ACTIVE ONLINE; NOT ACTIVELY LEARNING

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This paper is a personal reflection of small-class tutorials for two first-year university statistics courses (150 and 2000 students each), with a few modes of learning implemented – in-person, compulsory and non-compulsory tutorials, asynchronous peer discussion videos and tutor videos, as well as live online tutorials. Although limited empirical evidence is presented, the following depicts the difficulties of implementing active learning in an online environment during Covid-19. The purpose of this paper is to highlight that, while the adoption of online teaching required rapid adjustments, we can now make improvements to help maintain quality teaching and social connection within our classes. It is important we spend time investigating how to better encourage active learning, with empirical evidence needed to guide future practices.

BACKGROUND

Constructivism is a learning paradigm frequently adopted in modern education. Essentially, constructivism is about actively *constructing* connections between knowledge, either in a cognitive manner (Piaget's cognitive constructivism), socially (Vygotsky's social constructivism), or through experiences (von Glasersfeld's radical constructivism) (McLeod, 2019; Pale et al., 2013). The following presents an indication of how constructivism might be used in classrooms. A more common phrase encountered, in curricula for example, is the idea of "student-centred" learning. This is where students develop their knowledge through actively participating in the learning process (McLeod, 2019). Active learning is currently advocated for primary and secondary schools, as well as for small class tutorials at university, whereby the teacher (or tutor) takes on a role of a facilitator of learning (Fields et al., 2006; McLeod, 2019; Miller, 2002). Connected ideas include social interactions, relating new ideas to prior experiences, as well as, specific to statistics, student-generated data, data exploration, simulations, and experiential modelling (Miller, 2002).

Digital technology can clearly support active learning in classrooms. For example, student-generated data can now be more easily explored through multiple representations with the use of tools, such as iNZight (Wild, 2018). Modelling and simulations with digital technology enables students to focus on the concepts and connections, rather than spending time on instructional tasks relating to creating plots and calculating summary statistics (Ben-Zvi, 2000; Chance et al., 2007). The pairing of digital technology and well-designed tasks inviting student discussions can lead to thorough explorations of concepts… but only if the students are there to complete the tasks and are open to discussing ideas. However, literature suggests that online learning may be beneficial to students' learning experience when implemented effectively (Curtis & Lawson, 2019). Online learning is not new and there are numerous online resources for education, both as a substitute for in-person learning and as a supplement (for example, for students having difficulty with a subject). A google scholar search results in numerous papers from throughout the 2000's relating to aspects of online learning. Yet, Covid-19 brings new challenges for education with the rapid adaptation required by previously in-person teaching and a large number of students who now depend on online learning. The focus of this paper will be pre-recorded video tutorials and live virtual tutorials.

Pre-recorded video tutorials are asynchronous, with delays between interactions (Chen, Shang, & Harris, 2006; Craig, Chi, & VanLehn, 2009; Curtis & Lawson, 2019). Asynchronous tutorials limit the opportunity for students to ask questions and can be a much more passive delivery (Chen, Shang, & Harris, 2006). This is also dependent on the video viewing platform working for all students and, in particular, that students have access to the internet. On the other hand, students can watch asynchronous tutorials at a time that suits them, wherever they are (Chen, Shang, & Harris, 2006) – anyone, anywhere, with access to the videos can participate in this learning. This would be highly beneficial for students who work whilst studying, such as teachers in professional development courses, as well as students who reside overseas or out of town, have children to look after, or prefer not to travel to the university for health reasons, especially with the presence of Covid-19. The resource is available to be viewed at any time and students are able to view the videos more than once if needed. Furthermore, this data can often be collected via the viewing platform, providing more information for course development.

In: R Helenius, E Falck (Eds.), *Statistics Education in the Era of Data Science*
Proceedings of the Satellite conference of the International Association for Statistical Education (IASE),
Aug-Sept 2021, Online conference. iase-web.org/Conference_Proceedings.php

Live virtual tutorials are real-time or synchronous – either in-person or online. These tutorials allow students to ask questions when they come up and receive as much guidance as necessary to clarify parts of the content, they are having trouble with. There is also a much more social aspect to live tutorials, whereby students have an opportunity to learn from each other. However, live tutorials (either in-person or online) are restricted by timing and/or location. Further, live online tutorials are still restricted by access to the internet and performance of a conferencing platform. A blended approach may provide a "best of both worlds" scenario. This could involve, for example, a mixture of both in-person and asynchronous learning. A combination of group-based learning and independent learning could present a cognitive constructivism and social constructivism balance that allows students autonomy over their learning (Hoic-Bozic, Mornar, & Boticki, 2009). This hybrid learning approach can help motivate students to participate and encourages active learning, particularly in large courses (Kenney & Newcombe, 2011). Literature suggests asynchronous learning may not be as beneficial as face-to-face learning but there is still more development that could be done in this area to help improve effectiveness and blended learning is one approach that could help facilitate this (Chen, Shang, & Harris, 2006; Curtis & Lawson, 2019; Hoic-Bozic, Mornar, & Boticki, 2009; Kenney & Newcombe, 2011).

REFLECTION

This section will reflect on my experience as an early career educator in my role as a tutor at the University of Auckland. My hope for this reflection is that you will be able to draw parallels to your experiences, or identify differences between them, as well as consider how we, as a community, might develop our online teaching going forward. The following commentary describes six experiences focusing on student-tutor interactions.

The courses referred to are:

- STATS 10X (Introduction to Statistics) – the University of Auckland's introductory statistics course taken by Arts, Science, and Business students alike. This course has an average of 2,000 students enrolled each semester, many of whom are enrolled as a core requirement. Tutorials are non-compulsory. https://www.stat.auckland.ac.nz/courses/stage1/STATS_101
- STATS 150 (Lies, Damn Lies, and Statistics) – centred around statistical literacy and critical thinking, this course has between 100 and 150 students enrolled each year. Students tend to take this course as part of their general education requirement or to contribute towards a degree in Statistics. Tutorials are worth 5% towards students' final grades. The tutorials are designed to be hands-on and prepare students for their assessments. https://www.stat.auckland.ac.nz/courses/stage1/STATS_150

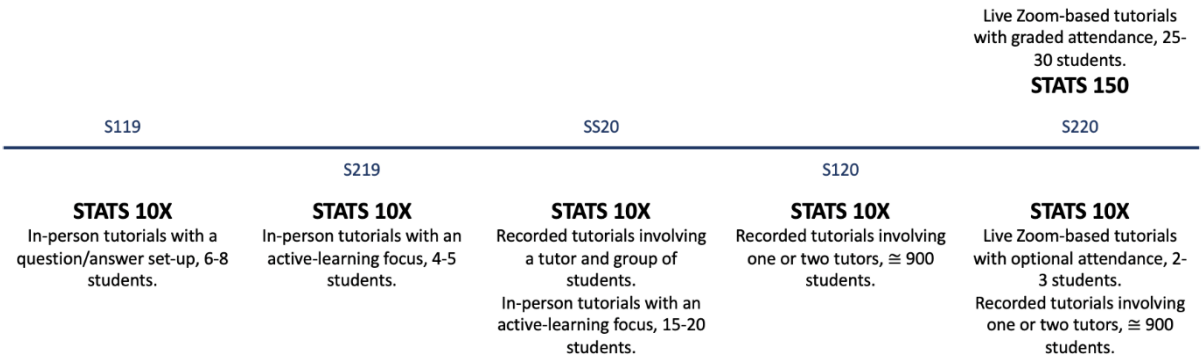

Figure 1. Timeline of course involvement and student attendance

Semester 1, 2019 (S119): STATS 10X, in-person tutorials with a question/answer set-up

Traditionally, STATS 10X tutorials typically gave students time to answer questions before the tutor asked for feedback and provided an outline of answers (which are already available in the back of their coursebook). When I started tutoring STATS 10X, the question/answer set-up worked well for someone who had no prior experience teaching. There was little discussion between students and no requirement to encourage group work – most students just wanted to copy down the answers and pass

the course. A few high achievers would also attend for practice and to clarify more in-depth ideas. As such, there was limited implementation of constructivism principles.

In semesters 1 and 2, tutorial class sizes were typically around 6-8 students out of an average of 2,000 students enrolled in the course. This could be due to the answers being available to them already, being unaware of the tutorial help available (information is given online, in emails, and in lectures, however), or a preference for alternative support such as lecturer office hours, assistance room help, or peer study groups. For the number of students attending, the questions for each tutorial were well-designed for individual study and question/answer delivery. However, the tutorial style did not necessarily advocate student-led learning. Feedback from the students suggested they felt that working through the questions was beneficial for them, they appreciated the use of analogies, and thought the content was well explained. It was also common for feedback from the 10X cohort to ask for compulsory tutorials and more options for tutorial times. It seemed students preferred to have a timetabled tutorial to attend. Of course, with such a large enrolment numbers, compulsory tutorials are impossible to organise due resource constraints.

Semester 2, 2019 (S219): STATS 10X, in-person tutorials with an active-learning focus

Recently, the wider teaching team has been exploring ways of providing a more active learning space during tutorials. We took some time to explore how we could incorporate peer and class discussions, investigative learning, and collaboration. The purpose of these tutorials is to provide an additional avenue for students to encounter the material and ask questions, preferably providing a different learning approach than that experienced in the lectures. It was thought that removing the time given to going through solutions would allow for more time to focus on group work, stepping away from right and wrong answers and moving closer to explorative learning. The aim was to encourage student-led learning, but we were hesitant to change the tutorial questions. While appropriate for the content, some questions are not conducive for active learning. Fill-in-the-blank and short answer question formats were not easily adaptable to group work and it seemed students often preferred to answer these by themselves. Overall, students were rather resistant to the move towards active learning. While students can pass the course without attending tutorials, feedback from students who do attend suggest that the tutorials are beneficial for clarifying concepts. We outlined our expectations with a tutorial guideline sheet (inspired by Higdon-Topaz, 2008), which talked about sharing, communicating, and positive learning environments. However, students seemed hesitant to write on whiteboards, wander around and compare answers with other groups, and ask questions. A larger issue, particularly for group work, was poor attendance.

Summer Semester, 2020 (SS20): STATS 10X, recorded tutorials involving a tutor and group of students

Without knowing what was on the horizon, the STATS 10X team had begun exploring possible alternatives to our traditional in-person tutorial set-up. A vicarious style of asynchronous learning (Craig, Chi, & VanLehn, 2009), this involved three students who had recently achieved A grades in STATS 10X (which they were taking as a core requirement) and myself recording discussions about common concepts. We would pick a topic for the video and explore some of the underpinning concepts; discussing the difficulties the students had, explanations that helped them understand, and key information to remember, while mind mapping these ideas on a two-way whiteboard. These videos didn't really have questions to be answered and did not follow the tutorial outline. While the discursive nature of these videos was somewhat haphazard, often deep conversations about the content ensued, with the students being honest about what they had trouble with and helping each other along the way. First posted in the Summer Semester of 2020, these videos, covering a variety of content, were then uploaded to the student course platform. The videos were intended as supplementary to some kind of in-person connection and as such were asynchronous, with no active participation or social interaction required by the students viewing the videos.

Semester 1, 2020 (S120): STATS 10X, recorded tutorials involving one or two tutors

For the first semester dealing with COVID-19, asynchronous, pre-recorded weekly video walkthroughs were created and posted online. Initially, there was only one tutor discussing content and solutions to tutorial questions. This progressed to a more conversational set-up between two tutors. These conversational tutorials were much easier to record for the tutors involved as we had someone to

talk to and respond to our questions. This was, in part, inspired by the pre-recorded video discussions with students that had been recorded the semester before. The student-discussion videos were also available to students. Accompanying this, students had access to an online assistance room, where tutors answered students' questions about the assignment or content as and when asked (a drop-in help area), and also Piazza (a forum-based discussion site, Piazza Technologies, n.d.), where a set of tutors wrote explanations to students' questions. These recorded tutorials were hence the "in-person connection". A large amount of effort was put into making these video tutorials interesting and light-hearted for students. Reflecting on their experience, one tutor felt "[the] production of the recorded tutorials is hard for me to separate from the conditions in which they were produced: the new experience of social isolation, as well as the abrupt end to in-person teaching and learning. In this respect, I was very wary of a disconnect that students would be facing and the potential consequences of this, as I was experiencing that same disconnect" (S. Snell, personal communication, February 23rd, 2021).

However, as we were muddling our way through this change and Covid-19, the recorded tutorials ended up deviating away from student-based questions and, instead, focused on answering the tutorial questions. The original tutor had also mentioned that, "[though] at the time I greatly enjoyed creating the recordings and was proud of the work I was doing, it is now difficult not to find many things that I wish I had done better" (S. Snell, personal communication, February 23rd, 2021). While this sentiment is not uncommon, given the circumstances, I feel the original tutor navigated the new mode expertly on their own and my involvement in the recordings as the second tutor was only to help make the process easier and more natural. The videos produced are an in-depth exploration of the tutorials. The only trouble, in my opinion, was that students were not there to join in with the discussion and ask the questions that they were having trouble with – as tutors we had to use our prior experience to gauge the kind of questions and difficulties that a typical student would have. In saying that, feedback from students suggested that they were generally pleased the resource was available. Students were able to access the tutorial videos whenever suited them and could re-watch parts if they needed to. Approximately half of the cohort viewed the page holding the videos at least once.

Semester 2, 2020 (S220): STATS 10X, live Zoom-based tutorials with optional attendance

In semester two 2020, the pre-recorded tutorials from last semester and student-discussion videos for STATS 10X were offered again and online, Zoom tutorials were held each week. Initially, 6 tutorials were held over 2 days, like usual, but this was reduced to 3 tutorials over 2 days due to a lack of attendance. Frequently, there would be no students show up to these online tutorials and a whole 5 students attending was quite surprising. Motivating students who attended to then talk to us was a further hurdle… long bouts of silence was not uncommon, and it often seemed that students were only there for answers. As a tutor, it was extremely difficult to gauge how the students were actually doing with the content. Often, we were greeted with blank screens as students didn't really want to have their video on. This, accompanied by a lack of response from students, made it extremely difficult to implement an active learning tutorial. Some students, however, did begin to connect with us and better discussions unfolded. This was further aided by having two tutors available during a single session, whereby we could talk to each other and help create a more conversational environment for the students to participate in when they wanted to. Essentially, this became live versions of the recorded tutorials where students could ask questions as well. With very few students attending the live tutorials, there was limited feedback, but it seemed that our time was still appreciated by the students who attended regularly. Interestingly, while students seemed to appreciate the pre-recorded tutorials being available (again, approximately half of the cohort visited the page at least once), some students seemed to miss the opportunity to learn from other students. It is then surprising that there was a lack of attendance at tutorials if student feedback was asking for discussions and social interactions.

Semester 2, 2020 (S220): STATS 150, live Zoom-based tutorials with graded participation

Weekly tutorials for STATS 150 were held via Zoom. Three tutorial times were offered, as usual for in-person tutorials. Tutorials for STATS 150 were compulsory, so we regularly had 20 to 30 students attending the tutorials (in-person and online). This meant that groups could be made, often with four or five students per group. The tutorials for STATS 150 are designed to be implemented through active learning practices. Group work is part of the question design and discussion contributes to completion of the tutorial. Working on the whiteboards, comparing mind maps and answers, as well as team-

determined solutions are part of the tutorial. Obviously, not all of this could be implemented in the virtual versions but, in general, the same discussive nature was expected. Compared to the in-person tutorials, the effectiveness of group work seemed to diminish over Zoom. One, maybe two, students in each group would actively encourage group discussions and work on communicating an answer. These were often the same students each time and other students in the group would hesitantly participate, even in smaller breakout rooms. Many of the students would opt for no videos being shown and this made it difficult to gauge students' reactions to the content and questions. It was difficult to judge whether the lack of response was due to confusion, going through the content too quickly, or just shyness. Due to limited responses being offered verbally, students were encouraged to type their responses in the chat if they preferred. Considerably more students chose this method of communication and, while it made the talking very one-sided for me, at least now I could see that there were students listening and engaging and understanding what was being discussed. Feedback on the small group tutorials seemed generally positive, with students appreciating tutor feedback. It was not uncommon for students to comment positively on the group work aspects of the tutorials. Students also suggested that the online tutorials were organised well, and many acknowledged the effort put towards online group work and collaboration opportunities. However, the online tutorials were certainly less collaborative than ideal, and students seemed to prefer the in-person tutorials.

Comparison of Experiences

Overall, I enjoy implementing active learning in the tutorials and am frustrated by empty chairs and black screens. I often feel like the dude from the Titanic calling out from the lifeboat *"Is anyone alive out there?"*. I find, as an early career educator, that one of the biggest struggles is motivating students to care about the content, to see its value, and want to learn. This might not be possible in STATS 10X given many of the students are taking the course out of necessity – they likely don't see the value in learning statistics if they don't feel it applies to their future. Clarifying why the course is a requirement and demonstrating this with tutorial examples could help towards this. I have noticed that attendance is better when tutorials are compulsory (of course) and, with the increased attendance, group work was more effective. However, this was diminished in the online environment, where blank screens and silence were common. Students seemed to prefer typing responses rather than verbally communicating their ideas. Even those students who chose to attend optional tutorials seemed to prefer passive interaction. The student discussion videos are informal, manic, and show the challenges students face when encountering this content. The tutor videos are an in-depth explanation of the tutorial questions. Yet, being able to touch base with a human being and asking questions live seems to add something not yet obtainable without face-to-face discussions (either online or in-person). I hadn't previously realised how much information I observe in person; walking round and reading students' written responses, gauging facial expressions, overhearing conversations, picking out the correct whisper's students offer in response to questions, or even just knowing where students are at with the content based on how much they're writing down. Having been a tutor for some time now, I no longer want to just stand at the front and list the tutorial answers; I am really enjoying the experiences where students interact with me, ask crazy left-field questions that I've never come across before, and getting involved in student discussions as they sound out the content. This has happened in these tutorials, but nowhere near frequently enough and certainly not online.

IMPLICATIONS

What do I want? I want students to talk to me, and to each other, I want them to engage in the content, and I want them to ask questions when they don't understand. Student feedback has implied they prefer in-person, discussive tutorials with a focus on active learning. While live tutorials have time/location restrictions, the social interactions seem to be appreciated by the students and, as tutor, it is easier to tailor my tutoring to students needs when able to connect with them. However, the current pandemic means in-person tutorials are not feasible for everyone and an online substitute is needed. While the recorded tutorials and student-discussion videos offer flexibility for students, a social connection and active learning equivalent is still needed.

Encouraging attendance and conversations is difficult, however, especially while online. It isn't clear why student feedback and student actions are so polar – students seem to prefer attending live online tutorials without connecting in a personal way. Personally, I would rather talk to avatars than

black boxes. Even better, it would be beneficial to have some way for students to click on reactions that then change the avatars. If a student is confused, I want to see an avatar of the student with swirly eyes; if a student feels that the content is moving too slowly, I want to see an avatar of the student with z's floating out of their head; if a student is worried about the content, I want to see an avatar biting their nails. Some way for students to mind map live and collaboratively, with a chat box, would be great for adapting to student's hesitation to verbally participate. A platform that enables quick polls to be asked, or share drawings of plots, enter questions anonymously, would help to create an environment where students who don't want to be conversational can still participate in the active learning.

Essentially, research into why students are resistant to interacting and collaborating online is needed, more effective platforms for distance learning are also required, and discussion among educators about the techniques that work for them would be beneficial for maintaining quality teaching in these trying times. Online learning, implemented effectively, can be an adequate substitute but it is important we spend time investigating how to better encourage active learning. Empirical evidence from questionnaires and focus groups is needed to identify best practices going forward, which may involve an adaptation of content and delivery more suited to student preferences while maintaining beneficial learning approaches – discussions are important, even if they don't like participating in them!

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