"From hands-on to online"

Physiotherapy students' experiences of learning and assessment during Covid-19

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Abstract

In March of 2020, because of the *coronavirus disease 2019* (Covid-19) pandemic, the Irish Government announced that all schools and higher education institutions should close and make alternative arrangements for teaching and learning. *University College Cork* (UCC) closed on the 12th of March, with online teaching and learning provided for students from the 16th of March. In this study, interviews were conducted with the 2019/2020 cohort of 1st year MSc Physiotherapy students, capturing their responses concerning changing to online learning and assessment during the early stages of the Covid-19 pandemic. A thematic analysis was performed on their responses, to identify common experiences, perceptions, and opinions about online learning in Physiotherapy.

Perceived advantages to online learning included the ability to self-pace learning and consume material in smaller, more manageable chunks, the ability to review lecture content, leveraging technology for peer engagement and group-work, and perceived enhanced learning during self-directed and problem-based learning activities. Barriers to online learning included distractions in the work-at-home environment, technology issues, internet connectivity, time-consuming asynchronous content, difficulties asking questions during synchronous events, loss of face-to-face peer learning, challenges conducting group work online, loss of practical skills learning, concerns over future proficiency, and challenges with assessments conducted online.

For the theory parts of the Physiotherapy syllabus, students felt that, in the future, these could be delivered online. Based on students' feedback, some improvements for online learning were suggested, such as further leveraging technology for new types of learning activities to enhance student interaction and engagement. However, for the learning and application of practical skills, students felt that this could really only be done in a face-to-face manner. The results of this study should provide useful insights to MSc Physiotherapy programmes adapting to the current changes in teaching and learning.

Declaration

The MSc dissertation, "*'From hands-on to online' – Physiotherapy students experiences of learning and assessment during Covid-19*", submitted for the degree of the MSc in Human Anatomy is my own work and has not been submitted for another degree, either at University College Cork or elsewhere.

Candidate's signature:

Date: 13th August 2020

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Chapter 1

Introduction

Preface

In March of 2020, because of the *coronavirus disease 2019* (Covid-19) pandemic, the Irish Government announced that all schools and higher education institutions should close and make alternative arrangements for teaching and learning. *University College Cork* (UCC) closed on the 12th of March, with online teaching and learning provided for students from the 16th of March. In this study, interviews were conducted with the 2019/2020 cohort of 1st year MSc Physiotherapy students, capturing their responses in relation to changing to online learning and assessment during the early stages of the Covid-19 pandemic. A thematic analysis was performed on their responses, to identify common experiences, perceptions, and opinions, and the results of the analysis are presented in this dissertation in part-fulfilment of the degree of MSc in Human Anatomy.

1.1 COVID-19 Pandemic

In the wake of the 2003 outbreak of *severe acute respiratory syndrome* (SARS), caused by the *SARS coronavirus* (SARS-CoV), a surveillance mechanism was put in place in the Chinese healthcare system to monitor for cases of *pneumonia of unknown etiology* (PUE) — with the aim to help with the detection of respiratory infections that may be of public health significance (Xiang et al. 2019; Li et al. 2020). On the 31st of December 2019, the government in Wuhan, China, informed the *World Health Organisation* (WHO) that health authorities in Wuhan were treating a cluster of cases of PUE (WHO 2020b). On the 7th of January, the cause of these pneumonia cases was identified by Chinese authorities as a new type of coronavirus, in the same family as SARS-CoV (WHO 2020c).

In the following days and weeks, the virus spread across China, the first death from the disease being reported by the Chinese media on the 11th of January (Taylor 2020). The virus spread to other countries — on the 20th of January WHO reported the first confirmed cases outside of China, in Thailand, Japan and the Republic of Korea (WHO 2020c), with many other countries confirming cases in subsequent days. The first cases were reported in continents outside of Asia— in the United States on the 21st of January, in France on the 24th, and in Australia on the 25th (Kantis 2020). The virus made its way

to Ireland the following month with the first positive case being reported on February 29th (RTE 2020).

On the 11th of February 2020, the virus was given the name *severe acute respiratory syndrome coronavirus-2* (SARS-CoV-2), by the *International Committee on Taxonomy of Viruses* (ICTV), and the corresponding disease was given the name Covid-19 by WHO (WHO 2020a). The virus continued to spread globally, and on the 11th of March 2020, the virus outbreak was officially declared a pandemic by WHO (WHO 2020d).

1.2 Closure of Higher Education Institutions

As Covid-19 escalated, the governments and authorities in different countries started to put measures in place to try and combat the spread of the virus. The measures included, amongst many others: the closing of international borders; travel restrictions and travel bans; social distancing, advising against gatherings of people; advising people to stay at home; quarantining; lock-downs; contact tracing and testing; closing businesses, and, of interest to this research, the closing of schools and colleges (Aytekin 2020; Cohen and Kupferschmidt 2020; Gibney 2020).

In Ireland, on Thursday the 12th of March 2020, as recommended by the *Irish National Public Health Emergency Team* (NPHET), the Irish government announced that from 6 p.m. that day, all schools and higher education institutions should close and that institutions should make other arrangements for teaching and learning (NPHET 2020). That evening, the President of *University College Cork* (UCC) sent an email to all students stating that they would be following the directive issued by the Irish Government and that the UCC campus would close on that date. It also stated that online teaching and learning would be provided to students from the 16th of March.

Initially, the closure of schools and higher education institutions was to be until March 29th, however, due to additional public health measures brought in by the government on the 24th of March, and recommended by the *Department of Education and Skills* (DES) (DES 2020), UCC extended the closure until 19th of April, communicating this to students on the 25th of March via email from the *UCC Emergency Management Team* (EMT).

The decision was taken by UCC that all outstanding assessments would go ahead as planned, and that end of term written examinations would be substituted by online assessments via *Canvas* (*Canvas* n.d.), the *virtual learning environment* (VLE) which was already in use by UCC. This decision was communicated to students on the 18th of March via email and via the UCC EMT website, which was set up by the UCC EMT to provide up-to-date information for staff and students regarding UCC's response to the Covid-19 pandemic (UCC 2020a).

1.3 University Education Delivery

Traditionally, university teaching and learning involves the delivery of courses and course content in a *face-to-face* classroom environment on the university campus. Teaching is

delivered by the teaching staff to larger groups of students via lectures, and then the material is reviewed and discussed in smaller groups during tutorial sessions, and tested and applied during practicals, workshops, laboratory sessions or other small group settings which depend on the discipline of study involved. These face-to-face sessions are usually scheduled at set times with students expected to engage in independent study outside of these times.

The type of assessment that students are required to undertake will vary from discipline to discipline. Continuous assessment involves students being evaluated throughout the academic year via examinations such as written assignments, essays, in-class tests, quizzes and presentations, with the end of semester assessment usually comprising of final written examinations. Assessment may be formative, where it is used to give feedback throughout the term to the students and as an indicator to the educator of the progress of student learning, or it may be summative, which is an evaluation of the student learnings at the end of a given module or term.

For medical and health science-related disciplines, there are other types of practical assessment administered. *Spot* examinations consist of different stations containing different materials such as cadaveric and plastic models, microscopic slides and radiological images, and require the students to identify marked anatomical structures and answer short questions about those structures as they move through the stations. *Objective structured clinical examinations* (OSCEs) are designed to test clinical skills and competencies such as history taking, physical examination skills, communication and attitude (Zafar et al. 2013).

The interactions between students and educators, and the corresponding teaching and learning environments in which they occur, are often classified as either *synchronous* or *asynchronous*. Synchronous interaction is when communication occurs in real-time, and therefore "requires the presence of both parties at the same time for teaching and learning to take place" for example, face-to-face communication in a classroom environment or an online video-conference. Asynchronous interaction allows the sequence of communication between parties occurs at different times, and therefore does not require students and instructors (or students and other students) to be present at the same time (Chen et al. 2005).

Distance learning is an approach to education in which "instruction occurs while educator and learner are not in each other's physical presence" (Mehrotra et al. 2001, Ch.1). One example of distance learning is correspondence courses, where learning materials, assignments, corrections etc. are passed back and forth between student and instructor via mail. Any learning (such as distance learning) where instruction is facilitated by the application of digital computer technology, can be termed in different ways, for example, *technology-enhanced learning* (TEL) or *computer-assisted instruction* (CAI) (Kirkwood and Price 2014). Similarly, online learning encompasses any instruction that is delivered via the internet (*Preparing for the Digital University* 2015). Online instruction can be synchronous, where communication occurs via live chat or live video-conferencing, or it can be asynchronous, where communication occurs via email or message boards, and material can consist of lecture slides, pre-recorded videos, web-based audio-visual

resources, or any other material that can be delivered online.

Blended learning or *hybrid learning* is a combination of both traditional face-to-face classroom learning with online learning (J. MacDonald 2008). Using the definitions given by Gagnon et al. (Gagnon et al. 2020), blended learning uses asynchronous online instruction to enhance learning between face-to-face sessions and does not replace any face-to-face time, whereas hybrid learning utilises both synchronous and asynchronous online learning, some of which may replace face-to-face time, in order to maximise both learning environments.

Flipped learning (or *flipped classroom*) is another form of blended learning where students receive materials, such as asynchronous online lecture recordings, to learn in their own time prior to face-to-face time, and the face-to-face time is reserved for the application of knowledge via active learning activities. *Active learning* is where the students are actively involved in the learning process via activities such as discussion, small-group work, case studies and problem-solving (Røe et al. 2019; Bonwell and Eison 1991). *Problem-based learning* (PBL) involves the use of realistic problems, to be solved by the students, as a basis for self-directed, small group learning (Mahnaz Moallem et al. 2019, Ch.1). *Experiential learning* is learning through the experience of doing; *experiential learning theory* (ELT) looks at how knowledge is constructed through a four-stage cycle of concrete experience, reflective observation, abstract conceptualisation and active experimentation (A. Y. Kolb and D. A. Kolb 2005). *Hands-on learning* is a form of experiential learning, and in the literal sense involves the use of one's hands.

Teaching and learning in higher education is often supported using *virtual learning environments* (VLEs), for example, *Canvas* (*Canvas* n.d.), which are learning management software systems that can facilitate many teaching and learning activities: the communication between educators and students (both synchronous and asynchronous), the delivery of course material such as lecture notes and supporting audio-visual media and resources, and also the provision of online synchronous or asynchronous assessments (McAvinia 2016).

1.4 MSc Physiotherapy Moves Online for Covid-19

The MSc Physiotherapy programme is a full-time, accelerated, two-year pre-registration programme run by the School of Clinical Therapies in UCC. There are usually 30 students per cohort, with three semesters per year. During semesters one and two, students attend lectures and practical sessions along with engaging in independent learning, with semester three consisting of two blocks of clinical placements. Assessment is wholly continuous, consisting of tutorial performance, presentations, class tests, essays, OSCEs and work placement assessments. Teaching and practicals, for the most part, take place in the Physiotherapy Department, at Nano Nagle Place, and the anatomy practicals are delivered in the *Facility for Learning Anatomy Morphology and Embryology* (FLAME) laboratory, in the Western Gateway Building on the UCC campus (UCC 2020b).

The closure of UCC campus on the 12th of March occurred towards the end of semester two, during week nine of a twelve-week semester. The physiotherapy teaching staff contacted the students to inform them that the learning material for the rest of the semester would be made available on *Canvas* and that alternative arrangements would be made for the OSCEs. For the first-year students, the semester two modules that remained to be completed were: *Clinical Anatomy*, *Rehabilitation 2: Principles and Prescription of Exercise*, *Musculoskeletal Practice 1*, and *Clinical Practice and Professional Development*.

Pre-Covid-19, the delivery of these modules involved face-to-face teaching and learning consisting of lectures, tutorials, practical laboratory sessions where students had access to plastic and cadaveric anatomical models and computer-aided learning stations, and clinical skills laboratory sessions involving the teaching of hands-on identification, palpation and assessment of anatomical structures and human movement, and clinical reasoning skills.

As a result of the UCC campus closure, face-to-face lectures were replaced with pre-recorded *Microsoft PowerPoint* presentations with voice-over, and face-to-face tutorials were replaced with online video-conferenced tutorials using *Microsoft Teams* (*Microsoft Teams* n.d.). The lecture material for the *Clinical Anatomy* module was augmented with access to *Acland's Video Atlas of Human Anatomy* (*Aclands* n.d.). For the assessments, face-to-face OSCEs were replaced with online video-conferenced examinations, and face-to-face spot exams were replaced with online spot exams on *Canvas*. Table 1.1 outlines the changes that were implemented to the delivery of the teaching and assessment for the outstanding modules being completed by first-year students.

The schedule for examination and assessment remained the same and the first-year students completed their OSCEs, posters and presentations as per the original schedule, finishing on the 1st of May 2020. Clinical placement 1 was due to start in May, followed by placement 2 in July, however, students were unable to go on placements and they were deferred until Year 2. Part of the second year Physiotherapy syllabus was brought forward to June and delivered to students as a four week online block of learning.

Module	Original Delivery	Covid-19 Delivery
Clinical Anatomy	**Teaching:** - 4 hours teaching (F2F) – 2 hours lecture – 2 hours tutorial, alternating between —- FLAME lab cadaver-based teaching —- clinical skills lab **Assessment:** - Spot Exam, in FLAME laboratory (F2F) - OSCE (F2F)	**Teaching:** - 4 hours teaching (online) – 2 hours lecture, pre-recorded on MS PowerPoint with voiceover (asynchronous) – 2 hours tutorial, using MS Teams (synchronous) —- Movement analysis —- (No clinical skills online replacement) * additional resources provided - Aclands Anatomy" **Assessment:** - Spot Exam, using Canvas (online, asynchronous) - OSCE using MS Teams meeting (online, synchronous)
Rehabilitation 2	**Teaching:** - 4 hours teaching (F2F) – 2 hours lecture – 2 hours tutorial **Assessment:** - OSCE , 20 mins., 10 mins, prep, (F2F) - (1500 word written assignment - completed pre-Covid)	**Teaching:** - 4 hours teaching (online) – 2 hours lecture, pre-recorded on MS PowerPoint with voiceover (asynchronous) – 2 hours tutorial, using MS Teams (synchronous) —- (No clinical skills online replacement) **Assessment:** - OSCE using MS Teams, following same format as F2F (online, synchronous)
Musculoskeletal Practice	**Teaching:** - 6 hours teaching (F2F) – 2 hours lecture – 2x2 hours tutorial **Assessment:** - OSCE , 20 mins., 10 mins, prep (F2F) - (2500 word written assignment - completed pre-Covid)"	**Teaching:** - 6 hours teaching (online) – 2 hours lecture, pre-recorded on MS Powerpoint with voiceover, —- plus discussion forum on Canvas (asynchronous) – 2x2 hours tutorial, using MS Teams (synchronous) **Assessment:** - OSCE using MS Teams, following same format as F2F (online, synchronous)
Clinical Practice and Professional Development	**Teaching:** (completed pre-Covid) **Assessment:** - poster, printed (asynchronous) - poster presentation (F2F)	**Teaching:** (completed pre-Covid) **Assessment:** - poster, submitted electronically (asynchronous) - poster presentation, pre-recorded and submitted online (asynchronous)
Placement	Placement 1 - due to start May 1st Placement 2 - due to start July	Placement 1+2 deferred to Year 2

Table 1.1: Changes to year 1 MSc Physiotherapy teaching and assessment for semester 2 of academic year 2019-2020, due to Covid-19.

1.5 Aims of this Study

As a result of the changes outlined above, that occurred to the teaching and delivery of the MSc Physiotherapy programme, this study aims to answer the following questions.

1. What are the perceived advantages and disadvantages to students of online learning and assessment?
2. Is there a future role for online teaching and learning in an MSc Physiotherapy programme?
3. How can future delivery of online teaching and learning be improved?

1.6 Literature Review

Scope

The scope of this review is to look at the responses of higher-level educational institutions to the Covid-19 pandemic concerning the delivery of health and medical science education and examine the personal experiences to these responses.

1.6.1 Response to Covid-19 in other Institutions

Since the early stages of the Covid-19 pandemic, there has been an increasing amount of material published concerning the effects of the pandemic on health science education and the changes and adaptations put in place by institutions to deal with restrictions.

An immediate measure was taken by Moszkowicz et al. (Moszkowicz et al. 2020) at the University of Paris, where they implemented a daily medical education procedure incorporating clinical and anatomy lessons for medical students, who up to that point were practising in the surgical departments but were now confined to their homes. The procedure involved using video-conferencing software *Google Hangouts* (*Google Hangouts* n.d.) to schedule appointments to allow students to connect daily for live lessons. The authors advocate that such methods could be used post-Covid-19 as part of a hybrid or blended learning approach incorporating different teaching techniques that complement the traditional face-to-face learning. Srinivasan (Srinivasan 2020) undertook a similar initiative in the University of Singapore to deliver anatomy e-tutorials to medical students using *Zoom* (*Zoom* n.d.), and a subsequent survey of students and educators reported positive experiences, expressing that it facilitated engaging discussion and the ability to clarify doubts about the understanding of the material.

Pather et al. (Pather et al. 2020) examined the changes that were implemented to the delivery of gross anatomy education in 18 different institutions across Australia and New Zealand, by inviting anatomy educators in those universities to reflect on their experiences. Face-to-face lectures were replaced with either live-streamed lectures, or (more often), pre-recorded videos (both previously and newly recorded), which were sometimes augmented with scheduled live-streamed discussions. Sometimes lectures were broken down into smaller chunks rather than being delivered as one big topic. Practicals were replaced with asynchronous activities such as videos from online resources

such as YouTube (*YouTube* n.d.), and other multimedia resources. Active learning was facilitated online by asynchronous problem-solving activities (such as quizzes and case activities) and discussion boards, and synchronous live-streamed small group sessions. Often these materials were accompanied with explanatory videos which described the changes that were being made and also to explain how to use the new resources that were put in place. The academic year in Australia and New Zealand starts in January, and end of term assessments had not been completed at the time of writing of the article but it was anticipated by the educators that any assessment would be online.

In another study by Longhurst et al. (Longhurst et al. 2020), the authors performed a *strength, weakness, opportunity, threat* (SWOT) analysis on the changes to anatomy education reported by 14 different institutions across the United Kingdom and Ireland. For lectures, practicals and tutorials, the measures taken were similar to those taken in Australia and New Zealand as described in Pather et al. 2020. Again, lectures were pre-recorded and uploaded to VLEs for asynchronous learning, with *Panopto* (*Panopto* n.d.) being reported as the most popular lecture recording platform. Additional live sessions were held on video-conferencing platforms such as *Zoom* (*Zoom* n.d.). Anatomy practical sessions were replaced with resources uploaded to VLEs and augmented with digitised cadaveric material such as *Acland's*, videos from *YouTube* (*YouTube* n.d.) etc., and 3D virtual resources such as *Complete Anatomy* (*Complete Anatomy* n.d.) and *Visible Body* (*Visible Body* n.d.). In addition to uploaded material, some institutions held virtual live tutorial sessions on *Zoom* or *Microsoft Teams*. For the United Kingdom and Ireland, the Covid-19 pandemic occurred towards the end of the academic year, so Longhurst et al. also captured the changes and measures that were implemented by institutions for assessment. For institutions that had practical assessment as part of the curriculum (as some did not), some opted to cancel, while some held online spot examinations. Some institutions also opted to cancel the written examinations, but for the most part, the written examinations were changed to online quizzes and examinations, such as multiple-choice questions, extending-matching questions and open-book examinations.

For Physiotherapy (U.S.: physical therapy) education, C. W. MacDonald et al. (C. W. MacDonald et al. 2020) looked to gain an understanding of the delivery of manual therapy during the Covid-19 pandemic by performing a global survey of manual therapy education providers. The survey reported that there were several perceived challenges in delivering practical skills learning and instruction. With face-to-face instruction of hands-on techniques deferred indefinitely, some of the changes put in place to replace it included: the delivery of synchronous online instruction, provision of asynchronous recordings of techniques and supporting written material, and also video-review of student performance, whereby the students were asked to practice on family members and video-record the techniques being performed, and then instructors would review the videos and give feedback to the students. In some cases for the asynchronous instructional material delivered to students, the content itself was broken down into smaller chunks of 10-15 minutes, for easier referencing and viewing by the students. For other skills such as clinical reasoning and decision-making skills, students were given case studies and asked to submit videos of their reasoning process, and also case studies

were discussed in groups once they were completed by students. Moreover, the survey found that in many cases, practical examinations of hands-on skills and competencies were also deferred, but in some cases live or student-recorded videos were submitted for assessment with feedback provided by instructors.

1.6.2 The Educator Perspective on Covid-19

Educators, including lecturers, demonstrators and technical staff also experienced several personal challenges concerning their roles due to changes precipitated by Covid-19 university closures. Pather et al. (Pather et al. 2020) reported in their analysis of responses from anatomy educators in Australia and New Zealand that educators were affected by changes in the type of work that they were now required to do, worries about job security, and increased workloads. For some, the demonstrator role changed from providing small-group face-to-face demonstrations to providing instruction over video-conferencing, and in some cases, the demonstrator role disappeared altogether. Some technical staff were required to learn new skills and apply them in creating new video resources and material for delivery online. The authors also report that all participating lecturers experienced an increased workload to support the changes required, and some noted that there was no longer the reward of the face-to-face interaction with the students and being able to enjoy watching the students learn.

In an article by Evans et al. (Evans et al. 2020), the authors note that in moving from traditional to online education there is a particular challenge for educators in making sure that assessments still meet quality requirements. This is also echoed by Khan and Jawaid (Khan and Jawaid 2020) in their discussion of *technology-enhanced assessment* (TEA), the application of technology to enhance assessments methods. The authors note that any method of assessment employed should be "safe, valid, reliable, acceptable, and fair". Online assessment can be asynchronous, e.g., written assignments or essays that can be done offline and then uploaded to the VLE, or it can be synchronous, e.g., *multiple-choice question* (MCQ) or online open-book examinations that are taken in real-time utilising the VLE, or other practical examinations such as OSCE that utilise video-conferencing software to replicate a face-to-face examination environment.

For Physiotherapy and manual therapy education, some educators that responded to C. W. MacDonald et al. (C. W. MacDonald et al. 2020) acknowledge that the hands-on practical teaching and learning was "definitely hard", and they planned on reviewing the manual techniques face-to-face once students were able to return to school. In some respondents opinions, online instruction lacked the facility to give immediate real-time feedback to students on their practical skills. Some also noted that they could not expect the students to practice hands-on skills at home, as they may not have access to plinths or people to practice on, and also that students would not have had the opportunity to feel the technique or test being performed by the instructor. Half of the respondents to the survey felt that the educational outcomes should be changed as a result of the changes put in place due to the pandemic.

1.6.3 The Student Perspective on Covid-19

From the student perspective, a first-hand student account was given by Franchi (Franchi 2020), where the author, as both an anatomy student and demonstrator, reflected on his own experiences on the impact of the Covid-19 pandemic. Of concern to the author was the loss of student access to anatomy labs and the range of learning materials provided, not just the cadaveric or prosection materials, but also the other models and materials provided in these labs. The author was also concerned that the loss of the face-to-face environment and interaction with peers, teachers and even anatomical donors would impact the development of other discipline-independent skills such as professional behaviour, situational awareness and empathy.

The anatomy educators who responded to the survey by Pather et al. (Pather et al. 2020), as well as reflecting on their own challenges, also provided feedback on what challenges were faced by students. According to the educators, some of the challenges encountered and reported by students included: financial worries due to a loss of income, feelings of "missing out" on their education and "what they paid for", concerns over lost access to practical materials and practical laboratory sessions, and struggles with lack of motivation without face-to-face interactions with the lecturers and peers. Educators also had concerns on behalf of the students about the impact that poor internet availability and time zone differences (for synchronous activities) would have on the students access to learning material and events.

For the Physiotherapy student perspective on online learning during Covid-19, as noted already in Section 1.6.2, physical therapy lecturers who responded to C. W. MacDonald et al. (C. W. MacDonald et al. 2020), had concerns on behalf of their students about the ability to provide feedback on practical skills in an online environment and also concerns over the at-home facilities of students. However, there is little by way of first-hand accounts from Physiotherapy students as to the impact of Covid-19 on their teaching and learning— something which this research project aims to help address. One possible reason for the lack of research in this area is the recency of the Covid-19 pandemic. Gagnon et al. (Gagnon et al. 2020) suggest there is a general lack of literature in the area of investigating online learning models as a distinct model for Physiotherapy education, and surmise the reason for this is that there are concerns over whether some educational outcomes, such as the development of professional and hands-on practical skills, could be achieved in an online environment. However, they do highlight other studies that have been conducted pre-Covid-19 on the experiences of student satisfaction in online learning in Physiotherapy, noting that some of the benefits reported by students were the ability to review lecture material, learn content at their own pace, and clarify concepts and ask questions at synchronous online meetings.

Pre-Covid-19, Mącznik et al. (Mącznik et al. 2015) performed a systematic review of online learning and technology in Physiotherapy education, which also captured the perceptions of students. The authors reported that some of the benefits for students were that online technology, which included social media, discussion boards and other web-based materials, was entertaining and easily accessible for students, and some studies

showed that these materials also helped enhance practical skills performance. Reported barriers included internet connectivity and the students' personal preference for paper-based materials over online.

Chapter 2

Methodology and Methods

Introduction

In this chapter, we discuss the methodology and methods that were employed throughout this research project. The methodology used was a qualitative descriptive approach, in which the aim was to provide a comprehensive, accurate summary of events as experienced by the participants (Sandelowski 2000). Data was collected from participants via semi-structured interviews, a method which provides some organisation to the interview process so that research questions are addressed but also allows space for deviations to occur and for participants to offer other topics of interest (Nicholls 2009; Galletta 2013). A thematic analysis approach was utilised on the interview data to process and analyse the responses and to produce the final report (Braun and Clarke 2012; Nowell et al. 2017).

2.1 Participant Recruitment

Participants were recruited from the UCC MSc Physiotherapy programme, from the first-year cohort of students for the academic year 2019-2020, of which there were a total of 29 students. An email was sent to the students by the MSc Physiotherapy Programme administrator along with an information sheet and consent form. The students were given the opportunity to contact the research team *Primary Investigator, Conor O'Mahony* (COM) and *Primary Supervisor, Niamh Brady* (NB) via email to ask any further questions on the nature of the study. Participation was voluntary, and informed consent was obtained once students returned a completed consent form with electronic or typed signature, indicating their wish to participate in the study.

2.2 Interviews and Data Collection

A pilot interview was conducted with a volunteer from the current cohort of students on the MSc in Human Anatomy course in UCC. Like the students of the MSc in Physiotherapy, the students of the MSc in Human Anatomy experienced disruptions to their teaching and learning due to Covid-19 and campus closure, and as a result, the test interview allowed obtaining pertinent feedback to assist in the refining of the interview guide.

It also facilitated the practising of interview technique, and familiarisation with the process of data collection and recording of video on *Microsoft Teams* (McGrath et al. 2019; Seidman 2006, Ch.6). Interviews were scheduled with participants via email and conducted online using *Microsoft Teams* by COM, over the course of two weeks beginning June 29th 2020. Participants were reminded as per the consent form that the interviews were being recorded, and consent was re-obtained before the recording function was switched on.

Multiple forms of data were collected to help ensure rigour via method triangulation (Carter et al. 2014); in addition to the audiovisual information from the recorded interviews and the resulting transcription text, the interviewer also took written notes during the interviews (Seidman 2006).

The interviews were transcribed by COM, using the transcription software Transcribe (*Transcribe* n.d.). To aid in transcription quality, help reduce errors, and ensure that the transcribed accounts were verbatim, the transcription notation used during the process was based on the guide reproduced in Figure A given in (Poland 1995). The transcription process itself also served to facilitate initial familiarisation with the data, as per the first phase thematic analysis as outlined in Section 2.4. Any personal or identifying data was removed or anonymised in the final transcripts.

A saturation sampling strategy (Glaser and Strauss 1967) was used, whereby participants were interviewed until data saturation was reached, i.e., when it was felt that there was no longer new information being uncovered through interviewing additional participants (Saunders et al. 2018). Out of a total of 29 students, 13 students volunteered to participate and 11 students were interviewed. As participation in the research was specific to MSc Physiotherapy students we did not collect extensive demographic information. Out of the 11 participants, 7 were female and 4 were male.

2.3 Final Interview Guide

An initial interview guide was developed by the research team and then reviewed and revised after the pilot interview and subsequently after each of the first two participant interviews. The final interview guide which was used during the research project is reproduced here.

Opening

- What changes were made to your modules when the University closed and online learning was put in place?

Opportunities/Benefits of Online Learning

- Did you find any advantages or benefits to online learning? What were they?

Barriers/Limitations of Online Learning

- Did you find any disadvantages/limitations of online learning? What were they?

- Tell me about your experience of learning practical skills?
- Was your experience of peer learning and/or peer support affected?

Changes to assessments

- What changes were made to your assessment?
- What did you think or how did you cope with those changes?

Future role for online

- Do you think there is a future role for online learning in Physiotherapy?

How could it be improved

- Are there any improvements that you think could be made with regards to the teaching?
- Are there any improvements that you think could be made with regards to the learning? Is there anything that you would do differently if you were doing it again?

Resources challenges

- Were there any challenges for you accessing any of the resources?
- Were you impacted by loss of on-campus resources?

Lifestyle Changes/ Support/ Motivation

- Did any lifestyle changes associated with Covid restrictions or University closure affect your studies? If so, how?
- Did you feel there was adequate support for you during the time?
- How did you find your motivation levels over the course of the last few months?

Closing

- Is there anything more you would like to add that we haven't covered?

2.4 Thematic Analysis

Thematic analysis is a method with six different phases, which is used for "identifying, analysing and reporting patterns or themes within data" (Braun and Clarke 2006; Braun and Clarke 2012). Although the phases are described as a sequential or linear process, thematic analysis is an iterative or recursive process and involves a constant moving between phases rather than completing each phase before starting the next. The six phases of thematic analysis from Braun and Clarke 2012 are detailed in Appendix A (Figure A.1) and are summarised in Table 2.1.

The basis for the thematic analysis applied in our research was the framework described in Nowell et al. 2017, which outlines an approach for conducting thematic analysis to include further measures with the aim of fulfilling criteria of trustworthiness as

Phase	Tasks
Phase one	Familiarisation with the data, including the transcription of video/audio interviews into written text, reading and re-reading of the data, and capturing any initial ideas.
Phase two	Creation of initial codes, a code being an identifier for some feature of the data that may be of interest, and collecting the data that is relevant to those codes.
Phase three	Analysing and sorting these codes into broader themes and collating the data associated with those codes within these themes.
Phase four	Reviewing and refining of themes, such as discarding themes without enough data or combining themes.
Phase five	Further refinement of themes and writing a detailed analysis of each theme.
Phase six	Producing the final report from the detailed analysis of the themes.

Table 2.1: Thematic analysis process, adapted from Braun and Clarke 2012

defined in Lincoln and Guba 1985. Trustworthiness is a way that researchers can convince themselves and others that the research and findings are: credible – does the research address what it intends to address and is the experience recognisable to readers and co-researchers; transferable – can the findings be generalised or applied to other settings; dependable – are the results consistent if the study is repeated; confirmable – are the findings the views and experiences of participants rather than views and biases of researchers. Figure A.2 shows the six phases of thematic analysis outlined by Nowell et al. 2017, in which they include these measures that can be taken to help fulfil criteria of trustworthiness.

The first phase of the thematic analysis process began with the transcription of the interviews. As mentioned in Section 2.2, the interviews were conducted by COM, and the transcription process provided COM with initial familiarisation with the data. Both COM and NB then separately reviewed the transcripts of each interview.

Interview transcripts were stored in text format using *Microsoft Word*, and analysis was performed using both *Microsoft Word* and *Microsoft Excel*. Initially, the research team discussed using qualitative research software such as *NVivo* (*NVivo* n.d.), however due to the cost involved it was decided that free tools would be sufficient.

Phase two involved the initial coding of the data, which was conducted via a series of online meetings between COM and NB using *Microsoft Teams* video calling. Initial codes were collaboratively assigned to participant data by using the comment feature in *Microsoft Word*, which allowed for these comments to be exported to *Microsoft Excel* via a macro function to capture the code along with the relevant data excerpts.

During phase three, both COM and NB met online via *Microsoft Teams* to further review these codes, for example, combining those that were now considered to be duplicated codes, and revisiting the transcripts to review the data to which these codes belonged to, reclassifying the quotes where necessary. Also, both COM and NB independently and collaboratively began sorting codes and deriving initial themes, using pen and paper mindmaps. Selected excerpts from the interview transcripts were gathered and sent to each participant for them to review as a form of member checking. *Microsoft Excel* was used to review the data and codes associated with each theme and perform some simple data analysis, such as, a total count of each code, and, for each

code, a count of how many participants had data with that code. This analysis was used to inform the revision of the themes during the process.

In phase four, the research team used *Coggle* (*Coggle* n.d.), a collaborative online mind-mapping tool, to create a mindmap of the themes from the hand-drawn mindmaps, which allowed the research team to edit and refine the mindmap and further develop the themes, which occurred during phase five. Once both COM and NB had agreed that the analysis of the themes was completed in phase five, then the writeup of this report commenced.

The data used in the report – the *Microsoft Word* documents containing the interview transcripts, the member-checked excerpts, the *Microsoft Excel* workbooks containing the coding and analysis, and the thematic analysis mind maps were all stored on *Microsoft Teams*. Snapshots of the data were taken at different stages so it documents the phases of the thematic analysis process and forms an audit trail.

2.5 Reflexive Process

Both COM and NB initiated a separate reflection diary which was kept during the entire research process. This allowed the research team to keep track of any initial thoughts or ideas about codes, but also to help enhance quality by exploring any potential biases or issues that may arise in the research (Jootun et al. 2009).

NB is a lecturer on the MSc Physiotherapy course and a perceived disadvantage of her involvement in the interview process was that the students might be reluctant to fully open up, which is why the interview and transcription process was conducted by COM. However, her experience and knowledge of the course, in addition to being an experienced researcher, was a distinct advantage to the research project.

For COM, as a student on the MSc in Human Anatomy, he also experienced the campus closures and the move to online learning, albeit on a different course to the participants, so it was important to have awareness of this difference and not project his own experiences onto those of the participants and to be aware of this potential bias during the analysis.

2.6 Quality

Table 2.2 summarises the measures taken by the research team during the different stages of the project to help ensure the quality of the research.

Stage: Task	Quality Criteria	Quality Enhancement Strategies
All: Reflexive Journal	Credibility/Confirmability	Reflexive journalling to examine potential bias
All: Audit Trail	Dependability/Confirmability	Store data in organised folder structure
All: Data Snapshots	Dependability/Confirmability	Data snapshots to data archive to capture audit trail
Preparation: Interview Guide	Credibility	Collaborative development of interview guide to counteract bias
Preparation: Pilot Interview	Transferability	Pilot interview conducted with MSc. in Human Anatomy student
Preparation: Pilot Interview	Credibility	Revision of interview guide
Data Collection: Interviews	Credibility	Revision of interview guide after each of first two interviews
Data Collection: Interviews	Credibility	Semi-structured interviews, open-ended questions and “probing”
Data Collection: Interviews	Transferability	Interviews conducted until data saturated
Data Collection: Written Notes	Credibility/Transferability	Method triangulation, multiple data sources
Data Collection: Transcription	Credibility	Use of transcription guide
Analysis: Data Familiarisation	Credibility	Revisit data for in-depth familiarisation
Analysis: Coding/Theme Generation	Credibility/Confirmability	Researcher triangulation and collaborative consensus by research team
Analysis: Member Checking	Credibility	Participants review of transcribed excerpts to ensure accuracy
Reporting	Credibility	Documentation of quality enhancement efforts
Reporting	Credibility	Documentation of reflexivity
Reporting	Credibility	Documentation of researcher credentials
Reporting	Credibility/Confirmability	Checking the final report

Table 2.2: Methods to promote rigour and enhance quality employed during the course of the research project

2.7 Ethical approval

This study was granted ethical approval on the 12th of June, 2020 by the School of Medicine Sub-Committee of the *social research ethics committee* (SREC) at UCC, and permission to carry out the project with the Physiotherapy students was obtained from the Head of the Physiotherapy department, Dr. Joseph McVeigh.

Chapter 3

Results

Introduction

In this chapter, the results of the analysis as outlined in Chapter 2 are presented. A mind-map depicting the resulting themes is shown at the end of this chapter in Figure 3.8. As detailed in Section 2.1, the participants in this study were students invited from the 2019-2020 first-year MSc Physiotherapy programme at UCC of which there were 29 in total, and of the 11 students that participated, 7 were female, and 4 were male, as shown in Table 3.1.

	First-Year Students	Volunteered	Interviewed
Gender			
Female	19	9	7
Male	10	4	4
Total	29	13	11

Table 3.1: Demographics for first-year MSc Physiotherapy students.

3.1 Transition Period Uncertainty

Once it was announced that the UCC campus was closing, the initial challenges that the students faced were centered around the experience of uncertainty, due to the evolving nature of the pandemic. Outside of teaching and learning considerations, some

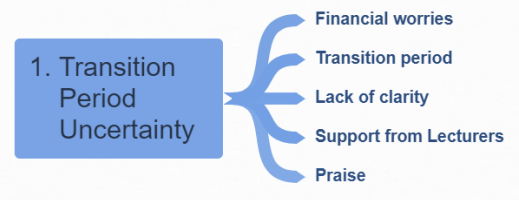

Figure 3.1: Theme 1 – Transition period uncertainty.

students (6/11) experienced financial worries caused by the unfolding situation. Some felt they were left with no option but to vacate their rented accommodation and move home, while other students were affected financially by the loss of employment, which contributed further to the stress.

> " *but definitely like the whole renting situation like [...] you know you'd always have... there'd be an ESB [electricity] bill and because you'd get cut off early, like all that kinda stuff you don't.. (laughs).. you don't really... you don't take into consideration when you move into somewhere, and if you up and leave, there's going to be a lot of financial cost*". (Participant 2)

> " *So that affected my income and plus the other job I work was lost as well over the time, so yeah, that was, yeah, that was definitely a big stress*". (Participant 10)

There was a transition period whereby the lecturers and college staff adapted to the campus closure to move from face-to-face learning to online learning. Some students (5/11) commented on this initial transition period, with some perceiving it to be a challenge.

> "*initially, like the guidance wasn't necessarily there because, they didn't know it was coming as quick, but as soon as they did kind of get on top of things, changes in terms of scheduling, and changes in terms of how content was being delivered, and what way... they were going to deliver a change, we still had... we'll say, tutorials and lectures, but... they were just delivered completely differently*". (Participant 6)

> "*I think there was a couple days period of transition anyway... until I suppose the lecturers sorted out the whole technology side of it, and transitioned onto, kinda, live lectures, or either recording them on PowerPoint [...] so that took probably a good bit of planning, so, yea it was really, am... I suppose, getting us up and running online was the biggest transition*". (Participant 3)

> "*I guess for the first week [...] we were off, there was kinda nothing happening because obviously they were trying to get stuff ready for our online learning, am... so you kinda nearly felt like you were in Limbo*". (Participant 5)

Some students (5/11) perceived that there was a lack of clarity around changes being made to the schedule of online lectures and tutorials, which in turn lead to some confusion and uncertainty.

> " *So there was a timetable for the last block of lectures, last 4 weeks or whatever, that ended up being changed, so there were parts of that that were mixed around, and then we had 2 other kinda timetables that were in the emails [...] but they would be chopping and changing if the lecture had to change the timeslot or if it ended up clashing with something else... so those were never updated in the actual timetable, so then you're kinda going around trying to find, "oh what do we need to be in now", there was just a lot of confusion like, people texting into our group chat, say... constantly being like, "oh are we meant to be online now?" "*. (Participant 8)

> " *It was hard to keep up with scheduling... scheduling is a massive thing because... am.... you had your lectures, but then there was online lectures, and then there was guest lectures, and some weeks... ah anatomy lets say, was at 9 o clock, but other weeks, oh no it was at 11 o clock, and some weeks it was live, and other weeks it wasn't live, and... it was very- that part was very hard like, the amount of texts... sent between groups being like 'what do we have today, who do we- what time is this at, I can't remember'*". (Participant 5)

However, nearly all students (9/11) remarked that they felt well-supported by the lecturer staff during the time and that the staff were always available via phone or email. Many of the students praised the staff for their support and for their efforts in making

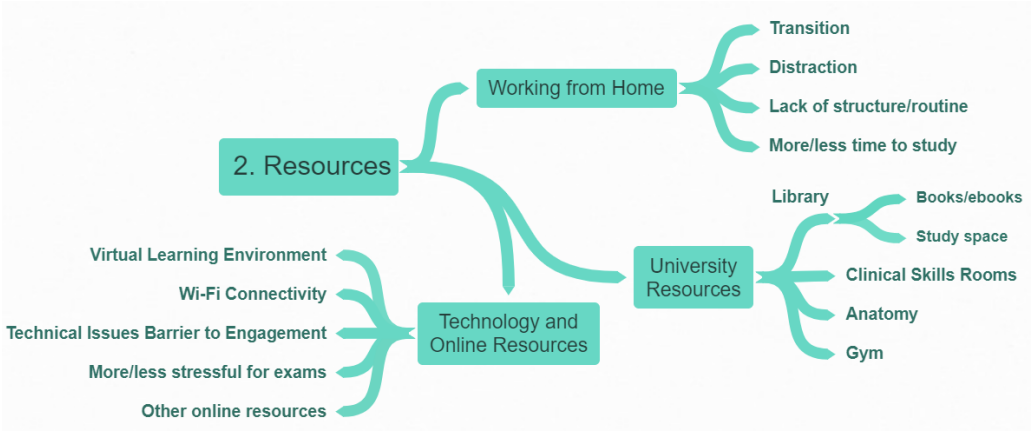

Figure 3.2: Theme 2 – Resources.

the most of the situation, and also acknowledged that it was a difficult and uncertain time for the staff as well.

> *" I think like in the current situation they're doing really as best as you know, or even better than they could, so".* (Participant 2)

> *" But in fairness like, they were always there, we always had tutorials, you know, in fairness they always stressed that if we had questions or... need help, they were just at the end of a phone call, cause they were at home themselves [...] and like, for the majority of the time I felt very well supported".* (Participant 5)

> *" I think the reason why it's been so... doable? is because of the staff being so helpful... enthusiastic and sympathetic throughout the whole thing... and trying to help as much as they can and I found that a lot of the lecturers as soon as an email was sent, it- you would have a reply in 10 minutes, so I definitely think that helped big time... and just how easy and approachable the majority of them were".* (Participant 7)

3.2 Resources

3.2.1 Working from Home

As well as transitioning from a face-to-face, in-person learning environment to online learning, students were also faced with the transition to "working from home". For some students, this involved vacating their rented accommodation in Cork City to live at home with their parents. Students stated that they faced a number of challenges around working from home. Distractions in the home environment, such as interaction with other adults and children in the home, or helping out around the house, were perceived to have a negative effect on learning for many students (6/11). Some students stated that they did not have a quiet space at home in which to study and were impacted by the loss of the library (see also, Section 3.2.2, University Resources). There were also perceived challenges concerning changing from their existing routines to establishing new routines at home.

> *" There is a huge change when you come home, like you kinda naturally slip into like, we were just talking about lifestyle... like when you're down in Cork, your whole day is centered around study, but like you fall into a pattern at home, you know like as I said we have a busy family,*

so like the dinner needs to be made, I'm not going to be like 'oh God no I'm studying', like you know you fall into that, there's work stuff to be done around, or... even like family like, there's grandparents... if any need help, you naturally fall into that role like, you can't be selfish... so that kinda changes?". (Participant 2)

" I was living on my own in Cork, and then coming back to... was there seven of us at home? so... it's a lot... two of them are kids so... (laughing) they're off school now as well so that was definitely... a challenge to get used to". (Participant 10)

" Like my day had kinda changed in the fact that... like my study time normally in college, like you'd do your lectures 'til like, 3 or 4, and then you'd be studying until like... you know 9 or 10 in the library, but like that, that's not really feasible at home [...] everybody in my house works, [...] most people were gone out of the house from 9 to 6, so that was my study time, but like, when 6 o clock came, you just couldn't get anything done... it was- it was a bit different, and then weekends as well were a lot like... busier". (Participant 2)

Other students found they had more time to study due to lifestyle changes such as job losses, and commuting students gained more time as they no longer needed to travel, however, others mentioned that the loss of a job also impacted negatively on routine.

" like I lost my job for like the first time in like 8 years, and that actually benefited me, If I'm... (laughs) If I'm being honest about it, like as I said, I had the weekend to study". (Participant 3)

" I think it was, well more for me than anything was that routine was gone? I was so used to working Fridays and Saturdays, it was kind of... I suppose for me, weirdly enough, that's my outlet? that's my time... for me, is to go to work and then that was taken away as well, so I found that kind of difficult". (Participant 10)

3.2.2 University Resources

Due to campus closures, students no longer had access to on-campus resources supplied by University, the School of Clinical Therapies, and the Departments of Physiotherapy and Anatomy. Many students (7/11) expressed that they were affected by the loss of the library, for either access to books or access to a space to study (see also, Section 3.2.1, Working from Home)

"I'd use the library but I wouldn't study in the library, it will be more if I was trying to understand like a nerve better or understand a certain pathological condition better, I'd find a book". (Participant 6)

"that's probably the biggest barrier for me that I actually missed the library space of- of going and getting things done and kind of unattaching yourself again, whereas, if you're around the house and you're trying to get things done, you don't have a dedicated space, It's obviously... it's very difficult to do that... am, I suppose you can kind of be tipping away, half productively for a longer time than if you went into the library and fully zoned into it and you came away from it again". (Participant 9)

Some students (3/11) noted that not all of the books that were available in the physical library were also available online through the library websites as ebooks.

"[I missed the] library mainly, especially coming up to exams, am... I was a little bit raging with myself cause, I had a book taken out, and am... the day I was leaving Cork like I returned it, cause I was like 'Oh like we won't be able to go back in', am, and I didn't want to get all the fines or whatever... but like obviously they let people keep the books or return them at a later date, but that particular one, like I emailed the library, I tried to see if there was an ebook version, and there wasn't... So I was so annoyed at myself (laughs) for giving that back, when I really

needed it, like, like I got through my exams but I really could have benefited from that book". (Participant 3)

The FLAME laboratory, located in the Western Gateway Building on the main UCC campus, was the location of the practical sessions for the Anatomy module, and it contains anatomy teaching materials such as cadaver prosections and plastic models. More than half of the students (6/11) expressed that the loss of access to the anatomy materials in both the FLAME laboratory and in Nano Nagle place negatively impacted their understanding and learning of anatomy.

"*Obviously the Flame lab is a massive help, like, massive, it's there in front of you, and you can visualise it, and you're quizzed on it [...] and especially coming up to exams like [...] it was a real loss in learning, like not having it*". (Participant 5)

"*Like, the FLAME lab is a weird one, because it's not somewhere you necessarily want to be, but as soon as it's gone, you realize how much you've missed it.... like I never thought I'd say like it was probably the most... yes impactful, but beneficial part of the entire course was actually seeing these structures in real life, because it's not just a 2D image anymore or even a 3D image of a skeleton, that's fine, the muscle goes to this little point, whereas you'll remember that little point if you actually see the muscle going there, am... that was definitely one of the main things that, and we've all spoken about it since [...] that was 100% one of the best tools they gave us in terms of learning the whole year through and not having that then I think was... a big- again we didn't realize it, until later on because everything else was... going on? but at the time, now, like... it's just a big, big loss*". (Participant 6)

The clinical skills rooms at Nano Nagle place provided students with the facility and space to practice clinical skills. Many of the students stated they were affected by the loss of access to these resources, in terms of learning (individual and peer) and applying skills (see also, Section 3.5, Peer Learning & Support and Section 3.6.2 Application of Theory).

" *Yeah I suppose even just being able to... like we would have had a couple of breaks maybe, in between our lectures... so we'd pop up to the physio rooms and someone would just hop up on a plinth and we'd do like an hours work in between... am... so that would have been like really beneficial*". (Participant 2)

" *Just from my own prep, for the exams [...] like the skeletons was kind of the main thing, and the plinth, actually having the plinth just to see, what way you'd set them up, like imagining- that was another thing with the one of the exams, it was "explain what way you'd put the patient" and it's very hard when you can't say just "I'd sit them on the plinth", that's not a good enough example [...] other things would have been useful in terms of like... the goniometers and stuff like that*". (Participant 6)

For other on-campus resources not necessarily related to learning, many students (5/11) were affected by the loss of access to the gym, as it provided students with the opportunity to take a break from their studies, take some exercise, and clear their heads.

" *I missed like, the on-campus facilities, not even in terms of learning, just like mental headspace, was like the gym?*". (Participant 6)

" *I guess [...] facilities of the gym? [...] exercise-wise, like you couldn't blow off steam [...] having access to the gym, you go and, you know, go on the treadmill for half an hour and just chill out, go swim, go do a class... you know it'd really kinda force you to take a break*". (Participant 5)

3.2.3 Technology and Internet

For the *virtual learning environments* (VLEs) provided by UCC, students already had access to *Canvas* and *Microsoft Teams* before Covid-19 and the shutdown of the campus, but once it was announced that the college would be closing, the students were given a quick tutorial on how to use the software. Some students were comfortable with the technology and commented that using *Microsoft Teams* was a positive experience and reported no issues with using *Canvas*. Students also had *WhatsApp* groups for information exchange and used *Microsoft Teams* to hold their own tutorial sessions in peer-groups (see also, Section 3.5, Peer Learning & Support)

> " *So we worked off Microsoft Teams, which was absolutely brilliant to be honest... am... we had a... literally very quick, half an hour tutorial on Thursday morning before we finished... on how to do it so everything moved on there*". (Participant 5)

> " *We would have set up a WhatsApp group there with four or five of us, and we would have communicated in that, am... you know, which is good coming up to exams, we could kinda discuss different things and ask each other different questions* ". (Participant 11)

However other students had a less positive experience with *Microsoft Teams*, stating that it took some time to adapt to using the technology, while others experienced ongoing technical issues using the platform.

> " *I suppose my laptop... decides to freeze at times and just... doesn't work, and especially everything's on Teams, and for some reason lately like, my Teams can just stop working for a few hours at a time, so then it's very hard... when Teams doesn't work, and you're trying to access it off your phone, which I'm doing now*". (Participant 10)

In terms of internet connectivity, there was a wide range of experiences reported by the students. Most of the students (6/11) mentioned that they had no issues or only minor issues concerning their internet connection. The remainder of students however experienced bigger challenges with their internet connections, especially during the live events on *Microsoft Teams*. Some students felt that these technical and connectivity issues were also a barrier to being able to engage and participate during the live lecture and tutorial sessions (see also, Section 3.3.1, Interaction)

> " *I was kinda conscious too of my actual connection here... like it's a lot better today, but, am... there was some tutorials where we'd get asked individual questions on our work and like, you'd just unmute yourself off Microsoft Teams and then answer the question, but am... a lot of the time, I- my signal was breaking up, I was just being told in the WhatsApp group that they couldn't hear me at all*". (Participant 4)

> " *Obviously, Wi-Fi is the biggest thing... so like if your Wi-Fi wasn't working or your computer decided to crash, which has happened plenty times... then you can kinda like miss half the lecture or... just like the connection could come in and out, it even happened throughout my exams like my internet would fail and then have to... to be losing time, that's definitely a massive disadvantage*". (Participant 10)

The majority of students (7/11) were concerned that others, either fellow classmates or lecturers, were having internet connectivity issues during the live events.

> " *I've been OK, but I do know there's been some of my class, and like they'd be on a call like this, and it would just cut out, be gone*". (Participant 1, when asked about Wi-Fi)

> *" We've had a couple of technical difficulties during, like live things, like eh, you know... slow connections, and people freezing and stuff, but nothing terrible I suppose".* (Participant 3)

There were mixed opinions about the assessments and the online nature of the exams. Some students found doing the assessments online to be less stressful, as the in-person examinations in the presence of other students could sometimes precipitate stress.

> *" There was definitely benefits, in that, I discussed this with one of them after the exams... like, I felt... it... they didn't seem as big of a deal I suppose, am... and I think that's because, they're not... you know, all you have to do is turn on your laptop and you're sitting there and you're kinda waiting for it to happen, whereas, you know, in... you know, you'd normally rock up and everyone would be gathered outside the door and some people could be crying, and some people could be happy".* (Participant 3, about online exams)

> *" I actually thought it was kinda easier doing exams online like this because, there was... I suppose the practical element was kinda taken out, and the actual kinda pressure and... nervousness on the day, if you were going to go into a practical, especially for... if, for us, I remember at Christmas, it was like you'd see people coming out, some people were actually really upset and nearly, nearly crying [...] so like that's exactly what you don't need going into an exam, am... but ah, I actually thought it was kind of easier this time around, doing it at home [...] I just think it was cause there wasn't, I didn't feel there was pressure, am... not having someone directly asking you questions I suppose right in front of you, having that presence there ".* (Participant 4)

However, some other students had concerns over technical issues occurring during the assessments, either on their own end or on the examiner's end, and as a result, found the process of online assessment more stressful.

> *" I was at one stage with the examiner, her internet was very bad, so there was a couple of times where she was breaking up and I was leaving the exam thinking 'Oh my God did she even catch what I said there about this?' and in the second exam, the day after or two days after... I had said something in the exam, [...] it was an answer to a question, and the examiner asked me the question that she wanted that answer for a few minutes later again, so then I- during the exam I was like 'Oh no, did she even get what I was saying while ago cause she's asking me the same question again here like'".* (Participant 8)

In terms of other online resources, students mentioned that they also availed of websites such as *TeachMeAnatomy* (*TeachMeAnatomy* n.d.) and *Acland's* (*Aclands* n.d.), and mobile apps like *Complete Anatomy* (*Complete Anatomy* n.d.), to augment their anatomy learning, in addition to *YouTube* videos disseminated by the lecturers to aid in the demonstration of practical material.

> *" The lectures were using multiple resources again with us in class like "Teach me Anatomy" and I actually have the app "Complete Anatomy", so I was actually referring to that and it's- it was very helpful, I suppose it depends on what you're learning, if it's like skeletal, it's very- it's very easy to see that on the skeleton, but if you're learning neuroanatomy, that's a bit harder, so that's where [...] the online stuff [comes in]".* (Participant 9)

> *" In term of not having the cadaver labs, we just kinda went about it ourselves, using "Teach Me Anatomy", and Youtube-ing things and stuff like that".* (Participant 8)

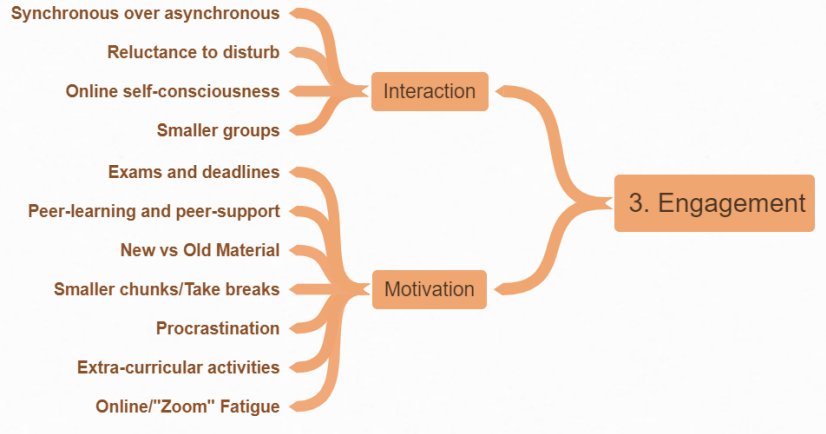

Figure 3.3: Theme 3 – Engagement.

3.3 Engagement

3.3.1 Interaction

As mentioned previously, lectures and tutorials were replaced with both asynchronous and synchronous online learning; lectures were replaced with pre-recorded *Microsoft PowerPoint* presentations with voice-over, and face-to-face tutorials were replaced with online video-conferenced tutorials using *Microsoft Teams*. Some students (4/11) expressed a preference for synchronous activities such as the live lectures and tutorials held on Microsoft Teams, over asynchronous materials such as the pre-recorded voice-over lectures.

> *" Like even how content was delivered, like I think the live lectures you were motivated more rather than the voice-overs ".* (Participant 6)

> *"To be honest, I found the voiceover lectures very difficult... because they could be very long... and as well, you're trying to pause and make notes throughout these voiceover lectures and then you have to re-listen back over it... where it's a little bit easier to... get the information from the-Teams- not get the information, but it's easier to process the information over the Teams and then you can ask questions, so it can change what- it's more interactive so it can change what you get from the lecture... whereas with the voiceover, it's like a script I suppose".* (Participant 7)

However even for these synchronous activities and live lectures, many of students (8/11) expressed various barriers to being able to ask questions during these live events. Many students felt reluctant to disturb or interrupt the lecturer during the class, and also that the immediacy of being able to ask a quick question, which would have been present in a face-to-face environment, was lost.

> *"You're muted, am... you might pop in with a question, am... but yea, I suppose you're kinda thinking to yourself, you know, 'do I really have to interrupt here?' [...] so a couple of times I had, kinda, things in my head, and I was like, 'Oh I'll ask this', and then like, they had totally moved onto something else, so I was like, 'aw, no, forget about it'".* (Participant 3)

Students acknowledged that they could send an email to the lecturers to get answers to questions that arose during either the synchronous online meetings or as a result of reviewing the voice-over lectures, but they were less inclined to do so as again they felt again that they would be disturbing the lecturer.

> "*You're even like reluctant to ask a question or email a question, not because of the lecturers but, you know you just ask it in 2 seconds in class, whereas, you're more likely to go google it yourself if... you're at home*". (Participant 2)

> "*So I ask a lot of questions, and I suppose, in the moment, when you're in class, you don't really think about them but, in an online context, I suppose, I examine... OK, should I really be sending an email over this or [...] is this really relevant that I have to, kinda disturb a lecturer over [...] You know, like... I know there's not supposed to be anything, such as stupid questions, but, it's just harder?*" (Participant 3)

Some students felt self-conscious about asking questions in front of the whole class in the online context, finding it less comfortable than the in-person environment.

> " *I found it harder... am... I found like, even asking a question, it's not as comfortable, am... like if you were in a class or you were in a practical, someone would come around to the plinth and you ask them, and they'd be the person next to you would hear, whereas now, the whole class is hearing*". (Participant 6)

And a couple of students (2/11) mentioned that they felt that smaller groups were more beneficial to engagement and asking questions.

> " *I'd kinda be sometimes reluctant anyway, to ask questions, like... I do find the smaller group chats help a lot [...] so there's 30 in our class, we only have groups of 10 or 7 [for tutorials], I think, they're split into like A B C and D, so I find when I'm in the smaller groups, a lot more questions are asked, because obviously it's a smaller group* ". (Participant 5)

> " *I think the groups, you can get a little bit more- more interaction with the staff member and I think some people who aren't very vocal- so I would consider myself to be a vocal person and questions, am... some people who aren't like that, probably would feel more comfortable within... a kind of the smaller more intimate groups I suppose* ". (Participant 7)

3.3.2 Motivation

All of the students (11/11) reported that motivation levels varied a lot over the few months since the commencement of online learning. For students who were working from home, some felt that their motivation levels were affected by their home environment, and the lack of routine and structure in the home was a challenge for many students (see also, Section 3.2.1, Working from Home).

Many students (5/11) mentioned that having the goals of examinations to study for and deadlines to achieve were significant sources of motivation. Correspondingly, students also felt that once the examinations were finished and deadlines had passed, their motivation levels waned.

> " *But like... after the exams, you kinda took a small break, you came back to the 4 weeks learning, so, [...] this week is the last week of the 4-week learning, and I struggled massively [...] there was like... no motivation there whatsoever*". (Participant 5)

> " *I think as well I had a goal in March, you know, we've got a goal for exams and the exams around the corner, so... there's that drive to continuously keep going, and... I think that was lacking... I didn't see- have any goal for this June period... and I know we've got our module outcomes, but... they just at the moment everything seems a bit wishy-washy as to what- not what matters but what is really important, what do I- what am I going to really need? how am I going to- from this June teaching how I'm going to pull that into November... you know?*". (Participant 7)

For some students, the interaction with peers for either learning or support had an effect on motivation levels (see also, Section 3.5, Peer Learning & Support), and some felt their own motivation was impacted by the motivation levels of their peers. The loss of the face-to-face practical elements, such as being able to apply the theory through engagement with other people, was also perceived to impact negatively on motivation levels (see also, Section 3.6.2, Application of Theory).

> " *Because we did so much peer learning, and because we all kind of, you know, we used our little kinda mini group to motivate each other and keep each other on our toes, and… because we gave each other little assignments to do, you were kinda had time pressure on you as well? am… that's- I found that a massive benefit*". (Participant 5)

> " *The whole way through, it's very hard… to get motivated when you're on your own no matter… I think I find then as well, you know when you're in college… and you'd be onto the other girls and you'd be meeting them and they'd be like, "oh I have this done or that done", and even like, I think all of us are feeling it at the moment… you kind of (laughs) … I'd nearly text the people knowing, they're the ones now that'll get me motivated and they're not motivated which… definitely doesn't help either*". (Participant 10)

> " *It became kind of, too much theory… am… as much as the lectures are trying to drill it down that you will see a lot of this on placement and these are situations that you'll see, you know, unless you're engaging with people, unless you're applying, say what we've learned up to now, it's quite difficult to kind of, get a bit of motivation, a bit of energy to do that*". (Participant 9)

Some students made the distinction between the online learning of material that had already been covered or introduced before campus closure, versus the learning of brand new material. For these students, the perception was that it was easier for them to continue from existing material but that covering new material online was more difficult or required more motivation.

> " *I think in March because we had a big follow-on from what we'd been doing… it was quite easy to slingshot back into the same stuff… it's now that we've been learning new things, it has been very difficult to keep that motivation high*". (Participant 7)

> " *It was actually done quite well I thought, by the college, because they had to adapt on their feet as well [and] come up with the remote learning, […] it was OK for a few weeks like I said, but I think now, we kinda gone back into another block of teaching, it's kinda a bit more difficult to get into new, fresh material from the off*". (Participant 4)

Some students mentioned that they felt the delivery of the material in smaller chunks, or the ability to take breaks during the consumption of the material made the learning more manageable and also helped with motivation.

> " *Our lectures would tend to be, you know, two hours long… so, if it's quite a long lecture like that, am… there was one actually, recently was given to us and it was broken down into 20-minute snippets? that was kind of more approachable, you know, to attack one piece at a time, it was Neuroanatomy, so like obviously a two hour lecture would have been kind of daunting to face into that if someone wasn't familiar with it*". (Participant 9)

> " *You could have a 2-hour lecture and it's really difficult to keep… attention for two hours, so it was nice that you know you could take it- especially with anatomy I found, you could take it in nice chunks, so like a half an hour or… you know?*". (Participant 2)

However, some students (3/11) also mentioned that since downloadable material and lecture recordings could be consumed at any time, this could lead to procrastination.

Figure 3.4: Theme 4 – Self-directed learning.

> *" You know some of the times, at the start I was taking notes, but then after a while I was like 'Oh, there's no point taking notes here, it's recorded, I'll just look back on it'.. but like the lectures are 2 hours long like... you know if was smart about it I'd start taking (laughs) taking my notes during the live lectures... am... and go back and top up on them".* (Participant 5)

> *" One mistake I would have made at the start is leave the kind of downloadable lectures pile up, you might have the lecture and it might just be you know, 40 minutes or an hour and by the time actually go through it slowly it could take you, you know, two three four hours... so I think it's important not to let them pile up because, am... they can take a lot of time to go through after".* (Participant 11)

For motivational factors outside of the curricular, activities such as sport and exercise were regarded as important for some students (5/11) (see also, Section 3.2.2, University Resources). As a result, some of these students were impacted negatively by the cessation of sporting activities and closure of sport clubs due to the pandemic.

> *" I suppose sport being off actually... sport was one thing that I... I definitely missed quite a lot, and I didn't realise I missed it so much until it started coming back in the last... kinda two weeks or that way, so... am... kinda nice now though, you know, there's things to look forward to like that".* (Participant 4)

> *" I play a lot of sport as well, and the fact that that was gone, it was just trying to keep your head space, like, I mean you could- I was guilty leaving a lecture someday and you'd just extremely annoyed [...] and knowing that you had training that night was kind of like,' okay, just get it out there you'll be fine tomorrow'... [so] that wasn't there".* (Participant 6)

Finally, one student touched on the issue of "*Zoom fatigue*" (Jiang 2020), the mental exhaustion associated with online video calls.

> *" And you had the usual kind of Zoom calls and things like that were quite good to catch up on people... but again, [...] after this, you kind of get tired of the 'Zooms' every weekend and things like that as well... I'm sure everybody in the country knows".* (Participant 11)

3.4 Self-directed Learning

For many students (8/11), a major advantage to the provision of online materials was that it facilitated them to manage their learning at their own pace. Students reported that they regarded it was a big advantage to be able to stop or pause the pre-recorded voice-over lectures and rewind to listen to the material again.

> *"I suppose you could like leave it, the content, to a later date, and maybe do a little bit of revision, like even for example like for, am... the anatomy module, like, am I think one of the last topics we had to do was on the hand, but it was kind of, getting, it was nice to be able to kind of nail down the forearm, and all that kind of thing, before transitioning onto the hand".* (Participant 3)

> "*Especially with the voice recordings, like I thought they were very handy to go back on, because normally in lectures like you know, you could have a 2 hour lecture and it's really difficult to keep… attention for 2 hours, so it was nice that you know you could take it- especially with anatomy I found, you could take it in nice chunks, so like a half an hour or… you know?*". (Participant 2)

> "*I found that very beneficial in one way because, I suppose you could pause, and, you know, stop, write notes, am… go back over that slide, am, you know if there's… you know there's always, most of your content is kinda going to be verbal, there's only going to be so much on a slide, so, I suppose it was nice to have that recorded, that you could really write down everything that they were saying, am… that was really beneficial*". (Participant 3)

However, students reported that a disadvantage to the voice-over lectures was that they were more time-consuming, and going through a single two-hour lecture took much longer than two hours. Because of this perceived disadvantage, some students expressed a preference for live lectures over the pre-recorded voice-overs (see also, Section 3.3.1, Interaction).

> "*What I personally prefer like, the live lectures over the voice-over cause like… fine, with the voice-over, it could be a two-hour voice-over but could take four hours to get through it… because you can pause it and… now again… it's handy that you can go back on it, but they are kind of recording all our lectures now, so even you can go back on them, but I prefer live lectures definitely because it's two hours you're done in two hours, whereas with voice-overs, I never get them done in the time-space because you're constantly pausing to write notes*". (Participant 10)

For some of the modules, the students were given workbooks with case studies to fill out before attending a tutorial, whereas pre-Covid-19 these workbooks would have been filled out in class during the face-to-face lecture. Some students (5/11) regarded that there were advantages to doing the workbooks in this way, prior to attending the lectures, as they felt it facilitated the learning of the material.

> "*Just preparing work before you went into it, so we used get like, a workbook and fill it out and go do our own research and find out our own evidence and then discuss it the week after, but I found that was really helpful for learning cause, before… you'd do the, ah… the workbook maybe, or you might do the actual lecture and then get the workbook after, so you'd be just doing it for kinda the sake of it in some cases, if you had other, am… we'll say projects or assignments coming up, so you wouldn't get as much benefit out of it I suppose*". (Participant 4)

> "*The ones that were based on workbooks where we kinda had to go off, do the work, and then come back for the lectures with the work, and to be honest, going back to regular lectures, I think even having something like that in place, is extremely useful for learning*". (Participant 8)

However, for other students (4/11), there were perceived challenges when it came to self-directed learning and the workbooks. For some, they felt that there was no outcome or conclusion to the workbooks, and for others, they had some challenges concerning the completion of group workbooks in assigned groups (see also, Section 3.5, Peer Learning & Support).

> "*A lot of the content is self-directed learning, so they are just kinda giving you a, like a list of things kinda you have to cover, and it's a lot of research on yourself, and I know that, you know you're in a master degree, like that, you know you have to be able to do that, but… and then we kinda have tutorials to go over what we gathered and that kind of stuff, but… yea sometimes I do finish up at the end of it, and I'm kinda like… I don't know if I really got the answer to that, you know […] and everyone's kinda finding different things, but sometimes there's no conclusion at the end of it, what was actually right or wrong*". (Participant 3)

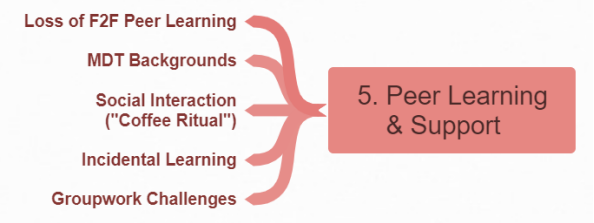

Figure 3.5: Theme 5 – Peer learning & support.

> "*They set up self-directed learning for the last few weeks, and... am... to be honest that didn't really work well, at all, like we're in a group, and I can see the intention, like the intention is good, and it does make sense like that we'd have to do our own kind of learning, am... and it's good as well to work amongst our peers, because we're not seeing each other as well too, but the only thing is, they have allocated timeslots to do the self-directed learning, but for most people those times didn't work? so for example [...] we never came online as a group and actually done that work together, so what we ended up doing was splitting up the workbooks, so I could take one part, the 4 others could take another section of the workbook, like to be honest it was a kind of a waste of time, we weren't getting much from it, we would have benefited from it more if we could have forwarded it on to the lecturers, and have the lecturers correct it for us... and tell us, 'this is correct, this is incorrect, you need to go back over this, what else could be done here', am... but yea like I can see the intent with the self-directed learning, but it would have been more useful for us to nearly do that individually, as opposed to in a group*". (Participant 8)

3.5 Peer Learning & Support

Many of the students (8/11) mentioned that they perceived their experience of peer-learning and their overall learning experience was negatively affected by the closure of the campus and the loss of face-to-face contact with their peers.

> "*I found it extremely hard to learn, not having, like my peers from college helping me as well I think, in year one I became really dependent on that aspect of things, especially for, am... the hands-on kinda stuff, and the practical... like even with the anatomy I struggled with a lot this year in comparison to last year... like last year I got into a habit of staying back inside in the college and doing work with a few other classmates and... I just found that to be my best way of learning anatomy, and when it came to having to study at home, it was just much harder, it was much harder to do learning from home*". (Participant 8)

> "*It definitely was affected, because we would have a good kinda class... like everyone would help each other out and if there was any tutorials or even in class, you know if someone wasn't sure of something you'd always have someone to ask, so that was... that was definitely affected, especially coming up to exams, cause people would kinda share their... evidence for things and... I remember even before Christmas there, for the anatomy practicals, and for am... Resp [Respiratory], everyone just came in and we went through everything together, you know like, pretty much like a mini exam, you know, we kinda staged it like a role play kinda thing, where you had one examiner, one patient, one therapist, and we kinda graded each other based on that, so I found that really beneficial that time, but I suppose yea, it was kinda taken away*". (Participant 8)

Some of these students regarded the multi-disciplinary backgrounds of their peers to be a big advantage in peer-learning prior to the campus closures, as it allowed students to share and exchange knowledge and learnings from the different disciplines and perspectives.

> "*Coming up to the exams at Christmas, everyone was on campus, in the classrooms, learning off each other, there was loads of different groups, and you're constantly just going from group to group, and… you had like the knowledge of the class, because we have such a cohort of like different people you know… we had so much knowledge off each other like, that you could just ask a question and that was it answered.*". (Participant 5)

> "*The first semester was great, that we had the athletic therapists, they were… very knowledgeable in the practical, where we would have been more knowledgeable in like the Resp [Respiratory], or that kinda stuff, so… it was a balancing act, we helped them, they helped us […] you know we did help each other a lot, like the fact that I would have had weaknesses and they would have helped me with those, and vice versa like… especially with the accelerated masters*". (Participant 2)

For some students, the lack of face-to-face contact with their peers was not only perceived to have affected learning but they also missed the social interaction and activities such as going for a coffee (see also, Section 3.3.2, Motivation).

> "*Definitely reduction in social contact, I'm very good at being on my own but the interaction with people is something that I just missed a lot […] and not being able to do the normal things… my thing was coffee, just being able to go for a coffee, was missed, so much*". (Participant 6)

> "*The lack of… like contact with the people you're in the course with […] there's only 30 of us in here and we all meet up, we all go and do stuff together… so I think, missing that was a big issue for me anyway, and as well… kind of the contact with them in terms of like… if we're coming up to the exam period we'd be going to the library together a lot of the time and when we go for a coffee, for the coffee break and you're with them and then you're talking to them about what they've been doing, what you've been doing, and then you can kind of work off each other in that aspect… where it's been quite difficult to do that here*". (Participant 7)

A couple of students felt that *incidental learning* occurred during these more informal, social, face-to-face interactions with peers and lecturers — even though learning wasn't intended, it still happened, and that this incidental learning also lost as a result of campus closing.

> "*You know, I think- I think the routine of having contact with your peers and your lecturers, and discussing things […] even the discussions before or after the class, that were kind of absent, they'd be very beneficial, I found those… those chats about […] just the odd question that might pop up into your brain about something that's ongoing or something that the lecturer would have mentioned, that wouldn't be quite included in the content, but they're very valuable snippets to learn and then you have the, you know, again, the peer support that you're actually just bouncing some things off them, or even unrelated to, you know, college content, you're just asking how are they getting on and what their circumstances are things like that*". (Participant 9)

Although the experience of face-to-face peer-learning for most students interviewed was impacted negatively by the campus closure, some students experienced what they perceived to be an increase in the amount of peer-learning, which was accomplished by replacing the face-to-face interaction with online interaction by leveraging *Microsoft Teams* to do their own small group tutorial sessions.

> "*Actually, you know what, that was increased… because we all depended on each other, to try and help each other out… so… myself and am… I think there was like 9 of us… 8 or 9 of us that would kinda be close in the class… we made our own Teams chat, and… nearly every evening, especially coming up to exams, we would be on the phone for 2 or 3 hours, going through exam questions, going through, am… going through just stuff that we had done in class… we each*

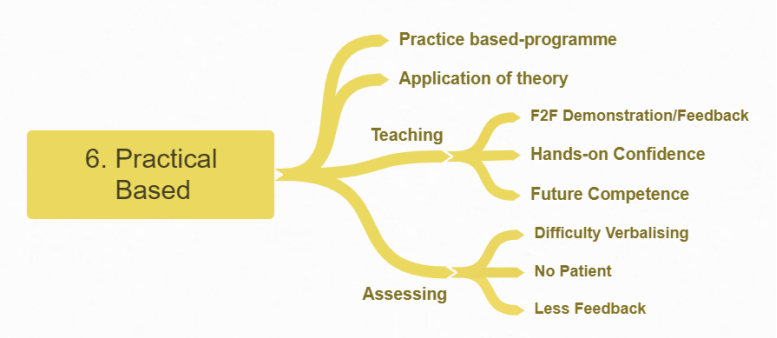

Figure 3.6: Theme 6 – Physiotherapy is practical-based.

> *took a section, for one of the modules we each took a section and did up a massive, like... word document on everything in that area, everything we could have been asked... am... all the like research and everything like that, evidence [...] we popped it up on Teams after like a week or so, so like... that aspect of like, helping each other out, learning off each other, I actually think increased a lot*". (Participant 5)

For some modules, the students received workbooks to complete in assigned groups prior to attending tutorial sessions (see also, Section 3.4, Self-directed Learning). There were mixed perceptions around this group work, for some they enjoyed working with their peers to complete these workbooks, but others experienced some challenges, in particular concerning the organisation and scheduling of synchronous group work online.

> "*I found that really good, that we were doing group work and we were in group calls, and... to be able to go through things together, and the workbooks, that was very good, I- I kind of enjoyed that, and you're talking away and having a bit of craic as well... that makes things much easier*". (Participant 7)

> "*So as I said, yea like, people are available at different times, it's hard to get hold of other people, you know [...] some people may not have looked at the workbook, you have done the bit of pre-reading at the start, you know everyone is at different stages, so I don't think... you end up not actually doing it as a group because people just take a section and, you know, go off and do that by themselves, you know you're more just dividing it up, so that's difficult definitely*". (Participant 3)

3.6 Physiotherapy is Practical-based

All of the students (11/11) at some point during the interviews iterated that they regarded Physiotherapy to be a hands-on and practical-based profession, and the loss of the practical elements of the course when the campus closed was a major source of concern for all students.

> "*Physiotherapy is particularly hands-on and it's particularly, am... it's a real, you know, practical profession, where your skills are very important*" (Participant 9)

> "*Disadvantages? [...] obviously, losing out on our practical hours as well... seeing as physio such a hands-on thing? "* (Participant 10)

> "*But Physiotherapy, like as a profession, it's a massive practical profession like, you know you've patients coming into you constantly and, maybe you're talking to them for the first 10 minutes,*

but then you have them up on the bed, and you're... assessing them, you're looking at their posture, you're like... you know sports physio, you're straight away doing massage, manual therapy, like if it's a... neurological patient like MS or Parkinson's... yea you're chatting to them, but again you're still assessing them [...] I think in every area of physio, it's mainly... 60% practical based?". (Participant 5)

3.6.1 Teaching Practical Skills

Some students felt that loss of face-to-face demonstration of practical skills by the tutors had a negative impact on their confidence in being able to practice and apply these skills since they no longer had the in-person guidance and feedback from the tutors to help them with their techniques.

"*[The lecturer] explained to us very well like the positioning of your hand and how to do it but you know I wouldn't have the confidence in trying it on someone when he's not there to oversee it*". (Participant 1)

"*Mobs [Mobilisations] are something that we've always been told you're extremely careful with, so him explaining it through a screen, there was no way I was even going to practice on someone... because I just didn't trust it, am... it was just hard, there was a lot of kind of... imagining involved, and YouTube "video-ing" and... you don't know if you're watching the right kind of YouTube video... we've always been told loads of physios do it differently... what way is the way they want us to do it, and am I looking at that... am... and I suppose, I think the practical bit is the bit that will have suffered the most, am... just the... in-contact learning is so important especially in this course like, and... missing that is I think a big thing*". (Participant 6)

Moreover, some students were worried that this loss of face-to-face teaching of practical skills would have a negative impact in the future on their competence as a clinician.

"*You can come back to [...] the books when you're on placement or even come back to the books when you're qualified and you can brush up... but are you really going to have the ex- the... ah, facility to come back and learn those manual skills again? probably not... or sorry, at least not the essential ones or the basic ones, you could probably go on and do CPD in specialized areas? but that was the big concern for me is that... I actually want to be competent coming out and... you know, this is- it's concerning*". (Participant 9)

3.6.2 Application of Theory

Some students remarked that the loss of in-person practical elements affected their learning of the theory, as they no longer had the facility to apply the theory physically or practically. Other students regarded clinical placements as another opportunity to put things into practice and apply theoretical knowledge, and since these placements were now postponed, this was seen as a challenge (see also, Section 3.3.2, Motivation).

"*When it comes down to actually learning and practising... even with communication, like, not having somebody in front of you to practice these things makes a huge difference*". (Participant 8)

"*I was disappointed that you know, our placement was put back [...] I was looking forward to actually getting out on placement, [it] kind of reinvigorates you at the same time, like if you go out and you have patient contact, it's like, "oh yeah, this is why I'm learning this", and "I need to brush up on this", and again, it just refocuses you, as opposed to kind of, you know, learning the theory the whole time and not really applying it, or not being able to see exactly how its applied, even when it's explained to us*". (Participant 9)

3.6.3 Assessing Practical Skills

As a result of the campus closures, the OSCEs were held over video-conferencing using *Microsoft Teams*. As mentioned, students had mixed as to whether the at-home environment was a less or more stressful environment for sitting the online examinations (see also, Section 3.2.1, Working from Home), and as well the loss of access to the materials in the clinical skills rooms such as plinths and other anatomical resources was perceived to be a disadvantage in the students' preparation for the exams (see also, Section 3.2.2, University Resources).

For the actual exam itself, many students (7/11) reported different challenges concerning the online interview-based assessment of their practical skills. A major challenge for some students was that they had difficulty describing how they would perform a treatment, as they no longer had a patient in front of them on which to demonstrate the procedure.

> "*I found it very hard... am... like little things, we were told like, you know, your professionalism etc., you get marked for all these things inside in the class, how you speak to the patient, how you- it's very hard to talk about how you would do something... yes, you're imagining the patient in your head, but it's just not the same*". (Participant 6)

> "*I didn't mind, kind of, the theory part too much because... you know it's the same as being in, but again, when you're asked to describe how you do something practically... when you're so used to, like, just doing it on a patient? Rather than, trying to like, describe how you do it... I found a lot harder anyway*". (Participant 10)

> "*But the practical side to it... was very odd to be honest... [...] when you're in class you have your patient in front of you, so you can see the patient, and... you kinda have a step by step routine, whereas... versus when you're on Teams, you don't have that routine because there's no one in front of you... so like, simple things like, introduce yourself to the patient, ask for consent, sometimes I've completely forgotten about saying one of those things, solely because there was no patient in front of me, whereas if I was [...] in the actual physical exam, you have that rhymed off no problem like... I- I think it was just because you were on your own, talking to yourself kind of, you just forget that part*". (Participant 5)

A related challenge reported by some students was that they found it difficult to judge the level of detail required for the verbalisation of procedures.

> "*I found it hard to judge how much detail to put in, and... I suppose, in the moment, after that particular exam I was really happy, but then when I started to reflect on it, I was like, "Oh no, I didn't, maybe I didn't go into detail enough about that", or I didn't verbalise this component of it... you know*". (Participant 3)

Some students felt that they did not get the same level of feedback during the exam from the examiner, due to the online nature of the exam and the loss of the face-to-face environment.

> "*I suppose, you kind of felt at times, I certainly felt that I was kind of talking to myself if I was talking for a long time, maybe... you know a minute or two minutes, ah... you don't get the feedback of the person, you know, are they listening, am I trailing off here, is this the question that they wanted answered, and things like that*". (Participant 9)

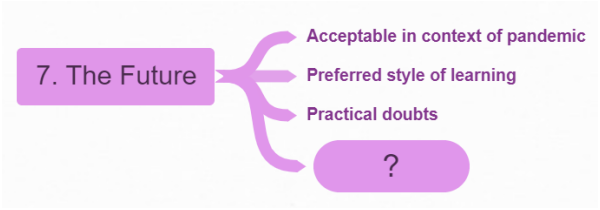

Figure 3.7: Theme 7 – The future of online learning in Physiotherapy.

3.7 The Future of Online Learning in Physiotherapy

More than half of the students (6/11) mentioned that they felt online teaching and learning was acceptable in the context of the pandemic as there was no alternative option given the current situation.

> "*Going forward even into next year, with... that kind of teaching as well, am... I know its kinda the only option for now, but I'd... I'd personally prefer if it was definitely in the college, but... with circumstances they can't do it for now*". (Participant 4)

> "*Obviously in this circumstance you have to... but if Covid-19 wasn't happening (shakes head)... then absolutely no, there should not be online learning*". (Participant 5)

However, some students expressed the opinion that, given the choice, they would not choose to do a Physiotherapy course that was delivered online.

> "*I think if you like online learning you'd be fine (laughing), but I don't like it, I... that's like why I'd never chose to do an online course... in anything I've done I've always... I rather be face-to-face*". (Participant 10)

> "*I don't know, maybe that's just me now, but... I couldn't think, I know if I was entering an MSc in Physio and I saw that it was online, that'd I'd be like... Oh God... (shakes head) no*". (Participant 2)

When asked about the future role of online teaching and learning in Physiotherapy, nearly all students, to varying degrees and levels of enthusiasm, felt that some or all of the theoretical content could be delivered via online learning.

> "*I think some of the aspects can be done, like the theories, the tests, the theoretical exams, the spoken exams, I think could be done online*". (Participant 7)

> "*Some of the actual theory could be delivered online, am... again like, I, like I said I found the workbooks were actually quite good, like if we were to go back in full time, in Nano Nagle, they would be something that they could actually use once a week, just to have ready for a tutorial*". (Participant 4)

> "*Yes and no, like physio has a massive [...] educational background, if that makes sense, like you have to know your stuff like... and there's so much information out there, and there so much education you could do, like you could spend your whole life learning about the body, [...] that yes, you could move nearly everything online, and you could do massive blocks of online learning, because there's so much stuff to cover*". (Participant 5)

However, all students (11/11), at some stage during the interviews, expressed doubts or concerns as to the future role of online teaching and learning for other elements of the MSc Physiotherapy curriculum, especially for the practical elements and the development of practical skills, but also for other discipline-independent or interpersonal skills, such as communication and empathy.

"*I don't think the practical aspect, definitely can't be done… am, I think… it can be done but I don't think you'd be as good a physio as if it was two years where we were all together*". (Participant 7)

"*But, you just, you need the practical component, and you can read books as much as you like, and know your content, but […] that's why our assessments are practical, you can know the theory, but actually implementing that is a totally different scenario […] I think things like lectures and having them pre-recorded and stuff like, that's fine, and as I said you can really consolidate it and go over it and all that kind of stuff, but, yea it removes maybe some of the interaction and, definitely the practical, it just can't be done*". (Participant 3)

"*But, definitely the practical elements, like, I don't think there's much use in showing someone a video, they have to do it themselves*". (Participant 4)

"*I mean the last few weeks have kinda proven that there is, to an extent [a role for online learning], but there [are] some things that cannot be done online, like I think definitely the element of, just developing communication skills, and being able to empathise with a person and things like that, I really don't think they're things that you can do online*". (Participant 8)

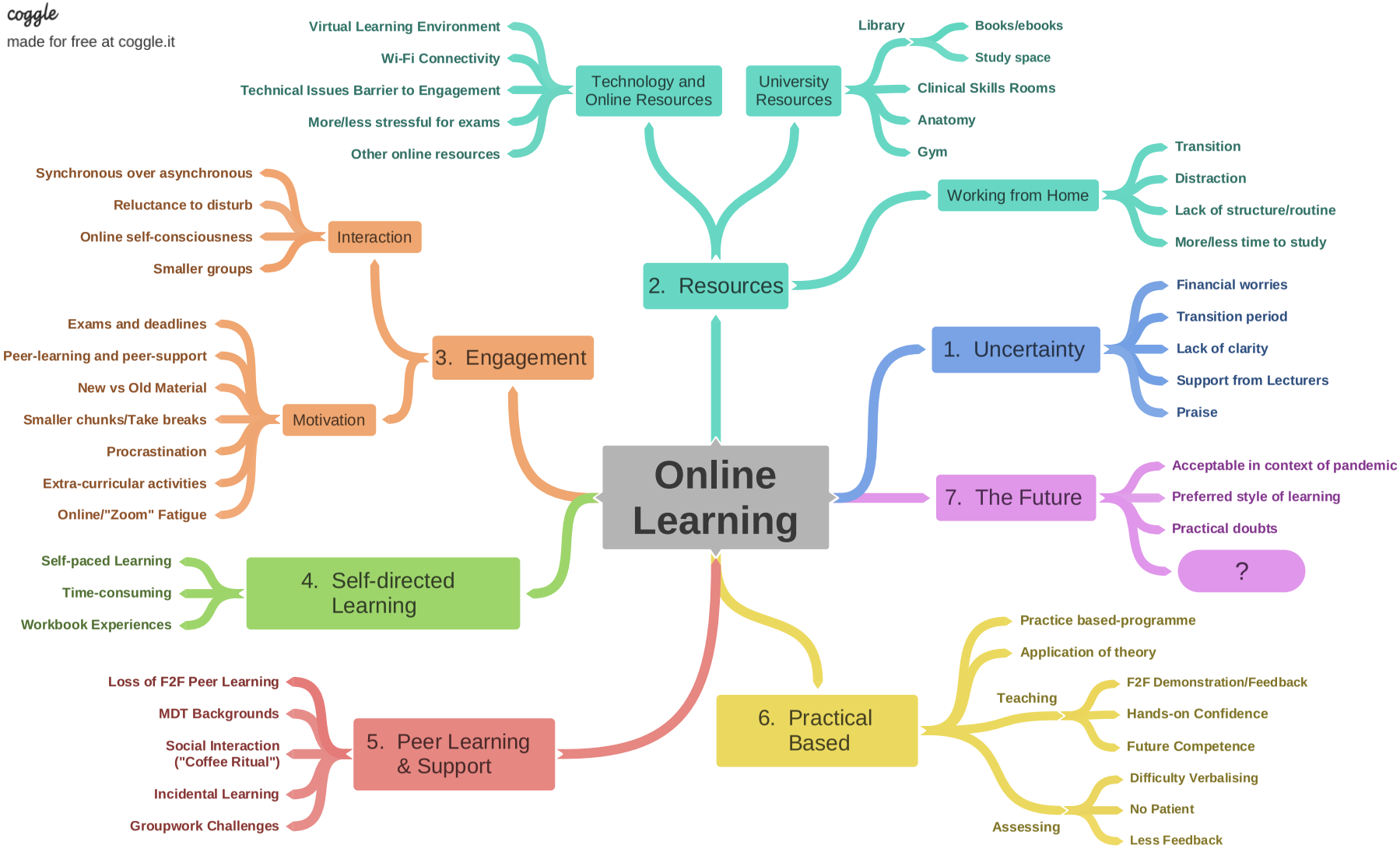

Figure 3.8: Thematic analysis – mind map of resulting themes.

Chapter 4

Discussion

Introduction

The Covid-19 pandemic was an unprecedented event, with repercussions that impacted many areas of people's lives. When the Irish Government announced the closure of higher education institutions, universities had to adapt quickly to move their teaching and learning online. The transition period for this to happen was acknowledged by many of the MSc Physiotherapy students in this study at UCC, as well as students and staff in other institutions (Pather et al. 2020; Evans et al. 2020; C. W. MacDonald et al. 2020; Gagnon et al. 2020). Undoubtedly, there was a lot of work to do and while academics put plans in place, for some students this precipitated feelings of uncertainty around how their education would proceed. For many of the students, they had additional worries over finances, job losses, and moving accommodation. However, students acknowledged the difficulty of the situation and praised the staff and the lecturers for their efforts in transitioning to online teaching and learning, and for being always on hand and available to give their support.

Given the enforced and necessary transition to online learning that occurred for the MSc Physiotherapy students, the questions that this research aimed to answer were:

1. What are the perceived advantages and disadvantages to students of online learning and assessment?
2. How can future delivery of online teaching and learning be improved?
3. Is there a future role for online teaching and learning in an MSc Physiotherapy programme?

4.1 Perceived Advantages to Online Learning

Although working at home was enforced by campus closure, students in this research study found there were some advantages to the new online learning environment. For some, they had more time to study due to being able to work from home as commuting-time was no longer a factor. Many students were comfortable with technology and were able to use VLEs and other platforms such as *WhatsApp* to communicate with peers

and engage in peer-learning. For some students, they experienced an increased level of peer-learning due to being able to communicate online. They were also able to use other online resources such as *Complete Anatomy* (*Complete Anatomy* n.d.) and *TeachMeAnatomy* (*TeachMeAnatomy* n.d.) to mitigate lost access to on-campus anatomy resources.

For asynchronous learning, such as the pre-recorded voice-over lectures, students in this research study found that there were many advantages, such as the ability to being able to take and learn the material at their own pace, pause voice-over playback and take notes, rewind and review content, and take breaks when it suited them. When material was delivered in smaller chunks, students found that it made learning easier and more manageable.

For some students, the smaller group tutorials made it easier for them to engage and ask questions. For the self-directed learning workbooks, some students perceived that it was more beneficial for their learning to complete the workbooks prior to the lectures, since before online learning commenced, these workbooks were done during class time and some students failed to see the benefit. And, for online assessments, some students in this research study found sitting the exams in an online format to be a less stressful environment than face-to-face.

4.2 Perceived Barriers to Online Learning

The initial barriers faced by the students in this research study were precipitated by the loss of access to on-campus resources and challenges encountered in their new learning environments. In working from home, the perceived challenges that affected students learning included: distractions in the home environment, the lack of a quiet place to study, the lack of routine, the loss of exercise facilities such as the gym, and the loss of learning resources such as library books, the anatomy lab and the clinical skills rooms. For some students, *Microsoft Teams* took some time to get used to, and broadband and Wi-Fi connectivity caused many issues, especially during synchronous events, and was perceived to affect learning but also on the students' ability to engage and interact with others during these events. Wi-Fi issues and worries also added to exam stress during the assessments.

For the voice-over lectures, students in this research study found that even though there were advantages to doing these lectures at their own pace, many found that a two-hour lecture was often taking much longer to go through and therefore was more time-consuming. Many students had a preference for synchronous learning activities over asynchronous from an engagement point of view, however, there were still perceived barriers for students for engagement and to be able to ask questions during the live lectures, such as technology worries, self-consciousness, and an unwillingness to disturb the lecturer during the session. For some, the online environment was regarded to lack the sense of immediacy that the face-to-face environment had, to facilitate quick questions and answers.

Motivation levels for students in this research study were described by one student to be "like a roller-coaster", with some students acknowledging that once exams and deadlines had passed, their motivation levels dropped. A downside to having materials available online for consumption at any time led some students to procrastinate — delaying the watching of voice-over lectures or note-taking from live lectures to a later date.

For the assigned group work and self-directed learning workbooks, students found there were some challenges around completing the work as a group, for example, scheduling or arranging to meet online as a group. Some students also felt that there was no outcome to the workbooks, they felt they didn't get any conclusive answers to the work completed.

For many of the students in this research study, they felt negatively impacted by the loss of face-to-face interaction with their peers for many reasons: for learning and applying theory in practice, for social contact, and for motivation. Some felt that in the face-to-face environment, the multidisciplinary backgrounds of the students allowed for the exchange of knowledge from different experiences, and also incidental learning occurred through this social interaction and that these elements of learning were absent in the online environment.

The biggest perceived challenge faced by all the students in this research study by the move to online learning was the loss of the face-to-face practical aspects of the course. For students, this affected the learning of practical skills in several areas, such as the loss in-person feedback and guidance, and the loss of learning by being able to apply knowledge. For some students, this precipitated worries about confidence and competence, but also worries about the development of other skills such as clinical reasoning and in-person skills such as professionalism, communication and empathy.

The assessment of practical skills was also a challenge for students, the interview format of the OSCEs did not suit some as they found it difficult to verbalise procedures, they no longer had a patient in front of them on which to demonstrate, there was reduced feedback during the process due to the remoteness of the examiner, and internet connectivity was an added worry during the exam. The deferment of clinical placements was also regarded to be a challenge for the students in this research study, as it was seen as a lost opportunity for learning and applying important practical skills and developing other professional skills.

4.3 How Online Learning Can Be Improved

Since internet connectivity affected the students in our research in various ways, the quality of broadband and access to technology available to students in a working-from-home or online learning environment should be a factor when considering the delivery of online education. A scheme was recently announced at government level to provide €160m of financial aid to third-level institutions, of which €15 million is for students access to technology resources such as laptops and Wi-Fi (Ardill 2020). Other initiatives like this would help students offset technological challenges with online learning, and

shows that the online learning experience for students relies on having appropriate technology and infrastructure in place to support it.

In situations where it is not possible to access the library and physical textbooks, for example, due to campus closures or when students are located off-campus, it could be a consideration at university level to ensure that any physical books that students would rely on are also available online. Some students used various other online resources and apps to help augment the learning of anatomy, such as platforms like *Complete Anatomy* (*Complete Anatomy* n.d.). Subscriptions to additional appropriate paid content, such as *Complete Anatomy* could help with learning and unburden students from paying for these resources out of their own pockets. Turhan (Turhan 2020) found in their survey of Physiotherapy students that these students were comfortable with technology and many used online resources in preference to textbooks for learning.

Gagnon et al. (Gagnon et al. 2020) highlight that the introduction of technology should be intentional and strategic, and should be based on sound learning theory. The authors summarise the *substitution, augmentation, modification, redefinition* (SAMR) model as a guide to incorporating technology into developing online and hybrid learning environments, and state that educators should favour *modification* (redesigned learning activities) and *redefinition* (new learning activities), over *substitution* (directly replacing offline with online activities) and *augmentation* (supplying additional resources to an existing activity). Modified and redefined learning activities can lead to enhanced student learning and more interaction and collaboration, for example, video-based synchronous events that also leverage technology for chat, messaging, breakout rooms for smaller discussion, in-class quizzes and polls, and Q+A sessions. The incorporation of appropriate technology in this way could also help students overcome their reluctance to disturb lecturers during live online lectures and tutorials.

Similarly, Evans et al. (Evans et al. 2020) and Srinivasan (Srinivasan 2020) mention the use of online technology such as *Slido* (*Slido* n.d.), an online polling platform, to facilitate question-and-answer sessions and encourage engagement, and also leveraging other features inbuilt in the VLE would enable tutors to gauge the level of learning and engagement during these sessions. Gagnon et al. (Gagnon et al. 2020) describe the "community of inquiry" framework (see appendix, Figure B.2), which acknowledges the importance of creating a "community of learners" by the interaction of three elements, social presence (students can identify with the community, communicate purposefully and develop relationships), teaching presence (teachers direct social and cognitive processes such that meaningful learning takes place) and cognitive presence (students are able to construct meaning and knowledge). This can help create an engaging, collaborative learning environment, and also help prevent student isolation and reduced motivation caused by a lack of social interaction in the online environment, which are challenges noted by Gillett-Swan (Gillett-Swan 2017) and also mentioned by some of the students in this research study.

In other research, Evans et al. (Evans et al. 2020) highlight that students, when watching longer lectures or lecture recordings, e.g., 50 mins, can become distracted by other activities such as checking their phone and social media. For asynchronous material

and recordings, structuring the material into smaller chunks should be a consideration when designing material for delivery online (Ní Shé et al. 2019). C. W. MacDonald et al. (C. W. MacDonald et al. 2020) also note that the delivery of material in smaller chunks was acknowledged by the students in their study to be easier to digest. According to Evans et al. (Evans et al. 2020), the interspersion between topics of other learning activities, such as quizzes or case studies, helps maintain active engagement, and the design of online learning resources should be intentional and favour new types of learning activities to best utilise technology and maximise learning, as opposed to just "shrinking and linking" content and making it available remotely (Gagnon et al. 2020). Pather et al. (Pather et al. 2020) also note that any restructuring of delivery should still ensure alignment with learning outcomes, activities and assessment.

Ariely and Wertenbroch (Ariely and Wertenbroch 2002) found in their study that externally imposed deadlines were more effective for their students to get work done, as opposed to deadlines that were self-imposed or created by the students themselves. This corresponds to the experiences of the students in this research study and highlights that a structured schedule with regular deadlines for students is important to help combat procrastination and help keep motivation levels up. Suggestions by Rogan et al. (Rogan et al. 2020) to make self-directed learning more acceptable for the Physiotherapy students in their study could also be considered post-Covid-19, these included better time-planning in the academic calendar, and reducing classroom hours to favour self-study time which would allow students more time to prepare clinical cases. Pather et al. (Pather et al. 2020), describe the "6 C's" of education during Covid-19, (see appendix, Figure B.3), one of which is "Clear and Effective Communication". The authors acknowledge that due to the evolving and changing nature of the pandemic, understandably messaging and communication can appear unclear and conflicting, so clear, effective and positive communication is important, to help clarify expectations around workloads and assessment, give structure and help reduce anxiety.

Possible solutions to the online practical learning and assessment issues faced by the students in this research project are not straightforward. Lecturers who responded to C. W. MacDonald et al. (C. W. MacDonald et al. 2020) in their survey had their students practice at home on family members and make videos to submit for feedback, which had some success, however, the lecturers regarded that there were many issues with this — not every student would have a suitable home environment or a patient for practising on, the lack of expert in-person feedback, and the much-increased workload for lecturers reviewing these videos.

4.4 The Future of Online Learning in Physiotherapy

Due to the Covid-19 pandemic enforcing campus closure and the move to teaching and learning online, for students in this research study, there was a high level of acceptability for online learning. However, this was often with the proviso that they perceived online learning to be necessary and the only way to do teaching and learning given the current circumstances. They all regarded Physiotherapy as a practical-based, hands-on course,

and some stated that they would prefer to learn hands-on rather than to do an online course or online learning. This reflects what was found by Stander et al. (Stander et al. 2019), who reviewed the learning styles of Physiotherapy students, and by using the *experiential learning theory* (ELT) framework (see also, Section 1.3 and appendix, Figure B.1) found that one of the two predominant learning styles for Physiotherapy students was "Converger", a student with this learning style "learns 'hands-on' and applying previously attained knowledge" (Stander et al. 2019).

Many of the Physiotherapy students in this research study expressed that they felt many or all of the theoretical components of the Physiotherapy course could be delivered online. Both Hew and Lo and Røe et al. found that a flipped-classroom approach and *problem-based learning* (PBL) improved student learning in health profession and physiotherapy education, albeit with the lectures in a face-to-face rather than online environments (Hew and Lo 2018; Røe et al. 2019). Similarly, Ødegaard et al. (Ødegaard et al. 2020, PREPRINT) recently found in their systematic review, yet to be peer-reviewed, that "digital learning designs" such as flipped classroom and hybrid or blended learning are more or equally as effective for achieving learning outcomes in Physiotherapy education. These studies, along with some of the feedback from the students in our research study, would seem to support an online, flipped-classroom approach whereby students receive online materials and workbooks as part of a PBL or SDL approach, to complete asynchronously as homework, and active learning activities are then performed in the classroom, either face-to-face or online.

The importance of clinical placements for the development of practical skills was acknowledged by other students and teachers in research by Ernstzen et al. (Ernstzen et al. 2009). A novel approach to overcome lost or deferred placements due to Covid-19 is discussed by Forbes and Martin (Forbes and Martin 2020), who suggest that in these situations where clinical placements cannot occur in their usual way, that it could be replaced or augments with *project-based learning* (PjBL), whereby students would take a challenging question or problem and would design, develop and implement a product or solution, for example, the development of a community resource for patients within a private practice. Some of these projects have been put into place already but the authors as of yet had no evaluation from the students as to their experiences with this type of placement. At St.Kings college in London, Physiotherapy students are undertaking virtual or *telehealth* based placements; with placement providers suggesting that students will have learning opportunities "to develop understanding and clinical reasoning, alongside skills in digital healthcare that will be critical for the future delivery of healthcare" (Hill 2020). However, a student in this research study had concerns over these virtual placements.

> *" I saw that [virtual placements] and I was just like, you can't have something like that and then expect someone to go into a hospital at the end of a degree and treat a patient... like, as in, it's close contact, it's the nature of the job".* (Participant 4)

Indeed, the biggest barrier to the future of online learning in Physiotherapy found in this research study is the teaching and learning of practical, hands-on, skills and related competencies. A survey respondent to C. W. MacDonald et al. (C. W. MacDonald

et al. 2020) had the perspective that more can be done with online instruction of practical skills than had previously been considered pre-Covid-19, and that "front-loading the theory in line with targeted practical sessions may be the way of the future". Pather et al. (Pather et al. 2020) also found from their respondents that the approach taken to practical teaching was to rely on future face-to-face experiences once the theoretical elements had been taught online. Finally, this opinion was also echoed by the students in this research study.

> " *I think we'll definitely need to have a stage where there'll be a recap on all of the practical side of Physiotherapy because, in terms of going out next year, like you need to practice it, it makes such a difference*". (Participant 8)

> " *I kinda think that definitely, [for] practicals, you just have to put on PPE [personal protective equipment] at this stage, if people can consent to it, absolutely fine*". (Participant 4)

4.5 Strengths of this study

As mentioned in Section 1.6.3, there is little by way of first-hand accounts from Physiotherapy students as to the impact of Covid-19 on their teaching and learning. This research will be an addition to that area and provide readers with an insight into the perceptions of Physiotherapy students and online learning. The results of this study will also provide useful feedback to the UCC MSc Physiotherapy programme and other Physiotherapy programmes to help them adapt to the current changes in teaching and learning.

A clear audit trail was maintained during the research, along with several other strategies during the thematic analysis to ensure scientific rigour (see Section 2.6). Interviews were carried out until data saturation was reached, to ensure a comprehensive representation of viewpoints, and member checking was performed with each participant to ensure that the transcribed interview was an accurate reflection of their experience.

4.6 Limitations and Future Work

The study was undertaken with only one class of students (first-year MSc Physiotherapy students) and captured the experiences and reflections of these students at a single point in time. It would be interesting to perform a longitudinal study on these students to follow up and capture their experiences at a later point in time and measure if and how their perceptions have changed. Another area that was not looked at was the effectiveness of online education by way of comparison of, e.g., exam results or outcomes, against traditional methods, which would again be an interesting area for future research.

As the participants were restricted to first-year MSc Physiotherapy students, for which it was known that there was not a wide variance in demographic information, the research did not capture any further demographic information apart from the gender of the participants. A more detailed demographic analysis may have added another dimension to the analysis performed.

The quality measures undertaken in this study to ensure the trustworthiness of the research are detailed in Section 2.6, and although the methods detailed in that section were employed to minimise bias, there is always a danger of some bias creeping in that researchers may be unaware of (Pronin et al. 2002).

It is clear that in the perceptions of students in this research study that the best way to learn practical skills is in a face-to-face manner, but to offset the impact of situations that limit face-to-face interaction, such as caused by Covid-19, there are technologies currently used in physiotherapy education, such as *virtual reality* (VR) (Kurul et al. 2020) and *augmented reality* (AR) (Kelly et al. 2018) that could be explored further specifically for the development of practical skills, although implementation of such learning solutions could be costly. Moreover, future work could focus on technology in physiotherapy education which also develops skills that extend to solutions for patients, such as telehealth, which, for example, has been shown to be effective and comparable to convention treatments for different musculoskeletal conditions (Cottrell et al. 2017).

4.7 Conclusion

As of the time of writing (12th August 2020), the new academic year in UCC for 2020/2021 is scheduled to start on September 28th. The current plan across the University is to use a hybrid or blended learning model, where in-person teaching will be blended with online delivery. For the MSc Physiotherapy students entering second year, they will return to campus on the 7th of September, having completed part of their second-year syllabus already, which had been brought forward and delivered online in June to replace the postponed clinical placements. For this academic year, lectures will be delivered online using a mix of synchronous live events and asynchronous learning materials. It is planned that approximately two-thirds of the delivery will be face-to-face, with the remaining third of it being online. Tutorials and practicals will all be delivered face-to-face using social distancing measures or with PPE.

Short and long term models and projections by epidemiologists would suggest that Covid-19 "is here to stay" (Scudellari 2020), and while related restrictions and social-distancing measures remain in place, it is reasonable to assume that medical and clinical health science education will continue online in some shape or form, therefore best leveraging online technologies to create engaging and meaningful learning experiences will be essential. For Physiotherapy students, since face-to-face, practical, hands-on learning is also essential, finding the balance between hands-on and online education will be an interesting challenge for students and educators alike — while Covid-19 remains part of the education equation.

Appendix A

Additional Figures - Methods

Phase	Description of the process
1. Familiarizing yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Figure A.1: Six phases of thematic analysis. (Table from Braun and Clarke 2006)

Phases of Thematic Analysis	Means of Establishing Trustworthiness
Phase 1: Familiarizing yourself with your data	Prolong engagement with data
	Triangulate different data collection modes
	Document theoretical and reflective thoughts
	Document thoughts about potential codes/themes
	Store raw data in well-organized archives
	Keep records of all data field notes, transcripts, and reflexive journals
Phase 2: Generating initial codes	Peer debriefing
	Researcher triangulation
	Reflexive journaling
	Use of a coding framework
	Audit trail of code generation
	Documentation of all team meeting and peer debriefings
Phase 3: Searching for themes	Researcher triangulation
	Diagramming to make sense of theme connections
	Keep detailed notes about development and hierarchies of concepts and themes
Phase 4: Reviewing themes	Researcher triangulation
	Themes and subthemes vetted by team members
	Test for referential adequacy by returning to raw data
Phase 5: Defining and naming themes	Researcher triangulation
	Peer debriefing
	Team consensus on themes
	Documentation of team meetings regarding themes
	Documentation of theme naming
Phase 6: Producing the report	Member checking
	Peer debriefing
	Describing process of coding and analysis in sufficient details
	Thick descriptions of context
	Description of the audit trail
	Report on reasons for theoretical, methodological, and analytical choices throughout the entire study

Figure A.2: Establishing trustworthiness during each phase of thematic analysis. (Table from Nowell et al. 2017)

Pauses	Denote short pauses during talking by a series of dots (...), whose length depends on the amount of time elapsed (e.g., two dots for less than half a second, three dots for 1 second, and so on. Denote longer pauses by the word "pause" in parentheses: "(pause)," for 2-3-second breaks. Use "(long pause)" to indicate pauses of 4 or more seconds.
Laughing	Indicate in parentheses, for example, (laughing) to denote one person; (laughter) to denote several laughing.
Coughing, etc.	Indicate in parentheses, for example, (coughs), (sigh), (sneeze).
Interruptions	Indicate when someone's speech is broken off midsentence by including a hyphen (-) at that point where the interruption occurs (e.g., What do you-).
Overlapping speech	Use a hyphen to indicate when one speaker interjects into the speech of another, include the speech of the other with "overlapping" in parentheses, then return to where original speaker interrupted (if they continue). For example: R: He said that was impos- I: (overlapping) Who, Bob? R: No, Larry.
Garbled speech	Flag words that are not clear with square brackets and question mark, if guessing what was said, for example, At that, Harry just [doubled? glossed?] over. Use "x"s to denote passages that cannot be deciphered at all (number of xs should denote approximate number of words that cannot be deciphered), for example, Gina went xxxxx xxxxx xxxxx, and then [came? went?] home.
Emphasis	Use caps to denote strong emphasis, for example, he did WHAT? (do not use boldface or underlining because it is often lost when text files are imported into qualitative analysis software programs).
Held sounds	Repeat the sounds that are held, separated by hyphens. If they are emphasized, them capitalize as well. For example: "No-o-o-o, not exactly," or "I was VER-r-r-y-y-y happy."
Paraphrasing others	When interviewees assume a voice that indicates they are parodying what someone else said or an inner voice in their heads, use quotation marks and/or indicate with (mimicking voice) in parentheses. R: Then you know what he came out with? He said (mimicking voice) "I'll be damned if I'm going to let YOU push ME around." And I thought to myself: "I'll show you!"

Figure A.3: Transcription guide used during the transcription process in this research. (Table from Poland 1995)

Appendix B

Additional Figures - Discussion

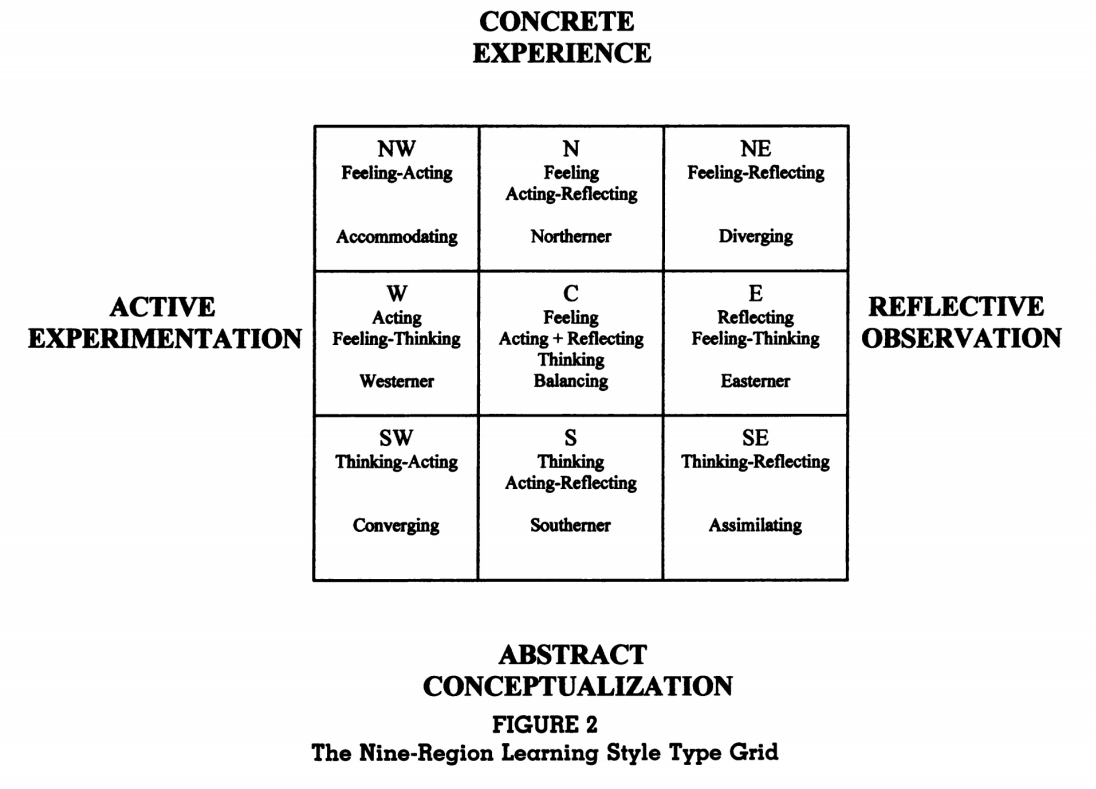

Figure B.1: Experiential Learning styles (Image from A. Y. Kolb and D. A. Kolb 2005).
Stander et al. (Stander et al. 2019) found that one of the main learning style types for Physiotherapy students was "Converging".

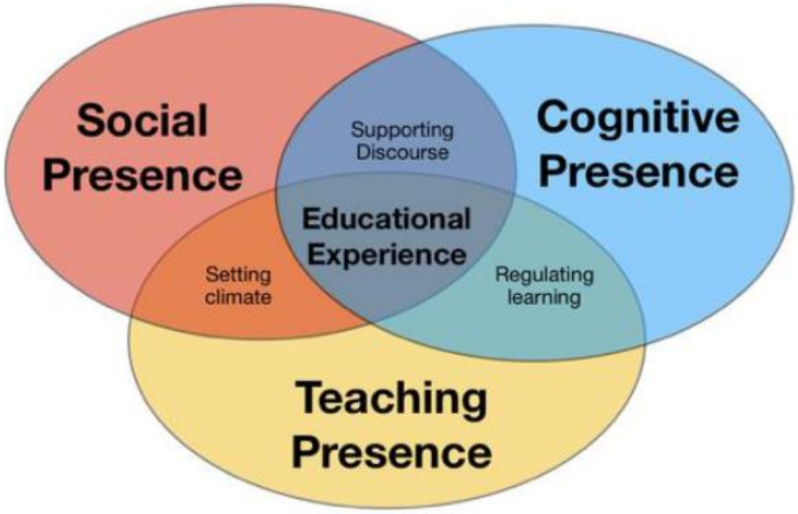

Figure B.2: The COI (Community of Inquiry) framework of interacting elements for online teaching. (Image from Gagnon et al. 2020, see also *The Community of Inquiry* n.d.)

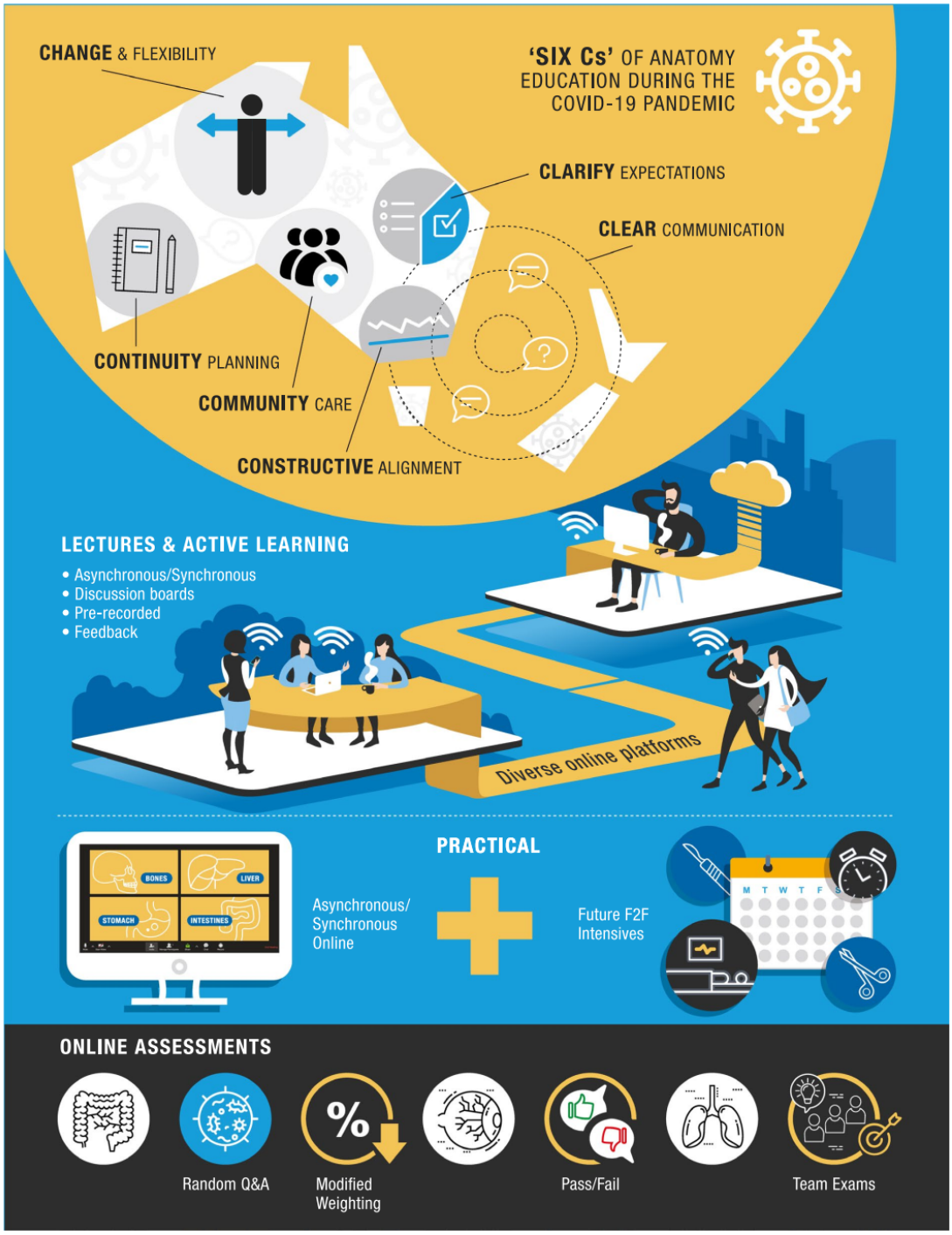

Figure B.3: The Six C's of Anatomy education during Covid-19 pandemic. (Image from Pather et al. 2020)

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Abbreviations

AR augmented reality. 48

CAI computer-assisted instruction. 3

COM Primary Investigator, Conor O'Mahony. 13, 14, 16, 17

Covid-19 coronavirus disease 2019. iii, ix, xiii, 1, 2, 5–10, 13, 26, 32, 41, 45–48

CPD continuous professional development. 36

DES Department of Education and Skills. 2

ELT experiential learning theory. 4, 46

EMQ extending-matching question. 8

EMT UCC Emergency Management Team. 2

FLAME Facility for Learning Anatomy Morphology and Embryology. 5, 25

ICTV International Committee on Taxonomy of Viruses. 2

MCQ multiple-choice question. 8, 9

NB Primary Supervisor, Niamh Brady. 13, 16, 17

NPHET Irish National Public Health Emergency Team. 2

OSCE objective structured clinical examination. 3, 5, 6, 9, 37, 43

PBL problem-based learning. 4, 46

PjBL project-based learning. 46

PPE personal protective equipment. 47, 48

PUE pneumonia of unknown etiology. 1

SAMR substitution, augmentation, modification, redefinition. 44

SARS severe acute respiratory syndrome. 1, 65

SARS-CoV SARS coronavirus. 1

SARS-CoV-2 severe acute respiratory syndrome coronavirus-2. 2

SDL self-directed learning. 46

SREC social research ethics committee. 19

SWOT strength, weakness, opportunity, threat. 8

TEA technology-enhanced assessment. 9

TEL technology-enhanced learning. 3

UCC University College Cork. iii, 1, 2, 5, 13, 19, 21, 25, 26, 41, 47, 48, 65

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