

UNIVERSITY COLLEGE DUBLIN
MATHS SUPPORT CENTRE



Annual Report 2021/22

MSC Tutors 2021/22



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1 The year in summary

The academic year 2021/22 was very challenging for the UCD Maths Support Centre (MSC). With 2-metre social distancing, mask wearing, sanitising stations, restricted capacity of just 12 people in the centre and a new hybrid support offering, our tutor team have done incredible work to maintain the high quality of support offered to UCD undergraduate students.

As we reflect on 26 months of pandemic-affected maths support and the significant decrease in student engagement that has occurred in this time it is important that we look forward to a brighter future. Figure 1 below shows the various formats of support the MSC offered before and throughout the pandemic. With face-to-face teaching and support available again on campus, we have learned that the online support offering in both synchronous and non-synchronous settings has a significant role to play for many of our students. The following report presents the data and activity of the UCD MSC for the academic year 2021/22.



Figure 1: MSC service before and throughout pandemic

2 Executive Summary

We first present a high level summary of facts and figures from 2021/22.

- The number of student visits at 2,328 from 738 unique students was an increase of 6.8% and 21.6% respectively on the previous pandemic-hit year.
- There were 312 (13.4%) online sessions, 1,801 (77.4%) booked face-to-face sessions and 215 drop-in face-to-face visits (9.2%).
- There were 152 distinct modules supported - 96 in Trimester 1 and 81 in Trimester 2 (including 25 modules taken by repeat/resit students).
- Visits from 86 modules not delivered by the School of Mathematics and Statistics (SMS) were recorded (a 115% increase on last year).

- Students from all six of UCD's colleges presented at the MSC.
- 77.36% of all visits were from students registered to level 0 or level 1 modules, an increase of 2.1% from 2020/21.
- The average time a student spent with a tutor was 42 minutes, the median time spent with a tutor was 19 minutes and the mean wait time to see a tutor in person for drop-in students was 6.7 minutes.
- The range of student visits was one to 48. The median and modal number of visits was 2 and the mean was 3.2 visits.
- 52% of all visits were return visits.
- 87.1% of all visits came from students registered to modules delivered by SMS, down 5% on the previous year. Of these visits approximately 65% were from service modules with the remainder from SMS degree programmes.¹
- 10.7% of visits related to statistical queries, an increase of 3% on last year - 9.4% of all visits came from STAT modules delivered by SMS.
- There were 1,661 one-on-one MSC sessions (an increase of 287 one-on-one visits), 107 sessions with two students (up 57) and 71 MSC sessions with three or more students, an increase of 17 group visits.
- There were just 16 bookings emanating from 15 unique students where the student did not turn up to their MSC session.
- There were in excess of 80,000 website hits to the MSC Leaving Certificate Mathematics suite of videos between September 2021 and June 2022.
- There were 32 bookings on the MSC-JJ Library Leaving Certificate programme in May and June of 2022 from 17 schools, including 5 DEIS schools.
- There were 12 male and 12 female MSC tutors hired, including six undergraduate peer tutors.

¹SMS offers 15 degree programmes across the College of Science (10), the College of Social Science and Law (3), and the College of Arts and Humanities (2). Some modules will have a combination of students taking that module as a core for their degree programme or as an option or elective. Thus it is not always possible to discern if an MSC visitor is a service or degree programme student due to anonymity.

Events at the MSC during 2021/22 included:

- MSC tutor Dr Anthony Brown received The UK and Ireland Mathematics and Statistics Support Networks Award for Excellence for 2021.
- MSC tutors Jack McNichol and Claire Bergin completed the National Forum's Digital Badge in Universal Design for Learning.
- Hybrid MSC operation of both bookable online (Zoom) and in-person appointments (with 30 or 60-minute appointments) and in-person drop in support via the centre in the James Joyce (JJ) Library.
- The expansion of MathsFit - a Refresher Course, Proficiency Quiz and Survey for 1,600+ incoming first years to include Engineering and Science students in addition to Business and Agriculture and Health Science students - see Section 14 for more on this.
- The resumption of the (in-person) MSC Leaving Certificate Maths programme at the JJ Library in May and June of 2022.

3 Services offered

The MSC offered three ways for students to engage with us this past year. Students could make a booking from the MSC website for an online 30-minute or 60-minute one-on-one or small group session. This offering was reduced from 12 hours per week in Trimester one to 7 hours in Trimester two as demand decreased. An online drop-in service was trialled for five weeks in Trimester one but demand was very low and so this was discontinued.

Students could also make a 30 or 60-minute appointment for an in-person support session at the centre and these were limited to one student booking per day. The physical centre was open for both drop-in visits and appointment-based bookings for 35 and 27 hours per week in the Autumn and Spring Trimesters respectively. The MSC was also available for 3 weeks of the Summer Trimester for Access students and students with extenuating circumstances due to Covid-19. The MSC opened for a total of 28 weeks of the academic year. The opening hours for the Autumn Trimester were Monday to Thursday 10am-6pm and Friday 10am-1pm. Spring Trimester opening hours were Monday to Thursday 10am-4pm, Friday 10am-1pm. The MSC also had a dedicated 90-minute online slot for Access (SEAM), HEAR (Higher Education Access Route), DARE (Disability Access Route to Education), Mature, International and FET-QQI (Further Education and Training - formerly FETAC) students each Thursday evening from 7-8.30pm for all 28 weeks. The dynamic MSC timetable shown below in Figure 2 allows potential visitors to click on

the name of a tutor to see their picture, bio and tutoring strengths.

Maths Support Centre @ Library Link 1 and online.				
Monday 31st Jan - Friday 29th April 2022 *				
Monday	Tuesday	Wednesday	Thursday	Friday
Claire M Maths, ACM & Stats 10.00-12.00	Anthony Maths & ACM 10.00-11.00	Kelly Maths, Stats & Engineering 10.00-12.00	Kelly Maths, Stats & Engineering 10.00-12.00	Kelly Maths, Stats & Engineering 10.00-12.00
Adam Maths, ACM & Stats 10.00-13.00	Killian Maths & ACM 10.00-12.00	Prabhleen Maths, ACM & Stats 10.00-12.00	Prabhleen Maths, ACM & Stats 10.00-14.00	Colin Maths, ACM & Stats 10.00-13.00
Claire M Maths, ACM & Stats 12.00-13.00	Cormac Maths & ACM 10.00-13.00	Killian Maths & ACM 11.00-13.00		Enda Maths, ACM & Stats 11.00-13.00
Emma Maths & ACM 12.00-15.00	Anthony Maths & ACM 11.00-13.00	Hardeep Maths & Stats 12.00-14.00	Ciara Maths, ACM & Stats 12.00-16.00	
Clodagh Maths, ACM & Stats 12.00-15.00	Jack McN Maths 13.00-16.00	Laura ACM & Stats 13.00-16.00		
Laura ACM & Stats 13.00-14.00	Sajal ACM & Stats 13.00-16.00	Claire B Maths & ACM 14.00-16.00	CJ Maths & Stats 14.00-16.00	
Conor F Maths & Stats 15.00-17.00				

Figure 2: Dynamic MSC timetable - Trimester 2 2021/22

In August and September 2021 the MSC ran a series of four 3-hour maths support sessions for incoming Access students (Access to Science, Engineering, Agriculture and Medicine), and Mature student cohorts (Open Learning), supporting over 60 students in the process. This included diagnostic testing and follow-up support using Numbas, the open source e-assessment and feedback system ideal for supporting adult students returning to education.

4 Optimising the blend of in-person and online mathematics support

In September 2021 we ran a survey of three distinct MSC user cohorts in an attempt to optimise the blend of in-person and online mathematics support from the student perspective. The three cohorts surveyed were: (i) those students that used the in-person MSC services prior to the pandemic but did not use the online service offered during the pandemic, (ii) those that used the online MSC service during the (fully online) pandemic period of March 2020 to September 2021 but had not engaged with the in-person service prior to March 2020, and finally (iii) those students that had engaged with both the in-person service prior to March 2020 and the online service offered during the Covid-19 online-only period (see Figure 3). The survey responses were coded under the five themes of: usage of MSC, social interaction, changes in pedagogy, future of maths support and maths is different. We also ran a separate survey which had a limited number of responses from students who did not use the MSC at all in the previous two years but were eligible to do so. The most common refrain from such non-users was that they: (i) did not know about it, (ii) were too fearful/anxious, embarrassed to use it, (iii) did not know how to access MSC services, and (iv) did not know what services were on offer at the MSC. In response to (i), (iii) and (iv) the infographic in Figure 4 below has since been advertised on plasma screens throughout UCD and uploaded to the Welcome to UCD Brightspace module, available to all undergraduate students, among other places.

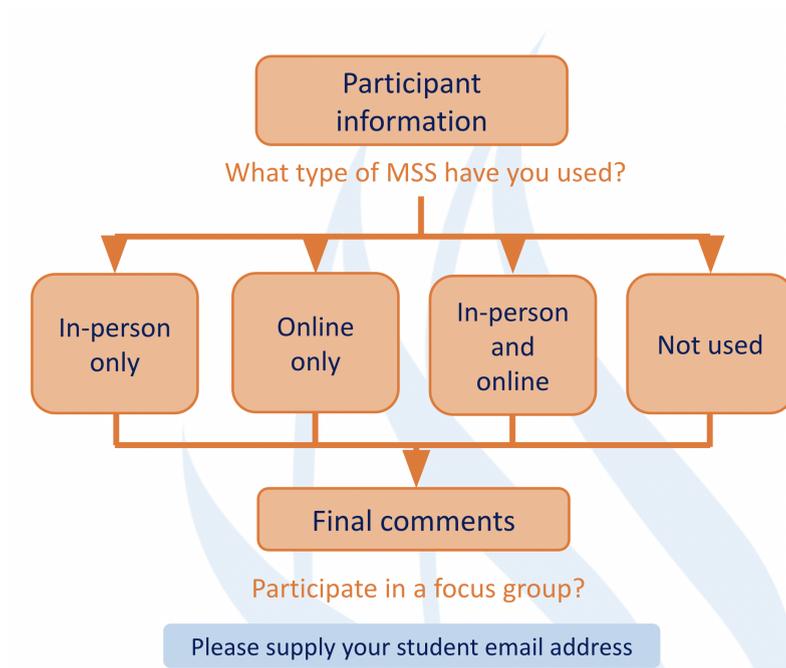


Figure 3: Hybrid options for MSC survey respondents

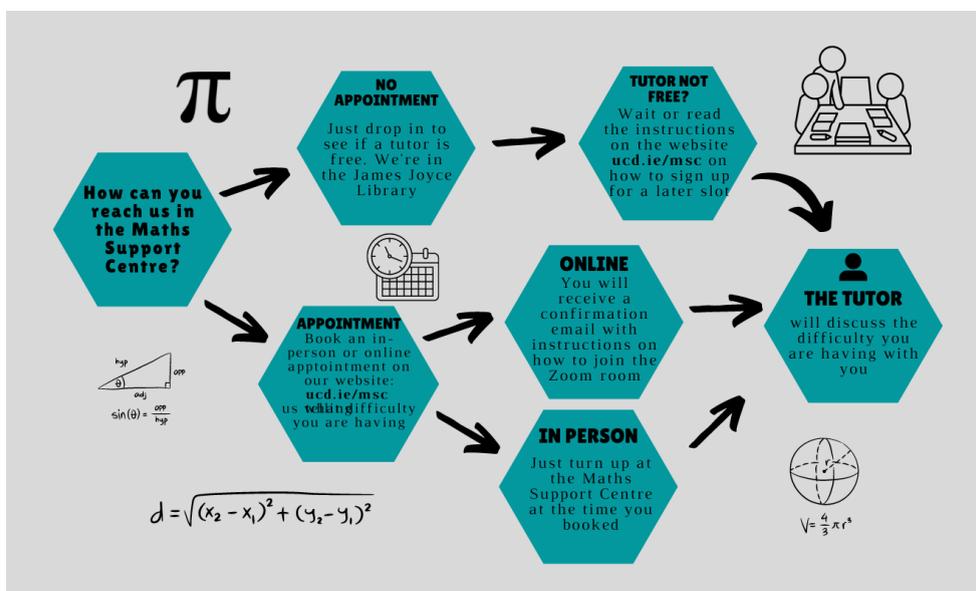


Figure 4: Options for MSC visitors in 2021/22

5 Governance and Oversight of the MSC

During 2021/22 the UCD MSC Oversight Committee met twice, on September 1st of 2021 and May 19th 2022. The terms of reference for the oversight committee were updated and published on the MSC website.

The final version of the 2020/21 annual report was signed off by the MSC oversight committee in September 2021 and presented for wider dissemination to the Student Experience Group (SEG), the Dean of Students, the Dean of Undergraduate Studies, the UCD Widening Participation Committee, the Librarian, relevant Programme Deans, relevant Heads of School, the Director of Access and Lifelong Learning, the Head of the Student Advisers Group, Academic Student Advisors, the Students Union Undergraduate Education Officer and the SMS Office Manager.

MSC management presented the 2020/21 MSC Annual Report for discussion to University's Management Team via the SEG on September 29th 2021. The chair and Registrar thanked the MSC for their contribution to the new Welcome to UCD module available on Brightspace for all undergraduate students and hoped it would be used as an effective advertising tool for students throughout the entire academic year. The SEG asked: what proportion of online/hybrid support do the MSC intend on providing going forward? and stated that the group are always impressed by the MSC's use of data to inform decisions in the centre that benefit students. Finally, the group asked if the effectiveness of the link between Module Coordinators and the MSC feedback system had changed during the pandemic or if students' issues were being pushed back to the module.

6 Visit data

The annual number of recorded visits (and unique visitors) to the MSC for the past seventeen years is given in Figure 5. The centre has facilitated 63,972 recorded student visits in this time. In Figure 6 we can see the dramatic effect on engagement the pandemic has had in the past two years. Figure 7 shows the numbers of unique student visitors to the MSC in Trimester 1 and 2 of the past year. With 2022/23 Orientation events to be restricted due to the late start of incoming students it will be a major challenge for the MSC to get visit numbers back to pre-pandemic levels.

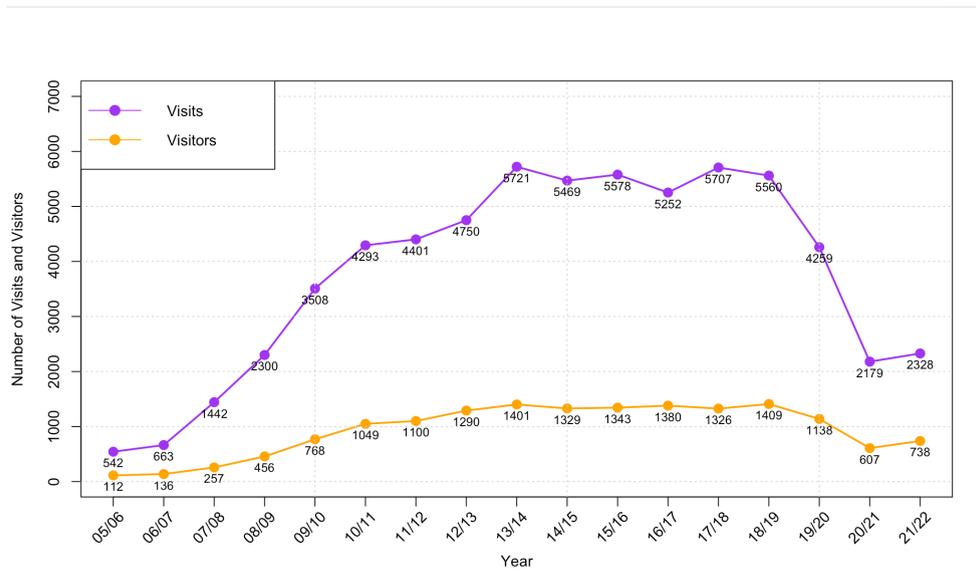


Figure 5: Annual number of MSC visits/visitors - 2005/06 to 2021/2022

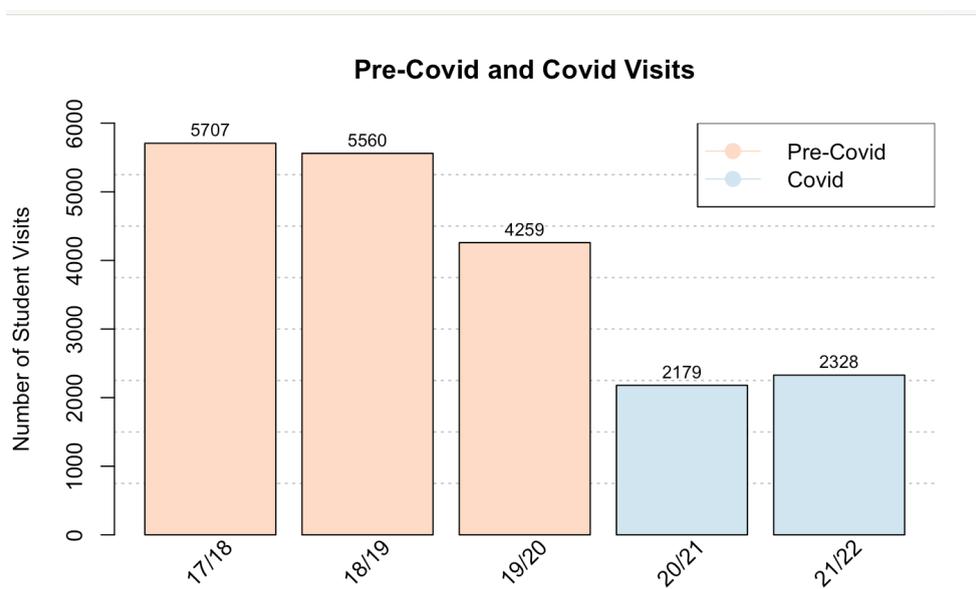


Figure 6: Comparison of visits from Pre-Covid and Covid periods

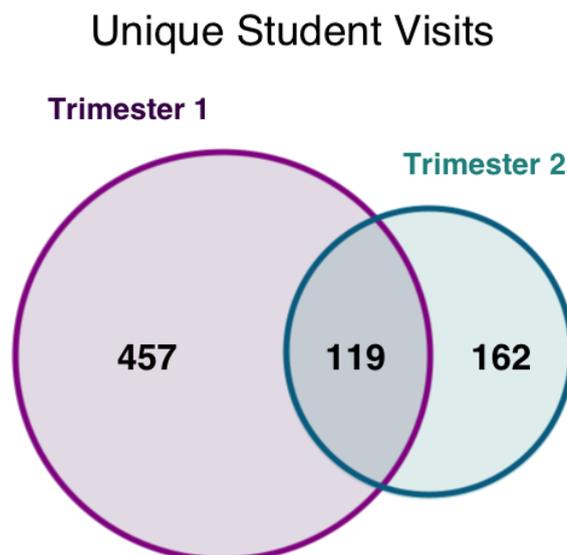


Figure 7: Unique Student Visits - Trimester 1 and 2 of 2021/22

7 How MSC Data is Recorded

The MSC data management software system links directly to a Tableaux file supplied by UCD Administrative Services. This gives a record of each student's module registration so that the details of each MSC session can be collected in a robust and accurate manner allowing for detailed analysis. Feedback from each student visit is then anonymously recorded (with the informed consent of the visiting student) by the attending tutor(s) and uploaded to the MSC database. Module Coordinators and lecturers have access to this anonymised MSC feedback for their respective module(s) at any time and it is also sent to them each Friday via an automated email. A short video explaining the MSC feedback system from the perspectives of the student visitor, MSC tutor and module coordinator/lecturer is available [here](#).

8 Wait Times and Time Spent with Tutor

In the previous five years the median wait time to see a MSC tutor had improved from 29.2 minutes in 2015/16 to **4.4 minutes** in 2019/20 all without an increase in tutor expenditure. In 2020/21 and 2021/22 students who booked a session did not experience a wait time with bookings (30 or 60 minute) made using the YouCan-BookMe software system which synched with the MSC tutors' Google timetable. This development was welcomed by tutors and students and will continue into the future. For those students dropping into the MSC without appointment in 2021/22

they experienced a 6.7 minute wait time on average.

The time spent with a tutor has consequently improved over the years. Generally a student can spend anywhere from 10 minutes up to an hour with a tutor (without pauses). In 2021/22 the average (mean) time spent with a tutor was 42 minutes (a 1 minute decrease on 2020/21) and the median time spent with a tutor was 19 minutes (a 4 minute decrease on the previous year).

9 Online Vs In-person visits

Figure 8 shows that more than one in eight student visits were online with more than three in four students preferring to pre-book a face-to-face session in the library. The drop-in face-to-face option increased in popularity as pandemic restrictions eased throughout the academic year. While the proportion of online visits may seem relatively small it is worth noting that this suited many students who could not get to campus for one reason or another, in particular Access and mature students.

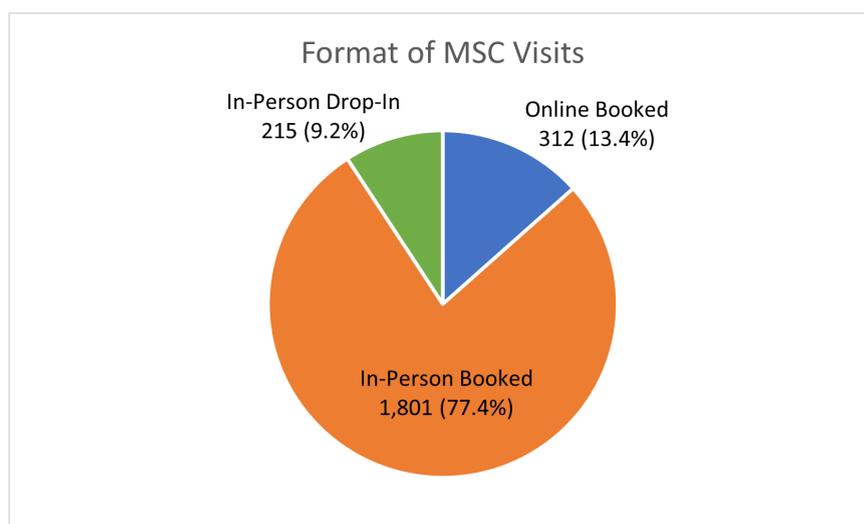


Figure 8: MSC Face-to-face vs Online Visits

10 One-to-one and Group Sessions

Figure 9 shows the number of student sessions corresponding to the number of students in the session. As usual the majority of MSC visits are dealt with on a one-to-one basis but the number of group sessions is not insignificant with 178 sessions involving two or more students. The number of these multi-person sessions

has increased significantly on the previous year despite the limitation of 12 persons to the MSC in Trimester 1.

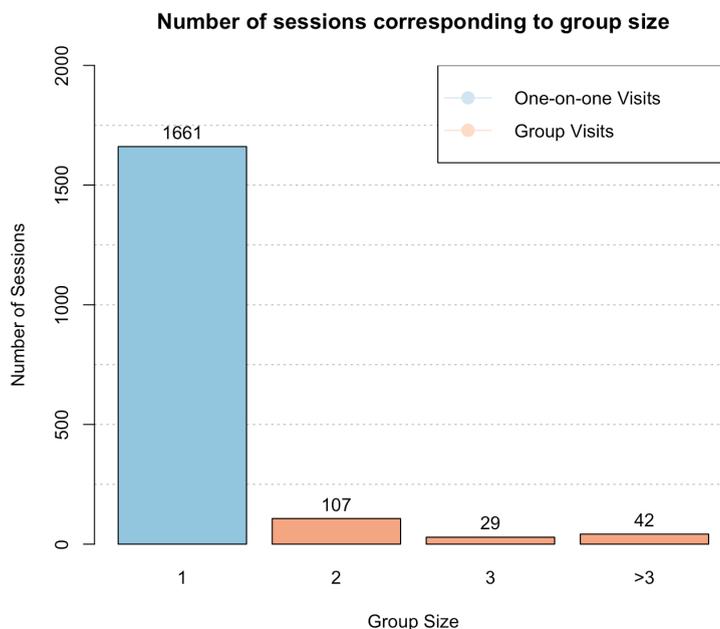


Figure 9: One-on-one and group MSC sessions in 2021/2022

11 MSC Visits by the Week

The number of MSC visits by week is given in Figures 10 and 11. The COVID-19 pandemic had a significant impact on students' engagement with the the in-person MSC service. Those that utilised the online support were highly likely to use the service again.

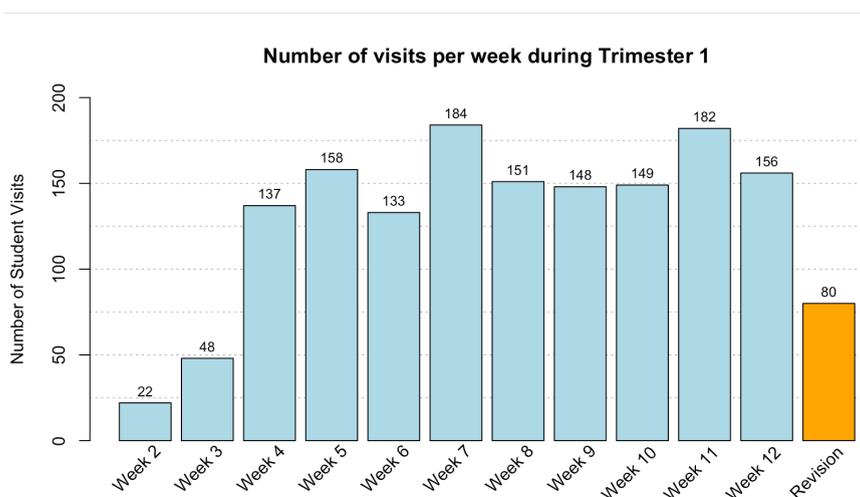


Figure 10: Number of MSC visits per week - Trimester 1 2021/22

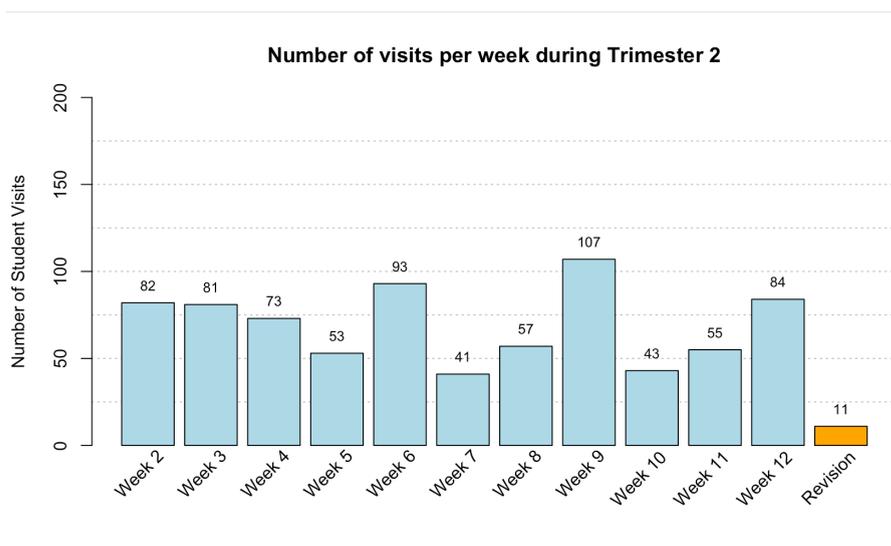


Figure 11: Number of MSC visits per week - Trimester 2 2021/22

12 Module Levels and Colleges at the MSC

The percentage of level 0, level 1 and level 2 visits was 8.26 (down 0.5%), 69.1% (up 2.1%), and 21.1% (down 2.5%) respectively. In Figure 12 the 1.6% of Other visits refers to stage 3, stage 4 and postgraduate students who booked an appointment on the MSC system but were subsequently referred back to their lecturer. The

proportion of level 2 students attending the MSC was 25% in 2012/13, increased to 32% in 2015/16, and further increased to 40% in 2017/18. In 2019/20 just under 1 in every 3 MSC visits were from stage two modules whereas during the fully online academic year of 2020/21 this statistic was less than one in four and just above one in five for 2021/22.

Percentage of Tutorials by Module Levels

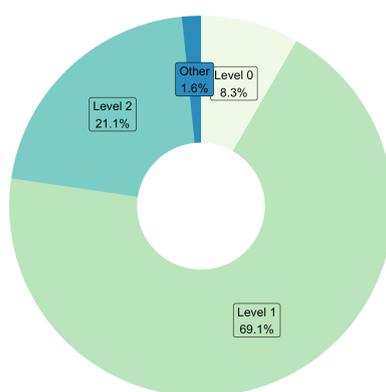


Figure 12: Percentage of MSC visits by module level - 2021/22

Figure 13 shows the number of visits by subject area in decreasing order.

Modules	Visits
Mathematics	1545
Statistics	204
Maths Studies	189
Applied & Computational Maths	90
Environmental Biology	54
Physics	46
Management Information Systems	44
Economics	31
Chemical Engineering	30
Psychology	23
Chemistry	17
Social Policy/Work/Justice	15
Computer Science	11
Electrical Engineering	11
Forestry	7
Mechanical Engineering	6
Politics	5

Figure 13: Table of visiting subjects based on MSC visit frequency

As usual, the MSC received visits from all six colleges of the university in 2021/22. Figure 14 shows a word cloud of the UCD subject areas whose modules were sup-

ported at the MSC based on their respective visit frequency (with 5 or more visits only shown).

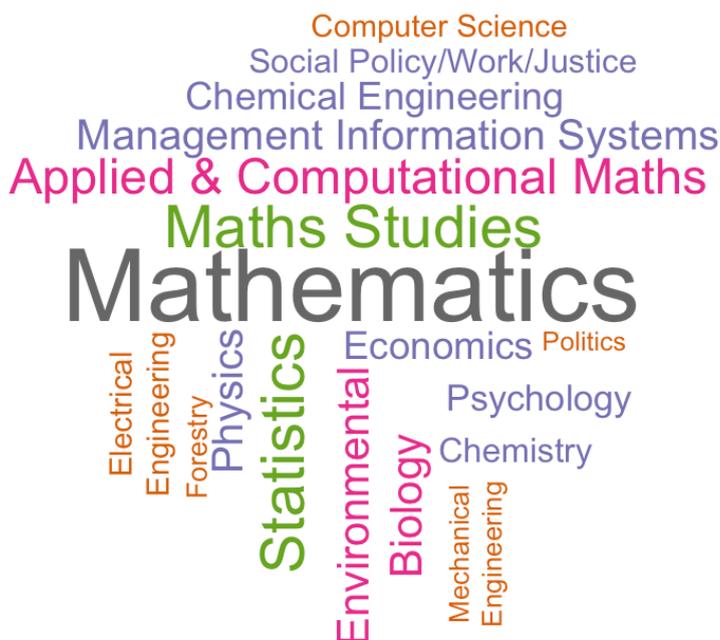


Figure 14: Wordcloud of visiting subjects based on their visit frequency

13 MSC Tutors

The success of the MSC is due to its talented committed staff. This year we interviewed, trained and hired thirteen candidates for the MSC tutor role while retaining eleven 2020-21 MSC staff. Training was conducted over a week via a blend of virtual and in-centre sessions. Twelve of our current staff are female meaning we have a 50-50 split of male and female tutors for the first time.

The proportion of female graduate students (both taught and research masters, and PhD students) in SMS for the last three years is 30% (2018/19), 30% (2019/20) and 31% (2020/21). The proportion of female MSC tutors for the past three years is 36% (2018/19), 28% (2019/20) and 27% (2020/21). In 2021/22 we have had the greatest proportion of female MSC tutors (50%) since the MSC was established in 2003.

Four of this years' MSC tutor cohort have doctorates in Mathematics or Mathematical Physics. Nine tutors were completing their PhD studies in the School of Math-

ematics and Statistics, three were doing a research MSc in Mathematics/Statistics. Six of our tutors were third or fourth-year undergraduate students in 2021/22. The remaining tutors were sourced from outside UCD.

14 MathsFit

This development initiated by MSC tutors and management in 2020 was expanded in 2021/22 from 792 students to 1,632 incoming first-year students studying service modules in Agriculture and Health Science, Business, Engineering and Science.

Given the disruption of teaching and learning due to the pandemic-enforced school closures in Ireland in 2020 and 2021, the MSC had concerns about the mathematical readiness of in-coming university students. While teachers provided expected grades the usual reflection (via student-completed state examinations) of students' achieved mathematical learning in secondary school was unavailable. Coupled with these concerns was the issue of university teaching, learning and assessment being wholly online for what turned out to be the entire first year of these students' studies.

To mitigate these potential problems, we designed MathsFit for these in-coming university students. MathsFit is an online suite of resources which includes a mathematical refresher course and proficiency quiz, a mathematical background questionnaire, and pre- and post-surveys of students' mathematical anxiety and resilience, as measured by the Betz (1978) Mathematics Anxiety Scale, and resilience. The refresher course and quiz cover three fundamental basics mathematics areas required by students to succeed at first-year university service maths courses i.e Algebra, Arithmetic and Trigonometry, and Functions and Calculus.

The proficiency quiz uses best practice in standardised diagnostic testing building on PISA (the Program for International Student Assessment) and tried and tested case studies from Ireland, the UK, the US, Asia and Australia. It provides students and MSC tutors with a snapshot of students' competencies in the fundamental mathematical areas which require mastery for success in their university mathematics courses. To further understand students' mathematical proficiency, part of the mathematical background questionnaire examined the students' perceptions of whether their secondary school curriculum was fully covered during the Covid-19 period.

MathsFit's key feature is a suite of digital supports to assist students with the transition to university mathematics. This includes short videos, uploaded to the institution's Virtual Learning Environment (VLE) Brightspace, welcoming students to the university and introducing them to the concept and rationale of MathsFit, in addition to an optional online Refresher Course which can be taken in advance of the

Proficiency quiz. Students complete the quiz and surveys through Brightspace and then, using the Intelligent Agents and Release Conditions features of Brightspace, receive a personalised support email. This email gave students information about, and links to, tailored mathematics support dependent on their scores (Bronze, Silver and Gold) from MathsFit as well as the opportunity to retake the quiz to measure their improvement. This support encompasses both one-to-one and small group virtual maths support sessions using Zoom, personalised video tutorials within the Moodle VLE and in-person small group support in the centre. The email also invited the highest MathsFit achievers to act as peer-mentors to the lowest achievers in the small group support sessions.

While the testing and diagnosing of students' mathematical competencies upon entry to university is quite common, studies concerning follow-up support and interventions for at-risk students are less common. In addition, there is a lack of research exploring and analysing online diagnostic testing, which up until now has usually been conducted live in lecture halls with pen and paper, and subsequent digital student support. Our findings see evidence of strong initial engagement, improved performance in basic mathematics skills and prolonged engagement with both online and in-person maths support throughout the first trimester of university study.

15 Research and Communications at the MSC

A number of research outputs related to the work conducted at the MSC were disseminated by MSC management and tutoring staff in 2021/22 including:

- Mullen, C., Pettigrew, J., Cronin, A., Rylands, L. Shearman, D. (2021). The rapid move to online support: changes in pedagogy and social interaction. *International Journal of Mathematical Education in Science and Technology*.
- Mullen, C., Cronin, A., Taylor, L., Liu, C. (2021). Evaluating the Impact of Mathematics Support Using Moderation. In M. Kingston and P. Grimes (Eds.) *Proceedings of the Eighth Conference on Research in Mathematics Education in Ireland* (pp. 284-291), Dublin, Ireland.
- Howard, E., Cronin, A. (2021). Improving service use through prediction modelling: a case study of a mathematics support centre. *IMA Journal of Management Mathematics*.

16 Outreach Activities at the MSC

Due to the pandemic the JJ Library-MSc Leaving Certificate Programme did not proceed within the James Joyce Library for the past two years. Instead schools were encouraged to engage with the 200+ videos created by MSC tutors covering all five strands of both the Ordinary and Higher Level mathematics course. This resulted in over 180,000 hits to the MSC website for these videos as measured by Google Analytics from March 2020 to June 2022. These videos will remain freely available via the MSC YouTube channel for anyone to access. Thankfully we are now in a position to offer the in-person programme again which ran in May and June of 2022 for students sitting the LC examinations in June and this service was free for all UCD linked DEIS schools. Each student can avail of a 2-hour maths support session (typically with 1-3 students per tutor) where they can discuss past examination paper questions, mathematical strategies and study plans. In 2022 we had 32 students avail of this service from 17 schools including 5 DEIS schools.

17 Future Developments and Recommendations

17.1 Developments for 2021/22

1. As InfoView was actively retired in 2021 the MSC now accesses a Tableau file directly from UCD Admissions and Administrative Services concerning student module registration data.
2. In response to the quantitative and qualitative research here, the MSC will continue to deliver a blended form of student support sessions both online and in person from the physical centre.
3. In September 2022 it is envisaged that MathsFit will be extended to six large first-year service-teaching modules involving approximately 1,800 students. This year students will have the flexibility to engage with a short Refresher Course via an elearning platform Bolster Academy (as desired by many students in post-MathsFit surveys, feedback and interviews) before and *after* taking the MathsFit Proficiency Quiz, survey, and engaging with follow on supports.

17.2 Recommendations

1. Given the current cost of living and energy crises and the number of students who find the online MSC service both flexible and useful for their needs we plan to offer approximately 15% of our MSC service hours online. The findings

around patterns of digital support usage, certain barriers in the delivery of digital mathematics support, students' changing attitudes towards the service and towards potential hybrid models suggests a hybrid MSC model is valued. Although most of the students surveyed in our study expressed a preference for in-person support, there was a clear minority who had a preference for online often citing the improved accessibility and the possibility of instant access. A future hybrid offering may allow us to support more students. It is clear, however, that hybrid support will need monitoring and iteration to keep up with students' attitudes as they continue to study in these changing times.

2. Given the increasing coverage of statistics in UCD degree programmes and the uncertainty some students have as to whether the MSC supports statistical queries we recommend a name change to **Maths and Stats Support Centre**.
3. The MSC must continue to lobby for a new home within the UCD Centre for Future Learning. While the past nine years in the JJ Library have seen significant growth in student engagement given the neutral and central location, the environment of the space is not conducive to academic support given its small capacity, poor ventilation, absence of natural light and limited scope for peer-to-peer learning.

18 Conclusion

In summary 2021/22 has been another challenging year for both visiting students and MSC staff for obvious reasons. However some of the challenges presented have resulted in innovations, such as the YouCanBookMe appointment based booking system, synchronous online hot topic sessions for large cohorts of students, and the obvious flexibility that virtual support has in terms of space and time for certain cohorts of students, that will be maintained going forward. We look forward to meeting the challenges that the post-pandemic world brings and continuing to support our undergraduate students with their mathematical and statistical difficulties.