material each week, students could complete the next portion of their assignment, and they would complete the assignment over the course of the semester. This meant that students had to maintain engagement to continue their project work.

In my approaches I relied on my reading around putting students at centre in education [3,4] and how better to empower them to become independent learners [5]. I also read articles discussing online delivery and how to use the technology effectively [6].

Successes and lessons learnt:

Synchronous

I feel that my changes to synchronous learning were effective, there were no specific comments from students about being able to see my webcam constantly, but occasionally it did prove a “talking point” and encouraged students to engage with the chat box writing in comments, for example when my dog appeared on the camera some students commented asking its name or writing messages for it. Although this started minor engagements, however jovially, it usually led to students being more active in the chat box overall and near the end of the semester I felt students were far more comfortable writing into the chat because of these casual engagements with it.

The Kahoot quizzes proved very popular with the students, so much so, that we regularly hit the free Kahoot quiz limit of 50 concurrent quizzers. It very much improved student engagement with students regularly commenting in the chat box about how a question was difficult or joking about “how did anyone get that!” and near the end of the semester we had some running jokes during the quizzes that students came up with. This improved engagement throughout the module very positively with students feeling more comfortable to use the chat box, un-mute mics and ask questions.

Asynchronous

The video guide library was used regularly by the students, as could be seen in the BBL statistics data (unfortunately statistics data is only maintained for 180 days so I can't present it here). It provided a means for students to seek answers to common problems themselves without the need to contact the teaching team. I feel that students who are more shy and less likely to contact a member of staff directly used the guides to good effect. Although it took a lot of time to create this resource, it can be easily rolled out to students in following years.

Assessment Change

Although there is no direct feedback from students to say this method of assessment was preferrable (due to them not experiencing the previous method of assessment), I feel personally a very big change to how the students approached the module this year. As the assessment was released and during each lecture/tutorial session I would remind them of how they need to use the tools I was demonstrating each week to complete their work, it seemed to dawn on students fairly quickly that they would have to engage with the content and work on their assessment a little each week as I was moving through the teaching content. Whereas in previous years we would notice a big surge in attendance around the two class tests and a dip in attendance otherwise, this year we saw a very steady healthy attendance all year through, Figure 2.

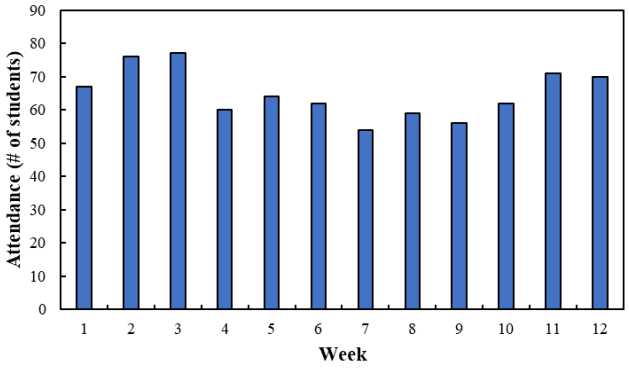

Figure 2 *Attendance record for MEC355 2020-2021*

In terms of successes, I feel like the changes incited a positive response from students as can be seen in the qualitative anonymised module feedback survey results, Figure 3. I highlighted responses which I feel pertain to the changes made.

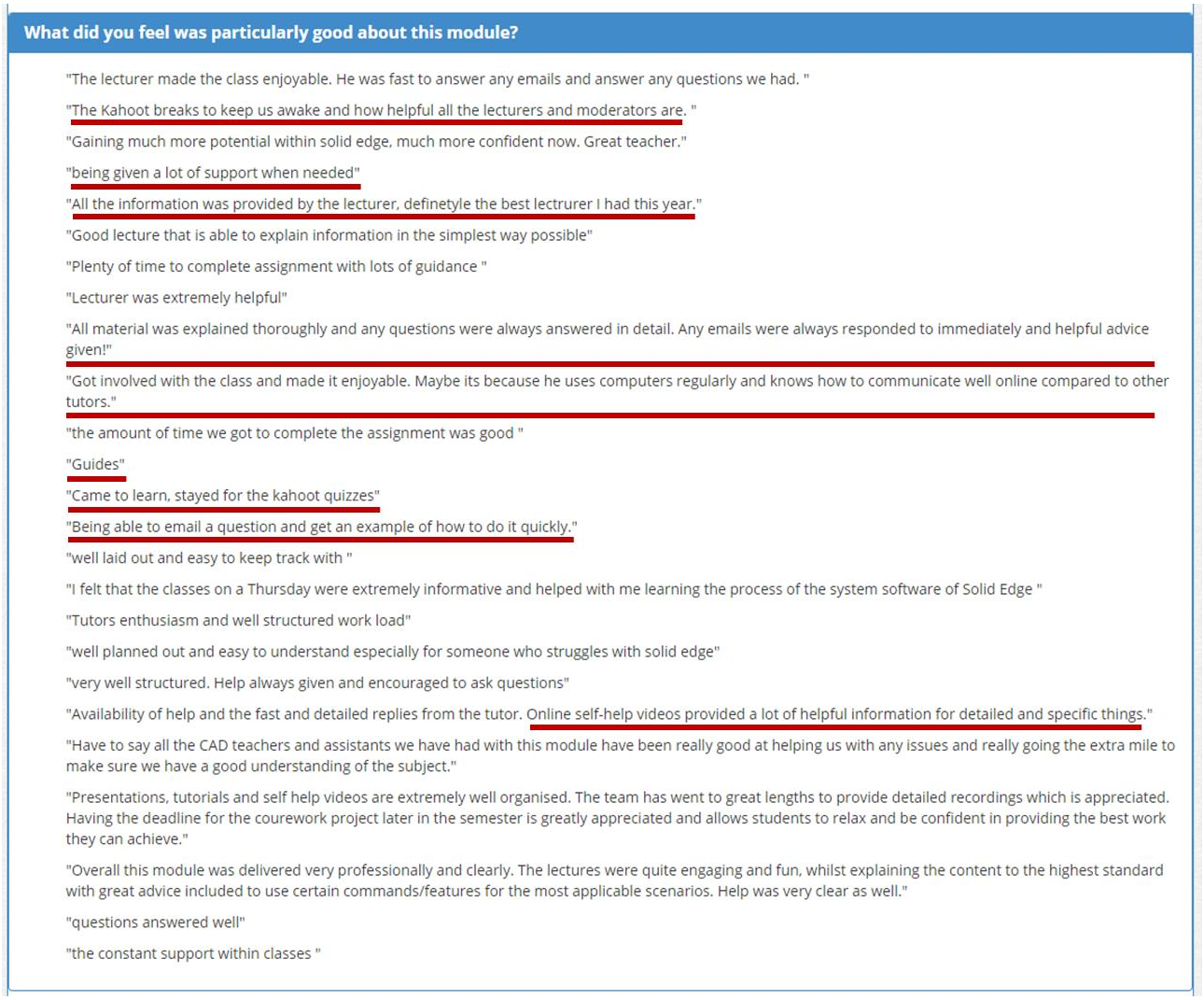

Figure 3 *Response to question "What did you feel was particularly good about this module?" from MEC355 module feedback survey 2020-2021*

Figure 4 shows the responses from the MEC355 module feedback survey compared to the university wide average, the responses to the MEC355 module were significantly above average in terms of the Agree/Strongly Agree with Disagree/Strongly Disagree responses significantly below university average. For transparency 45% of students enrolled in the module completed the feedback survey.

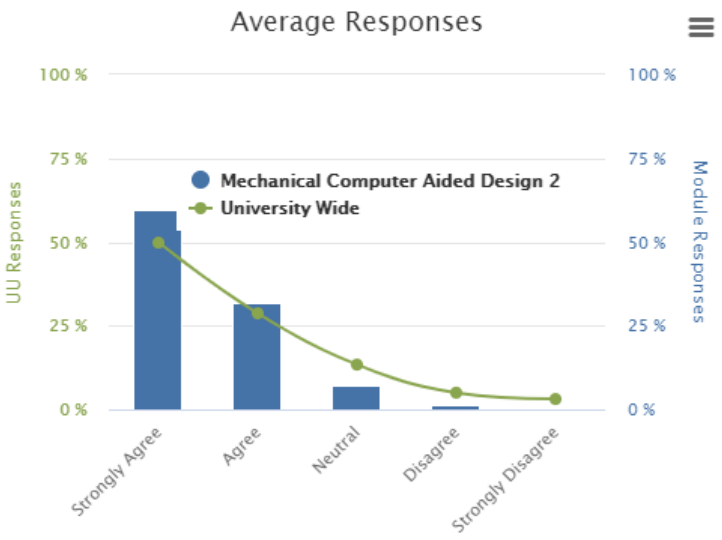

Figure 4 Comparison of MEC355 module survey feedback to university wide average.

Transferability:

I feel the practices discussed here are transferable to teaching other practical computer-based modules remotely, I have shared my experiences with some colleagues within the school and one of them adopted the short Kahoot quiz break during long lectures/tutorials and found it significantly improved engagement in the chat box on BBL collaborate sessions. I plan on retaining many aspects of the approach when delivering similar content remotely, particular the use of CamDesk and Kahoot quizzes. The implementation of the video guide library takes a significant amount of time to setup, so I would hesitate to recommend it to other lecturers as quickly, perhaps it would be useful to gauge from students the usefulness of such a resource before committing to it in its entirety.

If others were contemplating adopting the approaches, I would advise they casually observe how "professional" streamers on twitch.tv engage with their communities when live streaming and you can see how adopting some of these approaches would be beneficial in improving engagement in our own remote teaching practices.

Further information:

[1] Video Link

[2] Video Link

[3] Levin, B. (2000) 'Putting Students at the Centre in Education Reform', *Journal of Educational Change*, 2(1), pp. 155–172. doi: 10.1023/A:1010024225888

[4] Jerusalem, E. (2013) 'Student assessment: Putting the learner at the centre', pp. 139–269. doi: 10.1787/9789264190658-7-en

[5] Black, P. and Wiliam, D. (2005) 'Changing teaching through formative assessment: research and practice', What works in innovation in education, pp. 223–240

[6] Dartmouth College. (2020) *Teach Remotely*. Available at: https://sites.dartmouth.edu/teachremote/remote-teaching-good-practices/