Online Teaching

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Technology

Visualiser. I am using a visualiser for most online teaching. The one I have is a Jourist DC80 Document Camera (https://www.amazon.co.uk/gp/product/3898947424), privately bought, but it may be possible to get others through the university. When placed slightly elevated, e.g. on top of a book, it covers an A3 area, which can be filled with two A4 sheets placed next to each other. I write on these with fairly large writing and mostly black pens. Normally I write on the right sheet and keep the previous one on the left, but I sometimes place an earlier sheet on the left to refer back. I downloaded the software for the visualiser and adapt the settings for focus and exposure to light before use. Auto-focus should be avoided at all costs as it adapts when I lift my hand. I just cross out errors. If I have formulas with long lines I place one sheet in landscape format instead. I place the sheets on top of a black pad to avoid ruining the table. I keep my visualiser next to the monitor in between sessions as it's fiddly to readjust.

As the weather is getting better, I noticed that sun shining directly on the sheets can be a problem, and I am blocking a small part of my window with boxes for afternoon lectures.

I make sure that my face is visible to the students as well, and try to keep eye contact with the camera when possible. The quickest way to combine the camera and the visualiser (but I usually don't use it) is to just use my camera as normal Zoom camera and import the visualiser using share screen > advanced > content from second camera in Zoom. This is probably the best way for people who want to avoid the steps I describe below.

OBS. Instead I use OBS (https://obsproject.com). I create a scene using the plus button under 'scenes' at the bottom of the screen. Then I add, using the plus under 'sources', two 'video capture devices', one for the visualiser and one for my camera. I arrange the sizes such that the visualiser fills most of the screen but there is a reasonable amount of space for the camera on the right. I make sure that the window where I do this is enlarged enough to cover the full scene or more, when it displayed only a part I sometimes set up the scene wrongly. To mirror the camera, I choose transform > flip horizontal in the context menu for the camera. I adjust the displayed areas using the context menu item on filters, pressing on the plus below 'effect filters', choosing 'crop/pad' and adjusting the settings. This helps for example to cut away the edges of the camera picture to save space. To adjust the settings just click on the existing 'crop/pad' without creating a new one. The advantage with OBS is that my picture is a little larger, helping to connect with students, that it gets included in recordings automatically, and that I can use more fancy features of OBS (e.g. seemless switching to a second 'scene' with a computer simulation) if needed. The setup is automatically saved at the bottom of the OBS interface, but when restarting I sometimes have to reactivate the connections by clicking on the video capture devices, connecting them to a different device and then back to the old one. I usually check the setup a while before teaching to avoid surprises.

For live teaching, I click on 'start virtual camera'. This is at the bottom right of the screen on Windows and below 'tools' on Mac. (I don't remember whether the virtual camera needed an installation, google how to install an OBS virtual camera if you don't see these options.) Then I choose the OBS virtual camera as my camera on Zoom and pin myself so that I can see my writing. I also suggest that the students pin me. I don't mirror the camera on Zoom as I do this in OBS already and the visualiser shouldn't be mirrored.

For recordings, I use the plus under 'sources' in OBS to add an 'audio input capture' for my microphone, then click on 'start recording', 'stop recording' afterwards, and access the file using file > show recordings. I have turned to also recording Zoom sessions in this way as the resolution is better.

I try to avoid editing the recordings at all. I am happy to live with the crossings out, and I practice a little before the recording so that I am not out of words. But when I have a bad day, I have to make cuts and recombine the recordings using avidemux on Mac. On Windows, 'Microsoft Photos' (recommended by Lynne) worked well for slight edits.

Animated handwritten slides. As an alternative option, I have written a program/Python script animpdf (https://github.com/SebastianMuller/animpdf) to animate handwritten slides. This can be combined with the above setup and I still use this for pre-recorded videos with existing slides. But I mostly use the visualiser as it allows to adapt what I do to answers from students.

Chalkboard. For hybrid in person/online teaching I aimed a good external camera (on a tripod) at the board, used yellow chalk, large writing in particular for indices, and a good eraser (Hagoroma). I sometimes tried to adjust the camera settings to improve the picture but this didn't always help. But I felt this format treated online students as second class citizens. I prefer double teaching problem classes to hybrid teaching (assuming in person is possible and safe at all), but hybrid teaching to teaching in person only to give students a choice.

Unit format

During lockdown, I believe it is important to have a good amount of live streamed teaching, to keep students engaged and avoid isolation.

But I also like the idea of recording and reusing some lecture material, to keep more timetable slots and workload for problem classes. I am using this to some degree in all my units this year, depending on what works for these units:

- In Quantum Chaos (TB1, 4th year) I had three weekly live slots available and the balance was in the end: 8.5 live lectures, 6.5 hours of recorded lectures, 9.5 live problem and revision classes (at least one per week but more in some and all slots in the final week, 3 sessions were hybrid). This was basically a test run for a half flipped classroom. The format was well received, the students appreciated having a lot of synchronous teaching. About half of the students attended live, the others hopefully watched the recordings. But the format requires fine tuning, maybe it was too much back and forth between synchronous and asynchronous.

- For Advanced Quantum Theory (TB2, 4th year and TCC) I have toned down the pre-recorded element a little, and use it mainly for smaller addenda or for self-contained chunks where I find it the most suitable. To have a good amount of time for problem classes I have slightly increased the contact hours. (Due to the arrangements for the TCC, this was by continuing the course for slightly longer, instead of adding a fourth weekly contact hour.)

- For my part of Applied Partial Differential Equations 2 (TB2, 2nd year) I have occasionally used recordings to make space for problem class elements in lectures. (Probably I should have done this more!) But the main support for the problems is coming from tutorials given by TAs for smaller groups.

I list the length of pre-recorded videos on Blackboard. This was a suggestion from a student who felt this would help students schedule their work.

For units that are mainly or exclusively asynchronous, I would like to mention the possibility of 'watching parties' where the pre-recorded videos are played on Zoom and students can talk in the chat (and maybe lecturers can drop in for questions in the end?). I don't have any experience with these myself. But some

first year students said they would appreciate them as it is tricky to catch up with so much asynchronous material.

Interaction

Cameras. I ask that some students switch their cameras on so I am not teaching to an empty room. But I don't insist that they all do this.

Zoom polls. These work really well, in Quantum Chaos and APDE2 I had between one and three polls in each session.

Students talking or answering in the chat. In online tutorials with few students, where I asked students to pick questions and give their ideas for next steps, and they were happy to talk. In lectures I sometimes ask questions that can be answered verbally or in the chat. This was the main form of interaction in the Advanced Quantum Theory problem classes, which turned out to be quite interactive.

Breakout rooms. I didn't get breakout rooms to work well in Quantum Chaos and didn't try further in the other units as I felt APDE2 was too large for breakout rooms and Advanced Quantum Theory was too small. Otherwise I might have tried optional breakout rooms. With the most recent version of Zoom students can assign themselves to rooms. So I can ask a question, students who want to work alone can do so, breakout rooms will be used only by the students willing to use them and they can try to find their friends. This requires students to install the desktop version of Zoom. I did make an experiment to open optional breakout rooms in the end of APDE2 lectures just to allow students to socialise, but this was not taken up.

Airmeet. An interface with tables and chairs that students can use to work together e.g. during the office hour or at a different time. I used this in my lectures and labelled one table as my office. The students used this as a usual office hour and didn't form study groups, however it might be worth to try again.