

The Student Perspective on COVID-19 Related Closures at Irish Universities with a Focus on Accessibility and Engagement

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This paper describes the impact of the COVID-19 closures on accessibility and student engagement. A survey was designed and administered to students who were enrolled in mathematics modules in an Irish university at the time of the closures. A total of 263 students from six universities responded to the survey. The survey comprised three sections: Teaching and Learning, Assessment, and Personal Experience, and centred on how the changes in teaching and assessment were viewed by students. This paper examines a subset of the survey that focuses on students' access to and engagement with online learning. The data shows that the abrupt changes had a significant impact on students' motivation in addition to other factors which impacted engagement. The responses indicate that most (but not all) students had access to the appropriate technology and infrastructure to engage with online learning.

Introduction

The COVID-19 crisis has had a major impact on education. The Irish Government announced the closure of schools and higher education institutions (HEIs) on the 13th of March 2020. HEIs remained closed for the 2019-2020 academic year, with all teaching and assessment done remotely. The situation remains largely unaltered in the 2020/21 academic year. In this paper we will consider the effects of the move to online learning on mathematics students.

There had been an increase in the use of online learning in universities before the pandemic, and in the previous decade, many researchers have studied online instruction in mathematics. Trenholm and Peschke (2020) describe the differences between face-to-face (F2F) and fully online (FO) instruction in mathematics communities of practice at university. They explain that the content being learned is the same as before, however significant changes in communication, interaction, and assessment have to take place when transitioning from F2F to FO learning (Trenholm & Peschke, 2020). We note, however, that research on massive open online courses, blended learning, or other technologically progressive methods in use prior to COVID-19 might not be as applicable to current teaching as one might expect. A more accurate characterization of what occurred following the closures is *emergency remote teaching* (ERT), described by Hodges et al. (2020) as:

a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated. (Hodges et al., 2020, p.6)

Researchers at University College Dublin carried out a similar survey to ours (Meehan & Howard, 2020). Their work reported on the positives (commuting, self-pacing) and negatives (internet connection, lack of peer interaction) students associated with distance

learning. Hill and Fitzgerald (2020, p.3) also captured the student perspective, and they reported a ‘feeling of disconnectedness and isolation’ and decreased motivation from a reduction in engagement between students and lecturers.

We consider students to be equal stakeholders in mathematics education, and that their experiences offer valuable insights into how the closures were handled and how best to proceed. In this paper, we describe a subset of the results of a survey given to students who were enrolled in mathematics modules in Irish universities during the COVID-19 related closures. The research question is as follows:

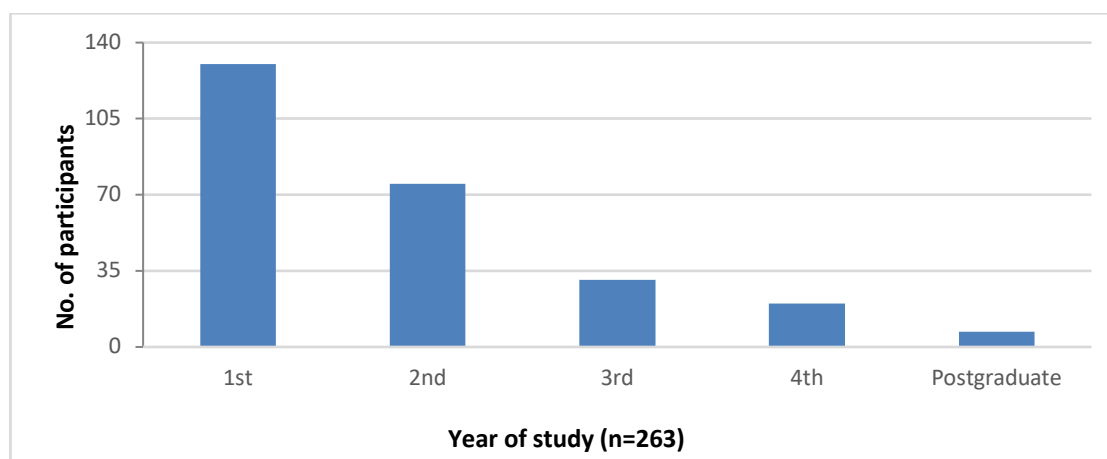
How did the initial COVID-19 closure impact students' access to and engagement with learning?

Method

We designed a survey to inform the research question comprising 16 questions, divided into three sections: Teaching and Learning, Assessment, and Personal Experience. The subset of the survey that is discussed in this paper is Q5, and Q12-16, which relates to students’ access to and engagement with FO learning. The survey received ethical approval by Maynooth University Ethics Committee, and was open from July 9th to August 9th, 2020, and as such only pertained to the students’ experience from March 13th until the end of semester. The survey was shared with mathematics lecturers through mailing lists, many of whom forwarded the survey to their students. In total, 263 students from six universities responded to the survey (available at Hyland & O’Shea, 2021). The year of study for respondents is contained in Figure 1.

Figure 1

Year of study of participants



The majority of respondents were enrolled at Maynooth University (62%), with the remainder spread across five of the seven other Irish universities. The most frequent degree programmes represented in our sample were specialist mathematics courses (21%), teacher education (20%), and general science (19%). Students studying a single science subject (e.g., physics, chemistry, or biology) made up 13% of the respondents, while 11% of the group were studying mathematics as part of a BA programme, and 7% were enrolled in computing

degrees. The survey responses generated a combination of qualitative and quantitative data. We analysed the qualitative data by following the general inductive approach to qualitative data analysis outlined by Thomas (2006). The approach allows “research findings to emerge from the frequent, dominant or significant themes inherent in raw data, without the restraints imposed by structured methodologies” (Thomas, 2006, p.283). The process, which uses coding to develop categories to condense the data, allows links between the research questions and the findings to be established (Thomas, 2006). Procedures to assess the trustworthiness of the category system, (independent coding, coding consistency check, and stakeholder checks) which Thomas (2006) describes, were also practiced during our data analysis. The quantitative data gathered in response to the closed response questions were tallied and are presented in tables in the Results Section.

Results

In this section, we present a subset of the results from the larger project. Though data was gathered on a wide range of questions in the survey, here we focus on data that describes students' access to and engagement with FO learning. We begin by looking at the data on students' access to technology and suitable workspaces which might impact their ability to work remotely.

Accessibility of Remote Learning

Five closed questions were designed to learn about the equipment, infrastructure, and facilities students had access to while learning from home. The results (Table 1) show that most students had access to the appropriate equipment to facilitate their learning. Access was not universal however, with several geographical and economic barriers restricting access to equipment (desk, computer, printer/scanner), infrastructure (fast, reliable broadband), and facilities (quiet space). Almost one third of students did not have access to a printer/scanner and a similar proportion did not have reliable broadband. It is also notable that students often use apps on their phone to scan their work which we believe impacted the responses to Q4.

Table 1

Students' access to equipment, infrastructure, and facilities for distance learning

Question	Yes	No	Prefer not to say
1 Did you have access to a quiet place to study?	200 (76%)	62 (23.6%)	1 (0.4%)
2 Did you have access to a table/desk?	249 (94.7%)	13 (4.9%)	1 (0.4%)
3 Did you have access to a PC or laptop?	256 (97.3%)	6 (2.3%)	1 (0.4%)
4 Did you have access to a printer/scanner?	186 (70.7%)	75 (28.5%)	2 (0.8%)
5 Did you have access to fast and reliable broadband?	166 (63.1%)	90 (36.5%)	1 (0.4%)

Students’ Experience of the Transition to Distance Learning

Several open response questions were included in the survey to investigate students’ personal experiences of the transition to distance learning. We focus on a subset of responses on how students accessed and engaged with FO learning. We begin with expressions of motivation, anxiety, and isolation (Table 2), which had a significant impact on student engagement.

Table 2

Student data on anxiety, isolation, and motivation

	<i>Strongly agree</i>	<i>Somewhat agree</i>	<i>Neutral</i>	<i>Somewhat disagree</i>	<i>Strongly disagree</i>	<i>Prefer not to say</i>
It was easier to motivate myself to learn during the lockdown than before	8% (n=21)	8.7% (n=23)	14.8% (n=39)	25.1% (n=66)	39.2% (n=103)	4.2% (n=11)
I felt more anxious about my learning during the lockdown than before	32.7% (n=86)	29.7% (n=78)	15.6% (n=41)	11.8% (n=31)	9.1% (n=24)	1.1% (n=3)
I felt isolated from my lecturer/class group	29.7% (n=78)	26.6% (n=70)	22.8% (n=60)	10.3% (n=27)	10.3% (n=27)	0.4% (n=1)

Students reported feeling increased anxiety and isolation during the COVID-19 closures. Though expected with such a sudden switch from F2F to FO learning, it is still concerning. Of the 263 respondents, 164 (62%) reported increased anxiety, 148 (56%) felt isolated from their peers and lecturers, and 169 students (64%) believed it was more difficult to motivate themselves during lockdown. An open response question asking for strategies to avoid isolation was also included on the survey; many responses described ways of increasing contact among students while acknowledging the complexity of such an issue in the current environment:

Student 152: I think it is just a consequence of isolation that can't really be avoided. It's difficult to replicate how it feels to go to a lecture in person just using online resources.

The increased isolation is also seen in responses to other parts of Q12, where students reported negative effects on communication with lecturers, peers, and support services, and a ‘very negative’ impact on their ability to study with peers which recurs throughout the data.

To finish the survey, three open response questions were asked about the challenging (Q14) and positive (Q15) aspects of teaching, learning, and assessment during the closures, and an opportunity for further comment (Q16) was provided. The responses relating to engagement are detailed below, with a focus on interaction and communication, which was the most frequently reported category. These responses are described below (in Tables 3, 4 and 5 respectively), where categories with five tallies or fewer are omitted.

The challenges students reported fell into five overarching categories: *interaction and communication* ($n=97$), *delivery of teaching* ($n=90$), *motivation* ($n=75$), *learning environment* ($n=21$), and *assessment* ($n=20$) (see Table 3). The category of *delivery of teaching* consisted of the *loss of in-person delivery* ($n=28$), *access to support* ($n=54$), and *access to resources* ($n=8$). *Access to support* was understandably the most frequently occurring category and is indicative of a change in interaction pattern brought about by the move online, with one student describing the challenges as:

Student 92: The 1 on 1 support from tutorials and maths support centre is very hard to recreate online. Lots of work can be self-directed however an hour or 2 of in person teaching can really help.

The category *interaction and communication* concerned the reduction of *peer interaction* ($n=46$), the difficulty of *asking questions in real time* during online lectures ($n=30$), students having *less communication* with their lecturer ($n=16$), and *lack of feedback* on work and assignments ($n=5$). Through *peer interaction*, we can see another example of how students' customary studying habits were uprooted:

Student 181: I found it difficult not having the library, Maths learning centre, and mostly my peers to study with.

We consider *interaction and communication* to be closely linked to *motivation*, which includes *loss of motivation* ($n=52$), issues with *self-pacing* ($n=17$), and feelings of *isolation* ($n=3$). Though student motivation can be impacted by many factors, it is unsurprising that the toll of the pandemic was felt by students:

Student 44: It's harder to motivate yourself to study at home, it feels more like a chore to have no peers to bounce ideas off, or to take small breaks between lectures.

Finally, challenges with the *learning environment* were mentioned by students, consisting of having access to an appropriate *study space* ($n=13$) and *issues with technology or internet* ($n=8$), relating back to the data on accessibility in Table 1.

Table 3

Challenging aspects of changes mentioned by students (Q14)

Category	Label	Tally
Interaction and communication	Peer Interaction	46
	Asking questions in real time	30
	Less communication with lecturer	16
Delivery of teaching	Access to support (MSC)	54
	Loss of in-person delivery	28
	Access to resources (e.g., books)	8

Motivation	Motivation	52
	Self-pacing	17
Learning environment	Home space	13
	Technology and internet	8
Assessment	Assessment format	13
Other		15

The social aspect of learning is a theme uniting many of the most frequently occurring labels in Table 3 (*in-person delivery, access to support, peer interaction, less communication with lecturer, and asking questions in real time*). The disconnect between this and FO learning led to issues with motivation and isolation which combine for 73% of the responses to this question.

Many positive aspects of the transition were also reported by students (Table 4), though benefits relating to access and engagement are few and far between. The absence of a fixed timetable for many students allowed them to work at their own pace, and at a time that best suited their circumstances. We note however, that self-pacing was also perceived as a negative for some students.

Table 4

Positive aspects of changes mentioned by students (Q15)

Category	Label	Tally
Learning	Self-pacing	44
	Individual study skills	26
Time	No Commute	35
	No set timetable	38
Resources	More internal resources (e.g., module-specific notes, solutions)	55
	Found external resources (e.g., third-party websites)	7
Assessment	Open book	8
	Online assessment	6
Other		14

Finally, the space for further comment which was provided at the end of the survey returned many of the previous findings (Table 5). In a sense, it caused respondents to prioritise their most salient opinion, which, in this case, relates to the delivery of mathematics. The most frequent response was that the learning of mathematics is a communal activity, that is to say, the way we engage our students when they are learning mathematics matters.

Table 5*All remaining comments mentioned by students (Q16)*

Category	Label	Tally
Teaching and learning	Maths is a social subject/needs to be delivered in person	11
	All resources should be uploaded even when in-person returns	7
	Clarify standards across departments/institution	6
Personal experience	Negative experience	8
	Resilient and pragmatic viewpoint	8
	Positive experience	6
Assessment	Assessments need to be improved and standardized	6

Discussion

In this study, we describe the results of a survey designed to investigate the impact of the COVID-19 university closures have had on students studying mathematics with a focus on accessibility and engagement. Responses to Q12 (Table 1) showed that most respondents had access to the appropriate equipment and facilities to engage with lectures remotely, although many students were relying on their smartphones or tablets to scan and access resources. It is concerning that nearly a quarter of the respondents did not have a quiet place to study or to take their final examinations. Some improvements have been made in this area, with universities making quiet rooms available on campus so that certain students have a suitable location to take their examinations. The access to reliable and fast broadband is a more difficult issue to solve in the short term, but has been flagged previously (Becker et al., 2017).

The students' experience of the transition was investigated by asking them how their motivation, levels of anxiety, and feelings of isolation have been impacted by the closures. The results portray a drastic reduction in motivation along with increased anxiety and feelings of isolation. Unger and Meiran (2020) have reported this with respect to COVID-19 specifically and have called for students' mental health to be monitored during epidemics. Even though these students are digital natives, it seems many had negative experiences with remote learning and missed personal interactions with staff and peers.

Trenholm and Peschke's (2020) advise that significant changes in communication, interaction, and assessment are crucial when transitioning from F2F to FO learning even though the mathematical content remains unchanged. Our results suggest that these changes did not take place to the necessary level during the COVID-19 closures. This is not surprising since the move to ERT (Hodges et al., 2020) was so sudden and unplanned. At the time of writing, Irish universities are in their third semester of remote teaching and there is no doubt that the community have become more accustomed to the changes. An end to COVID-19 related closures is in sight but the lessons we have learned as a community should not be

discarded (Hodges et al., 2020). Future events (e.g. weather and public health) may require ERT to be used again.

This research was undertaken to give a voice to students who were studying mathematics at the time of the COVID-19 related closures. Staff and students were faced with many difficulties, and our analysis has highlighted the areas of concern for students. In particular, our data has revealed the importance of personal contact with instructors and peers.

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