Report on Undergraduate Mathematics Students' Perceptions of the Affordances and Constraints of the Online Environment For Learning

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1. Introduction

In the UCD School of Mathematics and Statistics, the traditional face-to-face environment for a module usually consists of two to three 50-minute lectures, one tutorial and/or a programming laboratory, each week. Most modules are assessed using some combination of quizzes, assignments, and class tests throughout the trimester and a written, closed book, final examination scheduled at the end.

Owing to the Covid-19 pandemic, all modules in UCD moved to online delivery and assessment in March 2020. Students had completed seven of the twelve weeks of lectures and in most modules, had completed some continuous assessment. Lecturers had to adapt their delivery and assessment methods to an online environment within the space of a few days.

By the end of the spring trimester, most students had been taught and assessed using a face-to-face approach for seven weeks and an online approach for the remainder of the trimester. For this study, we wanted use this unique situation to investigate students' perceptions of the two approaches. We wanted to identify aspects of module delivery (lectures and tutorials) from the online approach that students valued in order that they might be incorporated into future module offerings. Equally, we were interested to know what they felt was missing from this approach.

Our research questions (RQ) are:

> **RQ1**. What types of face-to-face and online lectures and tutorials did mathematics students experience this trimester, and how beneficial did they think they were for their learning?
>
> **RQ2.** What particular aspects of the online lecture and tutorial formats did mathematics students think were beneficial to their learning, and why?
>
> **RQ3.** Having experienced both face-to-face and online delivery of lectures, tutorials, and assessments, what would mathematics students' ideal blended learning environment consist of?

In this report we focus on addressing the second and third of these questions. In Section 2 we describe how the study was conducted, who the participants were, and how the qualitative data was analyzed. The results of this preliminary analysis are presented in Section 3, with a discussion and list of recommendations in Section 4. We conclude in Section 5. We do not provide a literature review at this stage – urgency in producing the document prevailed! However, we make two comments before proceeding – one on resource usage, and the other on our meaning of the term "face-to-face".

It is good to remember that it is not technology that drives student learning - rather it is the pedagogy underlying the use of the technology that matters.[1] Knowing that a student favours a face-to-face lecture over a pre-recorded one in a module, or a discussion forum over a live online workshop in another module, tells us little. It is the role that the each of these resources plays in the overall design of a module, and ultimately in students' learning, that matters. This study was not designed to identify which resources are better for students' learning, based as it is, on comments received to address the RQs above. Our intention is to report on aspects of the resources that students perceived as beneficial for learning (or not) and the reasons they provide.

In the survey, we asked students to comment on their face-to-face experiences of lectures and tutorials before the physical closure of UCD, and their online experiences afterwards. However, after months of working from home we now appreciate that the term "face-to-face" is a misnomer. We were using this term initially to mean "*on-campus* face-to-face" experience, where two or more people are physically present together. But of course, we now realize that one can legitimately have a face-to-face interaction with another person online for example, via Zoom or Skype or Virtual Classroom. However, since "face-to-face" was the term used in our RQs, in the survey, and by students in their responses to the survey, that is the term we will use in reporting our findings. Finally, we use the terms "live" and "synchronous" interchangeably in relation to online learning.

2. Methodology

In May 2020, an electronic survey was emailed to almost 900 students who were either enrolled to undergraduate degree programmes in the School of Mathematics and Statistics, or who were taking modules in Stages 1 and/or 2 of their programmes that made them eligible to complete a degree in the School (for example students in Stage 1 and Stage 2 Science, and Stage 1 Arts and Humanities). In total, 156 responses were received and the breakdown of respondents is provided in Table 1.

[1] Eric Mazur, Nobel Prize winner in Physics, has written about the use of clickers in lectures. He notes: "I often meet people who tell me they have implemented this 'clicker method' in their classes, viewing my approach as simply a technological innovation. However, it is not the technology but the pedagogy that matters." His short article entitled "Farewell, Lecture?" (2009) in *Science, 323*(5910), 50-51 is an enjoyable read. You can find it here: https://science.sciencemag.org/content/323/5910/50.full

Stage 3 Bachelor of Actuarial and Financial Studies (BAFS) students were on placement, therefore the survey was not sent to them. Those in Stages 1 and 2 Science were enrolled to core modules that would make them eligible to pursue any of the Science degrees in the School after Stage 2. Students in Stages 3 and 4 Science were enrolled to Applied and Computational Mathematics, Financial Mathematics, Mathematics, Mathematical Sciences, Statistics, or one of the Mathematics, Science and Education programmes. The Arts and Humanities degree programme, along with the Social Science programme only have cohorts in Stages 1 and 2 currently. These students are enrolled to majors/degrees in Mathematics, Statistics, or Economics, Mathematics and Statistics (in the case of Social Science). Those in Stage 3 Arts are enrolled to a Mathematics and/or Statistics major. Two students were enrolled to the Higher Diploma in Mathematical Studies, while one student did not declare which programme of study he or she was following. To provide anonymity to the two Higher Diploma students, we will record them as being in Stage 3 BA if we quote them.

	Stage 1	**Stage 2**	**Stage 3**	**Stage 4**	**-**	**Total**
Actuarial & Financial Studies	9	19		12		40
Science	21	21	18	28		88
Arts & Humanties (Stage 1 & 2)	5	1				6
Arts (Stage 3)			4			4
Social Science (Stage 1 & 2)	8	7				15
H.Dip. in Mathematical Studies					2	2
Programme Undeclared		1				1
Total	43	49	22	40	2	**156**

Table 1. Number of respondents from each stage in each degree programme

In reporting our findings we will not distinguish which specific programmes the students in Stages 3 and 4 Science are enrolled to, in order to ensure anonymity for students. Similarly, with Stages 1 and 2 Social Science, Stages 1 and 2 Arts and Humanities, and Stage 3 Arts. We also asked students not to provide any module codes or titles in their responses.

In order to address the second and third research questions, the following four open-ended questions were included in the survey:

1. What particular aspects (if any) of the online lecture formats that you experienced were beneficial to your learning, and why?
2. What particular aspects (if any) of the online tutorial formats that you experienced were beneficial to your learning, and why?
3. Blended learning involves lectures, tutorials, and assessments being delivered via a combination of online and face-to-face formats. Having now experienced both face-to-face and online environments, what would your ideal blended environment for ACM/MATH/MST/STAT module look like, and why? (Where possible, make reference to lectures, tutorials, and assessments in your answer.)
4. If you would like to make any other comments on the difference in learning pre and post the closure of UCD, please insert below.

All but two students answered some or all of these questions, and generally students gave quite long and detailed responses, particularly those in Stages 3 and 4. All responses were exported to software package *NVivo* for analysis and two rounds of coding were performed. Further qualitative analysis needs to be carried out, therefore the results in this report, resulting from the second round of coding, should be considered as preliminary.

3. Results

We organize this section in five parts. Firstly, we highlight some of the positive and negative aspects of online learning *in general* during this period that students raised. While general, these comments may provide useful context for the more specific findings that follow. The main part of this section follows next. We describe recurring themes in relation to teaching and learning that run through the students' responses, especially in their explanations of *why* some resources were effective for learning or not, and when they contrast their experience of online learning to their traditional face-to-face experiences. In the next part of this section we focus specifically on students' perceptions of what was beneficial, and not so beneficial, in the delivery of lectures and tutorials/laboratories across modules in the school. In the fourth part of the section we touch briefly on comments made by students on assessment. Finally, we finish the section by presenting a selection of suggestions provided by students for the blended delivery of modules. These findings and suggestions will inform the recommendations in Section 4.

3.1. Students' Perceptions of the Affordances and Constraints of the Online Environment in General

3.1.1. *Positive – No Commuting*

Several students highlighted the extra time they could dedicate to studying when UCD went online in March, as they did not have to commute. Some mentioned saving two or more hours per day as a result of not having to travel to UCD.

> *As a student who commutes over 3 hours a day to get to and from UCD, I noticed that post closure, I had more time and energy to devote to online learning and assignments which I hope benefited my grades*. Stage 3 Science

> *I had a 2 hour commute to UCD so this allowed me around 20 hours extra a week for study.* Stage 4 BAFS

3.1.2. *Negative - Home Environment Unsuitable for Studying*

A number of students found their home environments unsuitable for learning, as they did not have a quiet place to study. Being unable to access spaces like the library for studying was detrimental for some. This brought particular stress when it came to completing *timed* exams at home, or engaging in live lectures or discussions.

> *I also have quite noisy neighbours. 3 boys under the age of 10 who love to argue. It got so bad that during one of my exams my mum had to go in to beg them to be quiet for the hour. I changed room twice during the exam to try and find somewhere quieter which didnt prove helpful. This caused stress which I would never experience in the RDS and I felt disadvantaged to maybe some of my classmates who didnt experience this disruption.* Stage 4 Science

> *The main difficulty comes because there is no where suitable to study (would often stay in Dublin & use the library) and the constant distractions surrounding me. It's certainly not conducive to learning.* Stage 4 Science

3.1.3. *Negative - Poor Connectivity*

Not unexpectedly, several students mentioned that poor broadband was a cause of stress and frustration. This was a particular cause of anxiety when completing timed, online examinations.

> *I live in a rural area, and as a result I was unable to access a lot of resources available to my classmates. (live lectures/tutorials, and even in some modules the lectures themselves which were not kept online after the fact.) I feel as though if UCD were to move more modules online (willingly or due to the pandemic) they need to take into account that not everyone has access to internet. As someone with a large family, I had to circulate my exam timetable to my family so that they would all stay offline during my exams, to give me some chance of accessing it. More than once I've lost time on quizzes on brightspace due to poor connections.* Stage 2 BA

Poor connectivity meant that accessing live, online lectures or live discussions could prove difficult, which frustrated students, especially those who were attempting to follow the pre-closure schedule for lectures and tutorials in order

to maintain structure in their studying. Where recordings of live lectures were not made available later, students felt particularly disadvantaged.

> *I did not find many* [aspects of online learning] *beneficial at all. It was hard to keep structure and do things according to the timetable. My internet is very poor so while live lectures were the best when I could connect they were very frustrating when I couldn't connect.* Stage 2 BAFS

It also posed difficulties when downloading large files, for example, hour-long lecture videos. For this reason, some of these students stated a preference for shorter videos which could be downloaded more easily.

> *The shorter lecture videos were far easier for me to download and access, I live in a rural area with poor internet connection so it took hours at times to download videos and I was unable to access lectures on brightspace virtual classroom on my laptop, so short videos made it possible for me to access all my lecture content.* Stage 4 BAFS

Other students reported limited access to hardware and of having to share devices with others in the household.

3.1.4. *Negative – Lack of Social Interactions with Friends*

It comes as no surprise that several students commented on how they missed the social aspect of on-campus life and social interactions with friends. A few students who cited a preference for online learning, noted the lack of social interaction with friends as the one disadvantage when compared with face-to-face learning.

> *Majority of things can be done online. The only advantage with face to face lectures is being with your friends. Other than that, everything about online delivery is better.* Stage 4 Science

Worryingly some stated that the absence of social interactions led to a lack of motivation, feelings of isolation, and negative impact on their wellbeing.

> *The main difference I think is not being able to see my friends and lack of motivation. Although I am able to keep up with my studies after closure of UCD, I think it is my overall wellbeing that is suffering rather than my grades*. Stage 2 BAFS

In the next part of this section we will return again to the theme of interactions, but with a focus on the impact that student-lecturer and student-student interactions, or their absence, can have on learning.

3.2. Students' Perceptions of the Affordances and Constraints of the Online Environment for Learning

3.2.1. *Positive - Availability of Recordings*

There was an overwhelmingly loud and clear message of appreciation for recordings of lectures and/or tutorials that were made available by staff. Availability of recordings (either recordings of synchronous/live sessions or pre-recorded videos) was the most cited benefit of having online lectures and tutorials. In responding to the question about the type of blended learning environment students would like, even those who expressed a complete dislike of the online environment, frequently suggested that recordings of face-to-face lectures and/or tutorials should be made available as a complementary resource.

What is really relevant from a pedagogical perspective are the *ways* that students described using recordings. An obvious use of them is to **catch up** on any synchronous sessions that were missed.

> *Knowing information was online (video lectures etc.) was very comforting, often missing live face to face lectures leaves you a step behind which is difficult to recover from.* Stage and Programme Undeclared

They provided **flexibility** for students to engage with material when it best suited them, especially if they had other commitments – a point we will revisit in the next sub-section.

> *Recorded lectures available online at any time is helpful when doing assignments/studying as you can refer back. Being able to choose when to watch when you're focused is more beneficial.* Stage 2 Science

> *As they weren't live I was able to fit them into my schedule in the best way that suited me and my other commitments.* Stage 2 Science

Many students spoke about how they used recordings to **review** parts, or all, of a live/synchronous lecture or tutorial that they had attended, particularly if they had found a topic difficult, or missed a point during the session.

> *Post live lecture recordings were extremely helpful for watching back afterwards, allowing me to follow the general direction with much more ease rather than rushing to take notes.* Stage 4 Science

> *The fact that you had the voiceover to accompany your notes. Ordinarily in face to face lecturing you are taking notes from the board and it is very difficult to listen to what the lecturer is saying at the same time. Even if you don't take notes and listen intently to the lecturer it is pretty much impossible to retain 50 minutes worth of information. Having the voiceover means you can rewind and hear that explanation again*. Stage 1 Social Science

The ability to **pause and rewind** a recording, whether using it to review a synchronous session or engage with the material for the first time, was repeatedly described as beneficial from students across all stages and progammes.

> *Pre recorded lectures* [are beneficial] *so when watching the lecture for the first time, it is easy to pause at certain moments to let the material sink in and to rewind to fully understand what the lecturer is saying.* Stage 2 Science

I found the online lectures much more beneficial as I could pause the video and go back if I missed something, if something was unclear or if I just needed time to digest the material (I think this is particularly important in maths modules). Stage 4 Science

From these comments we see that the ability to pause and rewind recordings, allows students to spend more time on topics they find difficult. And indeed, students repeatedly spoke about how recordings helped them to work through material at their **own pace**.

I loved that I could pace the learning myself. I could skip through parts of pre-recorded lecture that I understood well and could pause at places where I was confused - do my own thinking, check notes, rewind and rewatch. I find this a much more efficient way of learning than face-to-face lectures which are generally boring and frustrating because the pace is not individually tailored. Stage 3 Science

Prerecorded videos/podcasts were extremely beneficial. For the first time, this enabled the ability to replay explanations of content at one's own pace, allowing them to repeat explanations as many times as necessary for understanding before proceeding to the next content. This is vital in the subject of maths since all the material builds upon itself. It is much harder to try and achieve this after a normal lecture by just reading on its own. Stage 3 Science

The main part of the prerecorded podcasts/video lectures which was definitely benficial was the fact that you can pause the lectures and work through them at your own pace. Stage 3 Science

Students spoke about the difficulty of trying to concentrate and follow the ideas in a synchronous session and **take notes** at the same time. A significant number of students described how they used recordings to go over notes they had taken during the live/synchronous lecture and annotate them, or how they created detailed notes when viewing a recording for the first time.

The ability to pause lectures to make notes was helpful. Stage 1 Science

With pre-recorded video lectures it was incredibly beneficial to rewind lectures in order to write down more detailed notes and to be able to listen to the lecturer slowly and repeatedly in order to understand fully what they were saying rather than in person straight lectures where they may talk over something important too fast. Stage 2 Science

Prerecorded videos were of most benefit as they allowed us to watch and catch up anytime. Also it meant we could pause and listen multiple times to take detailed mathematical notes rather than being rushed and forgetting what was said or how a certain question works. Stage 4 Science

I could also pause the video to annotate my notes with whatever the lecturer is saying (there often isn't time to do this or ask questions in real lectures). Stage 4 Science

The ability to rewatch them and being able to take down not only the notes on the board but what the lecture is saying. Stage 4 Science

> *In person lectures I found I had to go home and redo the lectures* [notes] *myself anyway so doing them myself the first time allowed more time for other revision such as past papers.* Stage 4 BAFS

> […] *being able to replay certain parts of lectures, jump around to different sections etc. as often as necessary made producing good notes VASTLY easier.* Stage 2 Social Science

Finally, students spoke of recordings as being beneficial when **revising** for examinations.

> *Watching back over the recordings of online lectures allowed me to not only refresh myself on the content, but also transport me back to the lecture setting. Unlike only reading notes after a lecture, the ability to revisit an entire lecture identically to how you first viewed it especially helped with revision.* Stage 4 Science

> *I (along with everyone else) am currently studying for exams and I'm finding great use out of rewatching pre-recorded lectures as a study tool. If it were possible to record lectures even if students are present in the lecture hall I think this would be a fantastic addition and great way to blend the face-to-face delivery and online delivery.* Stage 2 Science

We finish with this student's summary of just about everything that was discussed above:

> *Having the full lecture online was useful because you could go through the lecture at your own pace and at a suitable time. If I hadn't quite caught up in a module by the time the normal lecture slot came (if I had a large amount of homework that week, for example), I could catch up and then watch the video, so it was much easier to know what was going on. If I didn't understand something, I could rewatch the video. I could pause the video so I could take extensive notes. […] Having the videos rather than lectures was much easier because you were never hungry or tired when watching them - you could always give them your full concentration. I would love if the videos were posted as well as having lectures next semester, because then you could assess which medium suited you better*. Stage 3 Science

3.2.2. *Negative - Maintaining a Schedule*

From the comments above one can see that some students liked the flexibility afforded by recordings to engage at a time that suited them, rather than having to engage synchronously. This was sometimes by choice, but sometimes by necessity, for example, an inability to participate in live sessions due to poor broadband, or due to other commitments such as caring for a family.

> *The ability to access learning at any time rather than specific points was useful* Stage 1 Science

> *I did not find many* [aspects of online learning] *beneficial at all. It was hard to keep structure and do things according to the timetable. My internet is very poor so while live lectures were the best when I could connect they were very frustrating when I couldn't connect.* Stage 2 BAFS (Repeated from 3.1.3)

> *For me, the pre-recorded lectures worked better than the live lectures since I had childcare commitments which made it challenging for me to get the time during to day to juggle my college commitments (ordinarily my kids would have be at school but obviously were home during the lockdown period).* Stage 3 BA

Echoing the Stage 2 BAFS student in the comment above, several students spoke about trying to maintain a "structure" or schedule to their studies by keeping as close to the pre-closure timetable as was possible.

> *I found full online timetable which stuck to the usual module schedule worked best.* Stage 4 Science

Many students thrived in the pre-closure, on-campus environment and missed the structure and social interactions it afforded.

> *My ideal learning environment for the listed modules above would be a face to face format. I found an environment with my lecturer and classmates the most optimal way to learn mathematics. I preferred having a stricter timetable and found it easier to concentrate during my face to face lectures, along with having no distractions. I particularly missed face to face tutorials, and being able to see my tutors work out problems step by step.* BAFS1 F7

For a student used to being on campus and regularly attending lectures and tutorials with friends, the move to being at home on your own with nowhere to "be", can make it difficult to stick to a timetable and result in you falling behind.

> *However ideally there would be a mix of both online and face to face as it is very easy to let online recorded lectures build up where as you would simply go to face to face lectures when they're on. Face to face lectures are definitely more enjoyable due to the social aspect.* Stage 4 BAFS

One has to be very disciplined to adhere to a timetable without the usual structures such as timetabled lectures and tutorials, and the support networks of friends. Not surprisingly the lack of structure and absence of social interactions, can lead to a lack of motivation to study.

> *It was much harder to motivate myself to learn from home. I ignored the work for the first week and then the assignments started to pile on. When you spend hours doing an assignment it's easy to say you've done enough work for today. When UCD was open you have classes no matter what. It's too easy to fall behind at home.* Stage 2 BAFS

> *While working post closure of UCD finding motivation to keep up with lectures/tutorials as they went live was often difficult. Lack of interaction with other students, and lack of any specific structure personally being the primary reasons for this.* Stage 2 Science

In terms of suggestions for helping students (who wanted to) keep to a schedule and not fall behind, a noted benefit of having live/synchronous sessions was that they provided structure to study.

> *I think live (recorded) lectures helped with student engagement and made it easier to follow a daily schedule, but also take the time to ask questions at the point of formation and not forget them/not bother to ask later on (Which was the case for non-live lectures).* […] *Live (recorded) interactive tutorials including group work and tutors solving examples also really aided in student engagement and helped us to stay on top of our work and not fall behind and get stressed and in over our heads.* Stage 1 Science

> *Live tutorial were best as you could ask questions and you were forced to be there etc.* SCI2 M7

Some students noted that *low-stakes*, weekly assessments were beneficial in motivating them to keep up with material, as well as enabling them to gauge their understanding. These comments were mainly made by Stage 1 and 2 students, leading one to suggest that perhaps the material in their modules is more conducive to having low-stakes, weekly assessments that test understanding.

> *Small weekly quizzes were good to ensure I kept up to date, without an overwhelming amount of content having to be covered in the short time slot* Stage 1 Social Science

> *Having a quiz to do every week helped me stay abreast of what I needed to be able to do. Constant checking of progress and clarifying my level of ability made it very easy for me to tell how I was doing.* Stage 2 Social Science

> *I found the online software quizzes at regular intervals helpful as it gave me a structure of content that I had to complete by a certain point. (I struggle with self-directed learning).* Stage 2 BA

On the other hand, requiring students to engage with too much continuous assessment can be detrimental in terms of them keeping to a schedule. (One can argue that this can happen when students are on campus too!)

> *Due to the lack of timetable I began to study modules at different times than normal and this would result in not being prepared for an online lecture and so I wouldn't be able to keep up. This was partly due to the higher number of assignments after the closer* Stage 3 Science

We know from (pre-Covid) experience that even with a weekly timetable of lectures and tutorials, not all students will "show-up" and engage. However, if a module coordinator does not ensure that their module has structure, with a clear weekly timetable, or is late in uploading content, then maintaining motivation may be challenging for students.

> *I prefer pre closure by a mile. Studying at home by yourself is way harder and no fun. Also the timeline that material was posted online was a bit overwhelming and not evenly spaced.* Stage 2 BAFS

> *When there are no set classes and timetables it is very easy for lecturers to just upload notes and not carry on teaching. It is these modules that are difficult to work through.* Stage 3 Science

Ensuring that a module is well-structured, with a clear weekly timetable and goals is a great start for module coordinators and lecturers. But we must remember to communicate this clearly and frequently to students.

> *Online learning would be sufficient if there was good communication between lecturer and students*. Stage 1 BAFS

Highlighting the importance of communication between lecturer and students leads us to the next subsection, which reports students' desire for interaction – interaction between lecturer and students, and between students and students. This was a predominant theme in terms of what students reported as missing in relation to their learning from a face-to-face environment.

3.2.3. *Negative – Loss of Interaction*

As mentioned above, for students who participated in on-campus life pre-Covid, the absence, or reduction, of interactions with friends, classmates and lecturers was sorely felt, and just like the absence of structure to one's week, could impact motivation.

> *Post closure of UCD I and many other students found self motivation to be extremely difficult; without the incentive of face to face interaction college felt very meaningless and unengaging. I don't think this is the fault of those teaching but it certainly impacted my academic performance and my desire to learn*. Stage 1 Science

> *Face to face hours were invaluable. Not only in understanding work but keeping course moral high*. Stage 1 BAFS

Several students reported that **interactions with friends** was what they missed from the face-to-face environment pre-Covid, not only from a social perspective but also in terms of their learning. Students from across stages and disciplines felt that the lack of interactions with classmates impacted negatively on their learning.

> *Post closure of UCD, I particularly missed being able to contact my friends about course work. It was more difficult to discuss mathematical problems and questions through text/video. Being able to confer with them during tutorials, as well as outside of lectures, was a big part of my understanding of maths, especially as it is not always feasible to contact a lecturer about small issues you may have regarding certain course work.* Stage 1 BAFS

> *Really prefer face to face learning especially as it's much easier to interact with classmates. For tutorials in particular I find it helps to be able to discuss problems with classmates and help each other figure it out together, this aspect of learning was really lost in the online learning I found. […] Often feel quite isolated when completing at distance learning and find it harder to reach out for help.* Stage 1 Science

> *However I really missed the interactions with my peers and the collaborative element to learning. It has made me realise how much I learn from the people around me and everyone being based on campus provides a great environment for collaborative learning.* Stage 2 Science

> *For me, the worst thing about college at a distance is the loss of discussion with classmates. Having friends explain things to me helps my learning accelerates my learning greatly.* Stage 3 Science

Face-to-face **interactions with lecturers and tutors** were also missed in the move to online learning. Therefore it is not surprising that when asked about what aspects of online lectures and tutorials were beneficial for learning, a number of students reported that they found interactive sessions useful.

> *For [one module] we had a live classroom feature where we could ask the lecturer questions directly and in person which was very beneficial.* Stage 1 BAFS

> *I found tutorials with more active engagement, either through labs or online, more beneficial.* Stage 4 BAFS

A number of students noted the difficulty of having effective interactions with lecturers, tutors and peers in online environment, and would really prefer if these interactions could occur in a face-to-face (on campus) environment.

> *My ideal learning environment would involve face to face tutorials as it is difficult to ask questions/do group work online.* Stage 1 Science

> *I think the tutorials are more beneficial face to face as it was difficult to answer any questions or write out solutions on virtual classroom.* Stage 2 Science

> *Online format was not as effective as sitting down with a tutor and being to discuss what you are not understanding. Stage 2 Social Science*

> *I would rather have tutorials face-to-face, as they encourage us to ask questions, which is easier to do in person.* Stage 4 Science

Several times in examining students' responses to the study, we noted that students had diverging views, indicating that we should be cautious when drawing definitive conclusions. For example the stage 4 student who made the last comment felt it was easier to ask questions "in person", whereas another stage 4 student felt the opposite.

> *The 'raise your hand' feature on brightspace made it easier to ask questions, without the nervousness that may come from speaking in front of a crowded lecture theatre.* Stage 4 Science

It is worth noting that sessions do not have to be synchronous to be considered interactive. In some modules, discussion boards seemed to provide an effective, interactive learning forum.

> *My lectures have all been very active on discussion boards, or easily accessible through email. This made it so any question I asked they had time to think of an answer and get back to me with a solution. They did not take long to respond and I have had no issues being able to understand course content.* Stage 4 Science

> *Discussion boards were extremely useful, have never seen so many people ask questions and I have never been as inclined to before. Very useful to be able to read other peoples questions and to be able to go back over them at different points.* Stage 2 BAFS

The ability to ask questions, and have them answered in a timely manner was a common theme in students' responses (as many of the quotes above show). Questions that they may have posed to lecturers after class, or to a tutor one-to-one during a tutorial, or to peers in an on-campus environment, now had to be posed and answered in a different way. They appreciated efforts to have their questions answered in an online format, and felt frustrated when it seemed they did not a have forum to do this.

> *Doing maths modules, a lot of the time small issues can be cleared up by asking a quick question in tutorials or lectures but this is not possible through online learning.* Stage 1 Science

We finish with a suggestion made by one student of how the idea of asking questions after a lecture might be replicated.

> *Maybe small 20min group meetings with a lecturer to maybe ask any questions (almost the equivalent to asking questions after a lecture).* Stage 4 Science

3.3. Students' Perceptions of the Affordances and Constraints of Online Delivery of Lectures and Tutorials Specifically

Some of what we discuss in this subsection has been alluded to above, and certainly the findings above provide a context for the results that follow.

3.3.1. *Delivery of Lectures Online*

In Section 3.2.1, we outlined the many benefits that students perceive are afforded by making recordings of lectures available. The majority of students who spoke about favouring live/synchronous lectures over pre-recorded ones, were clear that recordings of these lectures should be made available afterwards.

We have touched on some of the benefits that students describe of a lecture that is offered live/synchronously. Firstly, its delivery and scheduling helped provide structure to the week with students feeling they have to show up and be prepared at a particular time. Secondly, students see the ability to ask questions and interact with the lecturer as another benefit of the live/synchronous lecture.

However, we note that not every live/synchronous lecture will necessarily be interactive, just as not every lecture held on-campus will be. (In the quote that follows, the student uses the phrase "straight lecture" which was described in the

survey as a lecture that "features almost exclusively formal in-class presentations by the lecturer".[2])

> *More interactivity in the lectures themselves would be good. This is because it can be hard to stay engaged in an environment at home that's not designed for learning like lecture theatres are. There's always some distraction and often in live straight lectures the lecturer is oblivious to questions being asked. It's very easy to fall into a state of switching off when a lecturer is not clear and not answering questions*. Stage 2 Science

Managing interactions in live, online lectures is something many of us are unfamiliar with and may need to get creative and/or engage in some upskilling.[3] And as another example of diverging views amongst students, not every student wants to engage in a live/synchronous lecture.

> *I've found the new environment to have benefits and drawbacks. As I explained I loved the ability to rewind in lectures however, I found live lectures and tutorials to be terrible. They were very unorganised, a lot of connection issues and oftentimes a lot of time was wasted and distractions incurred from lectures hoping for students to engage. I understand their intentions however, there is very little they can do to force this when students don't want to engage and as this continues it conversely leads to disengagement.* Stage 3 Science

As this last comment indicates, just as students have connectivity issues, so too do lecturers. Where the lecturer's broadband was poor, or the lecturer was not familiar with the technology, or did not have adequate technology, students found live lectures frustrating.

> *I found live lectures to be very unhelpful. Professor dealing with internet connection issues, bad camera quality etc.* Stage 2 Science

> *If online lectures are a necessity, lecturers should be supplied with appropriate tools for drawing such as Wacom Tablets etc as the current Virtual Classroom wasted a lot of time when attempting to draw math equations etc which are critical for understanding.* Stage 4 Science

Where lectures were pre-recorded a number of students spoke about how a few short videos were better than a fifty-minute video for several reasons. As we have already seen, students with poor broadband coverage find it easier to download shorter videos. There was a perception that content was covered more concisely in short videos, the short length aided concentration and motivation, and if they were well labelled, finding material in a short video was easier.

> *I find a series of shorter videos easier to watch rather than one long video as you feel you are making more progress each time a short video is finished. I also find it quite hard to focus on a single video for longer than 30 minutes.* Stage 4 BAFS

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[2] Danielson, J., Preast, V., Bender, H., & Hassall, L. (2014). Is the effectiveness of lecture capture related to teaching approach or content type? *Computers and Education, 72*, 121-131.

[3] The following podcast contains some nice examples of managing interactions in live, online sessions using Zoom: Stachowiak, B. (Producer). (2020, August 27). *Teaching Effectively with Zoom with Dan Levy* - Teaching in Higher Ed, Episode 324 [Audio podcast]. Retrieved from https://teachinginhighered.com/podcast/hyflex-learning/

I favoured the short videos as they condensed the information and were easier to stay concentrated for as it was only a short period of time. Stage 1 Science

I notice that lecturers (sic) provided in pre-recorded form were typically edited / cut / split into smaller chunk in some fashion which made them more concise, the it enabled the same amount of content delivered in a lecture could be delivered more concisely and to some extent better presented, which made the content easier to digest. Stage 2 Science

Breaking lectures up into sections - three or four videos per lecture, instead of one hour-long video - was much better. Stage 2 Social Science

Short videos were better labeled to what content they contained was very useful for revision or prioritising work. Stage 4 BAFS

Not all lecturers offered live/synchronous lectures or pre-recorded lectures, and here students were very clear that providing a set of notes alone was not sufficient.

My ideal learning environment would consist of some sort of voice/video aspect that explains certain concepts covered in lecture slides. I found lecture notes alone made learning more difficult. Stage 1 Science

It's very difficult to teach yourself many aspects in maths so lecturer and tutor engagement is crucial. Some modules had no teaching aspect at all after the closure and it was impossible to self teach. Stage 2 Science

Posting just the notes and having a discussion board is borderline useless, why would we pay fees for that when we could buy a text book and use stack exchange instead? Stage 4 Science

Live lectures were, by far, the most effective way of teaching. Notes only was a disaster. Stage 4 Science

3.3.2. *Delivery of Tutorials*

Much of what holds for the delivery of lectures, also holds for the delivery of tutorials. Live tutorials have the benefit of affording more interaction between lecturer/tutor and students, and allow students to ask questions and work on problems together. Some students noted very positive experiences of live, interactive tutorials.

The live workshops were very helpful. We were broken into small groups on virtual classroom as we would normally be in the face to face workshops. This meant that any questions we had could be answered either by others in your group or the tutor without disturbing the whole tutorial group. The solutions for this module were also posted after both tutorial slots had taken place which was a great resource for studying. Stage 2 Science

However, as with lectures, students found it difficult to share work and write mathematics when working in groups in live/synchronous tutorials.

As one might expect, students appreciated when written and/or recorded solutions of problem sets were posted.

> *I also found uploaded worked solutions to problem sheets very helpful.* Stage 1 Science

> *As well as the discussion forums on brightspace the solutions were posted online which ensured you could check your solutions just like you would have done in the face to face tutorial.* Stage 4 Science

Some modules had a discussion forum where questions could be posted. Students from several stages reported that they found them very beneficial – they could ask questions, see what other questions had been asked by students, and the forum afforded a sense of transparency to the amount of support that was being provided to all students in a way that emails might not.

> *Forums were something I hadn't seen used before and I thought they were very good. I don't like feeling like I'm bothering lecturers with too many questions so it's nice if someone has already asked it and you can see it.* Stage 2 BAFS

> *I think discussion boards were helpful and they hadn't be utilised as well before. It just doesn't make sense that we all email lecturers the same questions individually.* Stage 2 Science

> *I liked how the discussion forum for "module 1" meant all the questions were there and could be referred back to. So there was no asking a question twice and if other people had questions that I was interested in and hadn't thought of asking, I could see the questions and answers. The tutor was always prompt in answering even outside tutorial times which was really great for immediate help.* Stage 4 Science

> *People who were shy and wouldn't normally interact in class, were more comfortable interacting in the discussion boards.* Stage 4 Science

> *Discussion board being used was great for transparency. Usually lecturers would respond to questions 1 on 1 via email but it was very beneficial to see other peoples questions.* Stage 4 Science

However, there were some negative experiences with discussion forums. Some students were reluctant to post questions when the posts were not anonymous.

> *The notion of the Brightspace forum is great but for those of us who are shy/would rather not have our peers viewing every single question a degree of anonymity would help.* Stage 1 BA

Others felt that a discussion forum was not effective if the tutor/lecturer response was not sufficiently timely, while another felt the discussion tool on Brightspace was not suitable.

> *Also the use of the discussion boards was helpful if questions were answered regularly. When lecturers/tutors were slow to respond (a day or two), this was very restrictive to learning.* Stage 4 Science

> *The discussion board available on Brightspace is not at all suitable for any sort of high quantity discussion such as this*. Stage 4 Science

Another form of support that some students mentioned as useful were "live" office hours and study sessions.

> *I didn't find live lectures useful at all, however live tutorials/ open office hours over zoom were very helpful.* Stage 3 Science

> *In one module the lecturer did exam prep sessions where he simply sat there with the camera on working on his own stuff until someone asked a question. I enjoyed working quietly through problems in this environment knowing I could ask a question if I needed to. You could here the birds singing in his garden and his cat came in a few times. He was busy with his research. It was a really pleasant working environment. Mostly we just stayed quiet and I got a lot done.* Stage 3 Science[4]

Only a few students spoke about the move to online computer laboratories. In general they found that the laboratory experience suffered due to the difficulty of sharing code.

> *I felt that my laboratory tutorials particularly suffered due to the move to online learning as although we tried working in groups on the blackboard VLE it is quite difficult to describe code without constantly just sharing one's screen. Before the move online the tutors were of huge benefit to these lab sessions, however after the move online I definitely felt more alone in my learning.* Stage 2 Science

3.4. *Students' Perceptions of At-Distance Examinations*

Assessment methods were not the focus of this survey, however some references to assessment were made when students were describing their ideal blended learning environment.

As we noted above, frequent, low-stakes quizzes proved popular as a means to motivate students to "keep up" with the module, and to assess their learning. In addition, a few students found the move to "open-book" exams refreshing, as they did not feel that they had to learn material off by heart, and engage in rote-learning.

> *In regards to assessments, for quizzes etc. on software I think that the online quizzes on brightspace work very well. I think for exams where the goal is to analyse rote learning then of course the only way to do it is the traditional sit down 2hr exam, however for exams where they are testing ability to prove theorems, apply concepts etc. I did feel it worked better to have the exams open-book, as there was no way to cheat, the exams require an understanding of the material in order to be able to answer.* Stage 2 BA

> *In terms of assessment I thought that the introduction of more open book style assessments was of benefit to my learning. I felt I was able to focus more on my*

[4] Since first reading this comment we have observed that at least four of our colleagues have cats that like to walk in front of their computer screens when they are on zoom calls!

understanding of the content rather than getting bogged down learning off premises definitions and proofs. I also enjoyed that it was a chance for module coordinators to be more creative when it came to assessment, introducing new forms of assessment instead of simply following the previous years approach Stage 2 Science

We found another example of diverging views from students on the same issue – this time in relation to the absence of examinations in the RDS. While some students noted the stress of taking examinations in the RDS, another found the lack of "buzz" associated with doing exams at home difficult.

I found exams at home better because I find travelling to the RDS and the environment very stressful whereas when I'm at home I can control the environment around me a lot better. I also think open book exams helped me a lot because it's not rote learning things that's being tested, it's the understanding of the topic and the application of it. Stage 2 Science

I think at home exams were good as still hard but took away unnecessary stress of going to the RDS and no need to learn off formulae etc. when in reality knowing formulae isn't needed. Stage 2 BAFS

Assessment stayed the same other than doing exams at home. Time pressure is a lot harder at home as there's no exam buzz. Stage 3 Science

3.5. *Students' Suggestions for a Blended Learning Environment*

When responding to the question about their ideal, blended learning environment, a lot of students said they really hoped that we could revert back to an all-on-campus experience in the new academic year. With much regret, we feel that this is probably not going to happen in 2020-2021 ☹

Although we have more analysis to complete, an interesting observation is that in answering this question, many students came back again to the idea of interaction in sessions, and more specifically, to planned interaction. Their suggestions resonate with the idea of a flipped learning environment. In such an environment, the instruction is usually completed by the student before class, often through readings, but more commonly nowadays through video. Then the in-class time is spent with students working on tasks and problems, by themselves or in groups, with the lecturer providing support and managing the interactions.

Some students suggested that non-interactive sessions could be pre-recorded, in order that live/synchronous sessions might be freed up for more interactive activities and/or students could plan and prepare for the interactive sessions in advance.

I think nothing was lost by having face to face lectures prerecorded online. There is very little engagement in person at any of my lectures and I think people were more inclined to ask questions online. It is easier to understand material when you can pause and understand it as it is explained to you. I feel the same about tutorials, many of the tutorials which I have had so far involve very large groups of students and little engagement so it makes sense to have these recorded online and students

can watch them whenever they want. Obviously it is difficult with funding etc to do a lot differently but i think ideally face to face time would be much more interactive to deepen understanding and applications of material with prerecorded content used to explain content initially. Stage 2 BAFS

I personally think lectures could exclusively be replaced by tutorial sessions where we work through examples of questions. And notes can be read at home instead of formal lectures. It allows for a better understanding of the maths cause we have seen more examples, maths learns by doing not reading out loud. Stage 3 Science

We are aware that we are about to present an excessive amount of quotes. However, we were so impressed by the thought and attention that several students gave to these responses that we would like you to hear their suggestions for encouraging interaction in live/synchronous sessions:

My ideal: pre-record lectures and post them along with notes and exercises online. Let us watch these in our own time and read through notes in our own time. Have free discussion sessions maybe once a week - preferably very small groups (maybe 2 or 3 students at a time in lecturer's office) where we can have an open conversation about what we are learning independently - ask questions about problems and confusions but also present to the others what we have come to understand and feel part of a mathematical community by sharing our enthusiasm. Stage 3 Science

My ideal tutorial: Lecturer sets a problem sheet a week in advance. Students attempt all questions beforehand (and tutor checks they have done this....maybe some are for graded homework) Tutor then spends the class running through the problems on the sheet with student input. Some tutorials can be very frustrating because time is wasted while students attempt problems for the first time - i think this work should be done at home so time to answer questions and see worked examples is maximised. My ideal lecture: I would like a combination. Use prerecorded video lectures which would then free up time during live lectures to ask questions and work through some examples. Stage 3 BA

I believe the ideal blended learning environment would be where short video lectures are uploaded for a week's lecture material and tutorials and then the following week there would be a single face to face lecture where lecture runs through the material again from the previous week allowing students to easily ask them questions as they go through the material again. Stage 3 Science

The best classes were the ones that were prerecorded and you had to work your way through without any extra notes, but a follow up tutorial would have been helpful where students could ask questions. Maybe several smaller tutorials with 5-7 students and recorded lectures would work well, as you would be able to have a camera on and actually engage with the lecturer. Stage 3 Science

One of our lecturers used polls for us to vote on answers to questions during the lecture which was helpful in keeping the class engaged. Stage 3 Science

Lectures pre-recorded online of the main material. Regular (perhaps every week or two) meetings with lecturers allowing the opportunity to ask questions on the material AFTER students have had the opportunity to look at it and pinpoint any issues in understanding. This would even save time for lectures. In person tutorials.

This more appropriate situation for a more engaging environment, allowing students to ask questions as problem questions are discussed. Stage 3 Science

Posting notes online prior to lectures so students can be prepared with questions for these live lecture interactions (it's difficult to have questions on material just gained 5 mins prior). Stage 3 Science

Notes and problem sheets would be ideal to have posted online in advance. I think it would be beneficial if the lecturer to have organised voice call on brightspace where students could discuss problem sheet/notes/ideas themselves. Having a weekly timeslot for student group discussion would encourage students to join in the call even if they don't have any questions to ask the lecturer. Although some friend groups organise voice calls themselves to work on problem sheets, this would allow the whole class to bounce ideas off each other. An issue with this is that would only work with smaller class sizes, and maybe only stage 3/4 students. Stage 4 Science

Ideally, live lecture slots would be practical sessions with plenty of examples, whereby an understanding of the current weeks notes is assumed. Stage 4 Science

4. Discussion and Recommendations

The quality of the students' responses to the open questions on the survey suggest a desire for us to hear their experiences of online learning - what they perceived as beneficial in terms of lectures and tutorials in the move to online; what they missed from the pre-Covid face-to-face environment; and, what aspects of online and face-to-face learning they would like to see in the future. When drawing conclusions from students' responses, it is good to remember the diversity of respondents in terms of their stage of study, programme, and prior learning in UCD. For example, we note that students in stages 3 and 4 were more inclined to give more detailed, lengthy, and wide-ranging responses than some of those in the earlier stages. Undoubtedly their comments are informed and shaped by all their past experiences of studying in UCD. In addition, all of the respondents in the survey had spent seven weeks on-campus before the move to online, therefore their experiences of online learning will undoubtedly be different to that of students engaging in online, or blended learning, in a module from the first week. We need to consider what extra supports we need to put in place for these students at the start of their module in 2020-21.

General comments relating to the affordances and constraints of learning in lockdown resonate with those of workers from all over the world who were working from home, including lecturers! Some students found themselves in home-environments that were not conducive to learning for many reasons: lack of quiet spaces to study; poor connectivity; lack of appropriate hardware; or, juggling work with caring commitments. On the positive side, some students found themselves with extra time in their day when freed from a long commute. Some of our students have incredibly long commutes to university, and when things return to "normal", we should consider what we can retain from the online experience to give these students more flexibility and time in their schedule. Again, this is a consideration for employers and employees worldwide

– how can we keep the good parts of lockdown, such as lack of commuting, when things return to "normal"?

In terms of students' perceptions of the affordances and constraints of online learning, some messages came across loud and clear. The availability of recordings of lectures and/or tutorials was a resoundingly positive aspect of online learning. Students used recordings to catch-up on missed lectures and some enjoyed (or required) the flexibility that recordings provided. They used the recordings to review material, and found the pause and rewind functions enabled them to work at their own pace. Interestingly a significant number of students spoke about how they used recordings to take notes – either when watching a session for the first time, or to annotate and improve notes taken during a synchronous session. Finally, they found recordings useful as revision aids for examinations. We want to emphasize that many students who stated a preference for attending face-to-face lectures rather than solely viewing recordings, also emphasized that recordings play a role in their learning. Therefore while some students will use recordings as a *substitute* for live lectures, many others will use them to *complement* the live lecture. These findings resonate with much of the research literature on how university students use lecture recordings, and mirror those in a study by the authors.[5]

Recommendation: Where appropriate[6], recordings should be made available as either pre-recordings of videos or podcasts, or recordings of live, synchronous sessions.

In terms of making pre-recorded videos, students spoke about finding short recordings useful for a number of reasons – those with poor broadband coverage find them easier to download; there was a perception that content was covered more concisely; the short length aided concentration and motivation; and, if they were well labelled, it was easier to locate what you wanted to engage with. A general rule of thumb, is that if you are recording a video you should try to make it no more than ten minutes long. If the content you are dealing with requires a longer explanation, then split it into multiple videos. Some educators advise that if you plan to make a recording of a live lecture available online afterwards, you may want to think about how you can splice the recording where natural breaks in the live lecture may occur.[7] And a key recommendation is to label your videos so that your students can easily find what they are looking for. A good idea is to state clearly both at the start of the video, and under the description on Brightspace, the learning outcomes the video addresses.[8] Finally, while you may

[5] Howard, E., Meehan, M., & Parnell, A. (2018). Live lectures or online videos: students' resource choices in a first-year university mathematics module. *International Journal of Mathematical Education in Science and Technology, 49*(4), 530-533.

[6] For example, it may not make sense to record sessions where the focus is on students working in groups, with little formal instruction provided.

[7] We came across this suggestion in the following podcast: Stachowiak, B. (Producer). (2015, November 25). *Making Online Courses Work with Doug McKee* - Teaching in Higher Ed, Episode 076 [Audio podcast]. Retrieved from https://teachinginhighered.com/podcast/making-online-courses-work/

[8] Section 3 of the following paper gives a suggestion for how learning outcomes can be used to organize a module and the resources within it, including short videos: Meehan, M. & McCallig, J. (2018). Effects on learning of time spent by university students attending lectures and/or watching videos. *Journal of Computer Assisted Learning, 35*, 283-293.

want to discuss current topics in some videos, you may want to make other videos that you can use again, perhaps in later years. For this reason take care not to mention anything in the videos that will "date" them.

Recommendation: When pre-recording videos, plan on breaking a 50-minute lecture into 3-4 shorter videos and label them. When making recordings of live sessions available, think about how you could splice them naturally into smaller videos.

In the move to online learning, a clear message from a significant number of students was the need for structure or a schedule to be maintained. This is where these students had an advantage over those engaging in a blended or online module from the start – they had followed a timetable of lectures and tutorials pre-Covid, and many of described attempting to maintain this timetable in the move to online. They did this in order to provide structure to their week, to prevent themselves falling behind, and to motivate themselves to work. They appreciated it when lecturers also did their best to maintain the pre-Covid timetable, and were critical when all the material was uploaded without a structure or time-line for learning.

Recommendation: Modules should have weekly schedules, outlining items such as what is happening each week, learning outcomes that will be covered, any deadlines for submission of work, and any assessments scheduled.

Live/synchronous sessions were cited as an excellent way to provide structure to a week, however we know that some students may not be willing/able to engage in synchronous sessions. Therefore for those who choose to use recordings only, clear weekly learning goals should be made explicit. This should encourage students not to leave watching all the recordings to the end – like binge watching a series on Netflix! Some students, particularly Stage 1 and 2, cited that low-stakes, weekly quizzes encouraged them to keep up with work in addition to helping them assess their learning.

If you do have a weekly schedule in place, it must be communicated to students. Pre-Covid you may have made announcements in lectures, or posted announcements on Brightspace, or sent the class an email. It is likely though that some students were made aware of what was happening from other students, or at least reminded by peers when deadlines were looming. If students are not meeting regularly on campus then we need to work extra-hard to communicate with them, as many of their informal communication channels may be down. Suggestions include saving up all you have to say and put it in a regular, weekly email, at the beginning or end of each week, explaining what was done the previous week, what is coming up the next week, and what deadlines are on the horizon. Even better if you complement your email with a short "talking head" video that summarises your message – put the link on an announcement on Brightspace, and perhaps send an email too. If you think are doing too much, then you are probably getting it right.

Recommendation: Maintain regular (weekly) communication with students about the module schedule, perhaps using more than one channel of communication.

While the lack of, or reduction in, social interactions was keenly felt by most people when the country went into lockdown, and the impact this had on well-being was well-acknowledged, students highlighted how they keenly missed the easy interactions with peers and lecturers that they enjoyed pre-Covid, and the negative impact this absence had on their learning. Many reflected on the role that peers play in their learning, formally in lectures and tutorials, but also informally working on modules outside timetabled classes. In most cases, students appreciated when lecturers and tutors conducted live sessions that encouraged interaction and invited student questions. The issue of "asking questions" was raised a number of times, and discussion forums were, in the main, seen as beneficial in this regard – not only were questions answered, but students could see what questions their peers had, and felt that there was transparency in the support being provided to students in the class. In addition, discussion forums are an excellent example of an asynchronous format for encouraging interaction.

Recommendation: Modules should offer some formats (e.g. live sessions, discussion forums, drop-in (online) sessions) where interactions between students, and between students and lecturers, can occur.

Where live/synchronous sessions are scheduled in a module, lecturers should think about how to maximize their effectiveness for student learning. For example, several students observed that there is little need for a "straight lecture" that invites limited or no interaction, to be provide live. Many students feel that it can be as effective (if not more effective!) to engage with such lectures via a recording. There were many suggestions from students about ways in which effective interactions could be promoted in a live session, mainly by taking what some refer to as a flipped-classroom approach – an approach that many lecturers are familiar with. When the number of live sessions (either on-campus or online) we have with students may be limited, we need to think about how to maximize their effectiveness for learning. If you find yourself in traditional lecture-mode during a live session, ask yourself if a recording may have been a more effective way to deliver the content!

Recommendation: Use live/synchronous sessions for encouraging interaction between students, and between students and lecturer.

It is also good to remember that while some affordances and constraints of online learning emerged loud and clear from our participants' responses – availability of recordings; the need for a weekly schedule; and the importance of peer and lecturer interactions - in other instances we found diverging views from students on several issues. Some students preferred live/synchronous lectures while others preferred pre-recorded; some found it easier to ask questions online, others did not; some preferred doing exams at home, while others did not; some thrived in the online environment, others hated it with a

passion. Students are individuals with their own tastes and learning preferences, and as is the way in education, one size does not fit all!

When designing our modules for the coming year, we should think about how to allow for flexibility in the way they are delivered and in the ways that students engage with them. In addition, if flexibility is built into the module, it should make it easier to plan for an uncertain trimester, where it may be necessary to go completely online at some stage. While building flexibility into a module is an ambitious goal, there may be simple ways to start. We give three examples. Giving a live lecture, and making the recording available afterwards is a good example – you cater for the person who wants to be in a particular place, at a particular time, along with friends, and you also cater for the person who cannot attend or would rather study in their own time. If you intend to pre-record lectures as opposed to giving them live, then make the pre-recordings available in time for the student who wants to keep to a schedule to view them during the assigned lecture slot. Again you are catering for those who like to keep to a timetable, and those who prefer a more flexible schedule. Or if you are giving an on-campus tutorial, arranging that some students can participate live via zoom, provides flexibility to those who have long commutes. Even when things return to "normal", we may want to retain some of this flexibility in our learning environments. This is sometimes referred to a "Hyflex Learning Environment"[9].

Recommendation: Think about how you can offer flexibility to students in how they engage with your aspects of your module.

Conclusions

It is our hope that this report and the recommendations contained within will highlight some of the big things that you may need to consider as you face into this academic year. But at the end of the day, it is still ultimately the pedagogy that matters – a well-designed module that promotes student learning will work whether entirely face-to-face on-campus, blended, or entirely online. The online environment is just a medium through which learning can be supported. And yes, we may have to up-skill a little on the technological front and get creative in how we do things, but the fundamentals of good teaching and pedagogy remain the same. As one wise final year summed it up:

> *Whether live or online, quality of teaching usually came down to organisation, quality materials, going through topics in depth. Therefore classes which were good pre lockdown tended to also be good post lockdown. Some lecturers had a better awareness of the technologies available which increased the quality of their lectures.* Stage 4 BAFS

[9]We highly recommend this podcast for anyone interested in how to make module delivery and engagement more flexible: Stachowiak, B. (Producer). (2020, May 12). *Hyflex learning with David Rhoades* - Teaching in Higher Ed, Episode 309 [Audio podcast]. Retrieved from https://teachinginhighered.com/podcast/hyflex-learning/

We acknowledge that this report may not answer any of the questions you have about assessment, especially how one assesses while ensuring integrity at distance. All we can say is … more work is needed.

At the end of this report we highlight some resources we have found useful. Our plan is to keep adding to this list.

Best wishes for the new academic year!

Acknowledgements

We want to thank our wonderful students for the time and effort they took to complete the survey. Their responses were detailed, informative, thoughtful and insightful. We hope that for those of you still with us in 2020-21, you will benefit from the insights the School gained from your responses. Thank you!

Resource Recommendations

We found the some of the podcasts in the Teaching in Higher Ed series produced by Bonnie Stachowiak really helpful. Plus there are transcripts available on the website if you do not have the time to listen to the podcasts.

Here are some of our recommendations:

- **Episode 076** – November 25, 2015. *Making Online Courses Work with Doug McKee*: https://teachinginhighered.com/podcast/making-online-courses-work/

This episode is nearly five years old. Therefore some of the technology comments may be out-of-date. However this is a great podcast in thinking through some of the challenges of teaching online, with great tips. Well worth a listen!

- **Episode 309** – May 12, 2020. *Hyflex Learning with David Rhoads*: https://teachinginhighered.com/podcast/hyflex-learning/

This podcast explains why you might want to build flexibility into your modules, and gives suggestions for how this can be done.

- **Episode 316** – July 2, 2020. *Designing for the Uncertain Fall with Maria Andersen*: https://teachinginhighered.com/podcast/designing-for-the-uncertain-fall/

Highly recommend this podcast – it does what it says on the tin and contains excellent ideas and tips. In fact there are two other podcasts in this series with Maria Andersen – recommend both!

- **Episode 177** – November 2, 2017. *Learning is Not a Spectator Sport with Maria Andersen*: https://teachinginhighered.com/podcast/learning-not-spectator-sport/

- **Episode 234** – December 6, 2018. *A New Lens to Support Learning Outcomes with Maria Andersen*: https://teachinginhighered.com/podcast/a-new-lens-to-support-learning-outcomes/

- **Episode 324** – August 27, 2020. *Teaching Effectively with Zoom with Dan Levy:* https://teachinginhighered.com/podcast/teaching-effectively-with-zoom/

In this podcast you can hear about tips for using zoom to promote and facilitate interaction in live sessions.

- The IUA hosted the following webinar on May 25, 2020: 10 Simple Rules for Supporting a Temporary Online Pivot in Higher Education. The preprint on which the webinar is based can be found here: https://psyarxiv.com/qdh25 The webinar can be viewed here: https://vimeo.com/434674827