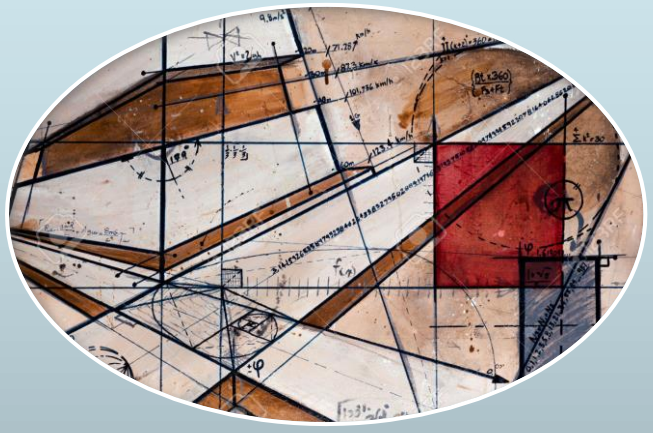

An audit of Mathematics Learning Support provision on the island of Ireland in 2015

Anthony Cronin, Jonathan Cole, Maura Clancy, Cormac Breen, Diarmuid Ó Sé

IMLSN
IRISH MATHEMATICS LEARNING SUPPORT NETWORK

T&L NATIONAL FORUM
FOR THE ENHANCEMENT OF TEACHING AND LEARNING IN HIGHER EDUCATION

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This report is the second in a series of reports from the IMLSN, supported by the National Forum. The first report in the series was:

O'Sullivan, C., Mac an Bhaird, C., Fitzmaurice, O. and Ní Fhloinn, E. (2014). *An Irish Mathematics Learning Support Network (IMLSN) report on student evaluation of mathematics learning support: insights from a large scale multi-institutional survey*. National Centre for Excellence in Mathematics and Science Teaching and Learning (NCE-MSTL), University of Limerick, Republic of Ireland.

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All 30 educators who took the considerable time to respond to the survey and supply us with the important information contained therein. We hope their valuable contribution has allowed us to present a clear picture of the nature and extent of mathematics learning support in Ireland.

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The National Forum for the Enhancement of Teaching and Learning in Higher Education for providing funding to allow this research to take place and funding the publication of the report.

A Message from the IMLSN Chairperson

The Irish Mathematics Learning Support Network (IMLSN) is delighted to make this report available to mathematics learning support (MLS) practitioners, our colleagues in STEM education and education policy makers. MLS commenced in an informal way in Ireland in the late 1990s with the first mathematics learning support centre (MLSC) opening in 2001. A 2008 report conducted at the University of Limerick demonstrated that 13 higher education institutions in the Republic of Ireland provided MLS in some capacity. Since then, MLS has become a necessary facility in most higher education providers to help ease the transition from second- to third-level mathematics education for thousands of students. MLSCs provide a non-judgemental, supportive environment where students get help to deal with the mathematics requirements of their programmes of study.

The IMLSN was formed in 2009 to provide a forum for practitioners in Ireland to learn about best practice in MLS, both from each other and from our colleagues in the UK. This report details the results of a comprehensive survey conducted in 2015 to determine the extent of MLS in higher education providers across the island of Ireland. The findings are positive, for example, an increase in the range and level of provision since 2008 and a demonstration that MLS provision in Ireland is at least comparable with that in the UK and Australia. However, significant challenges remain; for example, MLS provision is not permanent in the majority of cases, there are issues regarding the sourcing and training of tutors and the need for MLS to be guaranteed and sustained within all institutions is highlighted.

As chairperson of the IMLSN, I believe that this report is timely and, with the very high response rate (97%), representative of the state of MLS on the island of Ireland. The findings, along with the 2014 report on student evaluation of MLS, will strengthen both individual practitioners at a local level and the IMLSN at a national level in both their efforts to increase funding and support for MLS. MLS is making a significant difference to students' learning experiences of mathematics.

I want to thank the National Forum for the Enhancement of Teaching and Learning in Higher Education for their ongoing support, and for funding this research and the cost of the publication.

I acknowledge and praise the significant amount of time and dedication put into establishing this survey and writing up the report by the special interest group (SIG) of the IMLSN, and I commend the two additional members of the IMLSN who assisted the SIG with the editing process.

Dr Olivia Fitzmaurice
IMLSN Chairperson

Foreword

Since the formation of the National Forum for the Enhancement of Teaching and Learning in Higher Education, it has been a privilege to witness and to promote active collaboration and engagement throughout the whole sector. It is clear that collaborative approaches to excellence in teaching make sense, as does the provision of evidence-based learning support for students across disciplines.

When we look for evidence of teaching that has had a strong impact on learning, what has also been clear is that there are committed educators working with dedication, energy and focus to teach well, to develop creative and engaging approaches to learning, and to help students build confidence and efficacy.

Students tell us that the teachers they value most are those who care about their students' learning, those who reflect carefully and creatively on how learning environments can best contribute to student success, and those who find impactful ways to support student learning. Nowhere has this commitment been stronger than among our maths educators, many of whom have mobilised to provide the kinds of supports that students need, and to ensure that maths education encourages and enables student learning in the best ways possible.

The formation of the Irish Mathematics Learning Support Network and the now widespread provision and availability of maths learning support (MLS) throughout both higher and further education demonstrates that commitment. Through these support initiatives, maths educators are working to enhance and develop curriculum provision with co-curricular supports that customise teaching for individual needs, assist those who find maths subjects challenging or who are at particular risk, and help students to fulfil their potential at all levels. What is noteworthy about the maths learning centre movement is that it is a movement that has come from the coal face: active teachers working with students on the ground, studying the challenges and obstacles that they encounter and then designing supports that respond effectively to those experiences.

This report is both valuable and timely. It takes stock of the nature of MLS provision, and it shows how worthwhile and impactful this type of learner support is across many different institutional types. It calls for continued provision, resourcing and embedding of these supports and it points the way to further enhancement by recommending more improvements in areas such as tutor training, use of data, sharing of practice, monitoring of impact and strengthening of approaches to student referral and engagement. Mostly it recognises both the great work that is being done in MLS provision and the ways in which that work can become even more impactful and embedded across the sector.

Recognition and gratitude is due to all of those who have worked so hard to establish MLS provision and to be active participants in the Irish Mathematics Learning Support Network. Collaborations that have been generated as a result of this work are contributing in very substantial ways to the national enhancement agenda. In particular, I extend thanks to the

all-Ireland author/editor team who wrote and edited this report: Anthony Cronin, Jonathan Cole, Maura Clancy, Cormac Breen, Diarmuid Ó Sé, Ciarán O'Sullivan and Ciarán Mac an Bhaird.

Professor Sarah Moore
Chair, National Forum for the Enhancement of Teaching and Learning in Higher Education

Executive Summary

What is the IMLSN?

The Irish Mathematics Learning Support Network (IMLSN) was established in 2009 to promote mathematics learning support (MLS) and support individuals and further education and higher education institutions (HEIs) involved in the provision of MLS in Ireland. The IMLSN has an elected voluntary committee whose members are drawn from a range of institutions from around the island of Ireland. The IMLSN website (http://imlsn.own.ie/) has a full list of the network's activities, including workshops and developed resources and materials, and, together with the IMLSN mailing list (available via irishmathssupport@gmail.com), provides the latest news from the national and international MLS community.

Purpose of this Investigation

The purpose of this investigation was to establish the current state of MLS in Ireland including its nature, management, sustainability and the associated challenges and developments. The investigation involved an audit of MLS at 31 institutions in Northern Ireland and the Republic of Ireland including universities, institutes of technology (IoT), colleges of education and liberal arts (CELA), and colleges of further and higher education (CFHE). These represented a very large proportion of higher education providers in Ireland and 30 of the 31 institutions participated by responding to an online survey. As the audit surveyed higher education providers in both Northern Ireland and the Republic of Ireland, and also had both an extensive scope of questions and a very high response rate, this investigation offers the most comprehensive insight yet into MLS provision in Ireland.

Main Findings

Availability and practical operation of MLS

- MLS was provided in 25 of the 30 institutions (83%) that completed the survey.
- The type of educational institution was not a factor in the provision of MLS. The five institutions that did not offer MLS were one university, two IoTs, one CELA and one CFHE.

The following results refer to the institutions that provided MLS and n=25 unless stated otherwise. These 25 institutions included nine universities, 11 IoTs, three CELAs and two CFHEs.

- MLS was available to all registered students in 72% of institutions.
- MLS was provided through a mathematics learning support centre (MLSC) in 64% of institutions. 78% of universities and 73% of IoTs had a MLSC in place.

- A dedicated space for MLS existed in 80% of institutions; the nature of the space was very diverse. In 63% of cases (n=22), this space was shared, primarily with other academic supports.
- Up to five hours per week of face-to-face MLS was available in 24% of institutions and between six and 30 hours per week of face-to-face MLS was offered in 44% of institutions; the mean value for universities was 22.1 hours per week and for IoTs was 18.8 hours per week.
- MLS was available after 5.30 pm in 44% of institutions.
- The MLS service was closed during examination periods in 60% of institutions.
- MLS was permanent in only 40% of institutions (n=20). 44% of MLSCs were permanent (n=16). MLSCs had a more permanent status in universities.

Staffing and tutors

- In 20% of institutions, a staff of only one or two was responsible for their MLS service. A further 40% of institutions had staff numbers between three and five involved in MLS.
- The role of manager was full time in only 36% of institutions offering MLS.
- The nature of the role of manager was not strongly correlated with the type of institution (33% of managers in the university sector were full time with 36% the corresponding figure for IoTs).
- There was a strong correlation between the nature of the role of manager and the opening hours: six of the ten institutions offering more than 15 hours of MLS per week had a full-time manager while none of the six institutions offering at most five hours of MLS per week had a full-time manager.
- The most common source of staffing in MLS was full-time institutional staff; at least one staff member was from this source in 72% of institutions.
- Postgraduate students were employed in MLS in 48% of institutions.
- Undergraduates were involved in providing MLS to their peers in 36% of institutions (mainly universities).
- Universities availed of staff from a wide range of categories while IoTs were more reliant on their own full-time staff. CFHEs relied solely on their full-time staff.
- Tutor training did not occur in 52% of institutions. In the institutions that provided training, this varied from an individual meeting to a full day's training. Two respondents mentioned the use of tutor training material developed by the IMLSN and **sigma**.

Types of MLS available

- All 25 institutions provided at least one form of face-to-face MLS.
- A drop-in service was available in 88% of institutions, workshops were offered at 64% of institutions and 44% offered an appointment-based service.

- Online MLS was offered in 48% of institutions and was relatively more common within the university sector (67% of universities offered online MLS compared with 45% of IoTs).

Users of MLS

- Records of student visits were maintained in 80% of institutions; these records were paper-based in 60% of cases (n=20).
- First-year undergraduates were very clearly the main users of MLS, in general; the mean estimated percentage for first years was 55% (n=22).
- Three respondents observed that use of MLS by final-year and/or postgraduate students was increasing.
- MLS pervaded almost every discipline within an institution with engineering, science and business (in that order) being the most popular users. 73% of respondents (n=22) provided MLS to students from at least three distinct disciplines.
- Basic algebra and calculus were reported by respondents to be the topics causing most difficulty for students.
- One-to-one support was the most popular type of MLS, by far, being the top choice for students in 61% of institutions (n=23).
- Student engagement trends suggested that MLS was poorly attended at the beginning of a semester (40% of respondents reported this) but was busy near mid-term exams or continuous assessment deadlines (45% of respondents), at the end of semester (35% of respondents) and at exam time (35% of respondents) (n=20).
- 72% of MLS providers sought feedback from their students.

Reporting and evaluation of MLS activities

- 32% of respondents stated that their MLS service had been independently evaluated; in seven of those eight cases, MLS had opened before 2006.
- A regular report on the MLS service was produced in 56% of institutions; in 71% of cases, this report was sent to institutional management.
- There was a widespread belief on the part of MLS staff who took this survey that lecturers were very supportive of the MLS provision at their institution (80% agreed or agreed strongly with this sentiment).
- Seven out of 20 respondents (three universities and four IoTs) reported examples of subject lecturers making positive changes to their practice due to the existence of MLS.

Challenges and developments

- “Reaching non-engaging students” and “getting students to engage earlier” were very clearly identified as the two most difficult challenges faced by MLS providers (19 out of 22 respondents ranked at least one of them amongst their two most difficult challenges).

- The most common suggestion for developing or enhancing their MLS provision, expressed by 39% of respondents, was to have longer opening hours (n=23).
- The second most desired development was for more tutors (26% of respondents).
- Suggestions as to how the IMLSN could help MLS providers fell into four categories: reporting and disseminating best practice, developing and sharing resources, sharing experiences and promotional activities.

Comparison with 2008 Ireland Audit

- The extent of the growth in MLS provision since 2008 was the first most notable change. In 2008, 13 institutions in the Republic of Ireland submitted a report on their MLS provision. By 2015, the number of institutions in the Republic of Ireland known to offer MLS had increased to 20.
- There was a considerable increase, from 54% (n=13) to 72% (n=25), in the proportion of institutions that offered MLS to all registered students.
- The drop-in service was very common in 2008 (available in 77% of the 13 institutions providing MLS) but has become even more so; it was the predominant form of MLS in 2015, being available in 88% of the 25 institutions with MLS.
- The number of institutions offering online MLS grew slightly from nine in 2008 to 12 in 2015 but the proportion of institutions offering this type of MLS decreased. The types of online MLS have not changed considerably over the years; links to websites, a dedicated website or virtual learning environment and revision notes were prevalent in both 2008 and 2015.
- There was an increase in the percentage of institutions that sourced at least some of their MLS tutors from full-time institutional staff, rising from 54% in 2008 (n=13) to 72% in 2015 (n=25).

International Comparisons

- The extent of MLS provision as a percentage of the number of survey responses was very similar in Ireland in 2015 (83%, n=30), the UK in 2012 (85%, n=103) and Australia in 2007 (82%, n=39). Note that the UK and Australia surveys targeted universities only.
- The drop-in service was the most common form of MLS in all three surveys, available in 88% of institutions providing MLS in Ireland (n=25), 84% of institutions with MLS in the UK (n=88) and 72% of institutions with MLS in Australia (n=32).
- Other forms of MLS seem to have been relatively rare in the UK. An appointment-based service was available in only 6% of UK universities with MLS while other types of MLS (such as additional support for modules with mathematical content or optional support classes) occurred in 8% of UK universities. These figures are much lower than the corresponding figures for appointments and workshops in Ireland (44% and 64% respectively). In Australia, less than half of universities offered appointments (38%) and workshops (41%).

- One notable feature of MLS provision in Australia was that the proportion of MLS facilities that enjoyed permanent or long-term status was much higher than in Ireland.

Recommendations

The following recommendations are based on analysis of the comprehensive information given by the survey respondents and are targeted at the MLS community (both practitioners and researchers) and education policy makers on the island of Ireland. The authors of this report suggest that each recommendation is achievable in the short to medium term.

1. Given the widely reported benefits of MLS in terms of students' academic performance, retention and mathematical confidence, the embedding of stable and sustainable MLS structures across all relevant HEIs should be a key objective, and each institution should set up a MLSC (as appropriate, according to the nature of the particular institution) to encourage the permanence of MLS and provide a focal point and identity for this service.

2. Institutions should recognise MLS as a priority and devote resources, including a dedicated manager/coordinator, to facilitate the provision of a service which can grow and adapt to meet student requirements.

3. The IMLSN should facilitate the sharing of best practice in selection procedures for potential tutors.

4. A thorough training programme should be provided for all MLS tutors based on best practice to ensure that tuition is of the highest quality and to optimise the student experience of MLS.

5. Given the significant reliance on undergraduate and postgraduate students as tutors and the associated transience within MLS, institutions and the IMLSN should promote the role of a MLS tutor and explore the concept of longer-term contracts for tutors to ensure these positions are more secure.

6. While taking account of students' preferences for face-to-face support, and retaining face-to-face support at the core of MLS, MLS providers should ensure that a variety of support methods is available for students so that the service is flexible, convenient and caters for the diverse needs and learning styles of students.

7. Given that many forms of MLS workshops exist, research should be conducted to identify best practice for the effective running of, and promotion of student engagement with workshops to ensure that the student learning experience is optimised.

8. MLS providers should record usage data in electronic format to facilitate more efficient analysis of the data and to encourage an evidence-based approach to making decisions in managing MLS, promoting the service to students, reporting to senior management and applying for funding.

9. When collecting student feedback, MLS providers should use the paper-based survey designed by the IMLSN (or an electronic version if this is not feasible), with local variations as appropriate, to enable easier comparison of data from different institutions.

10. The IMLSN should consider establishing a set of guidelines for best practice in reporting MLS activities in order that relevant stakeholders (including (i) institutional senior management, (ii) lecturing staff, (iii) the mature student, access, disability, retention and careers offices and (iv) students) can benefit from the extensive data available.

11. Consideration should be given to the facilitation of independent evaluation of MLS activities and the development of appropriate guidelines and metrics for this to encourage the transfer of knowledge and good practice between institutions.

12. MLS staff should collaborate and make use of institutional connections with module and programme coordinators to assist lecturers who may wish to reflect on their teaching practice to enhance further the learning experience of mathematics for students.

13. Given that challenges associated with a lack of student engagement with MLS are very clearly the leading challenges across institutions of all types, further research to obtain a deeper understanding of these problems and to identify solutions should be a priority.

14. The IMLSN should investigate what advertising techniques are most effective to promote the existence and benefits of MLS and to improve engagement with MLS from the start of the semester and, in particular, the involvement of student ambassadors and social media should be piloted.

15. The IMLSN should continue to focus its efforts in four areas – reporting and disseminating best practice, developing and sharing resources, promoting MLS, and enabling sharing of experiences – to help MLS providers fulfil their aspirations for developing their service.

Future Work

The recommendations presented in this report are targeted at MLS practitioners, researchers and education policy makers. In particular, some recommendations indicate a menu of future work that the IMLSN could consider and this is discussed in this section.

Challenges associated with student engagement are significant for almost all MLS providers and more work is needed in this area. While recommendation 13 points to more research being conducted, recommendation 14 is very practical. Following the successful use of student ambassadors in England, similar schemes should be piloted in various institutions in Ireland. The IMLSN should collate the experiences of MLS providers and students in using these schemes and devise a model for operating them effectively.

The experiences of the IMLSN members should also be harvested with regard to recommendations 3 and 7. Recommendation 3 refers to the wide variety of practices that exist in terms of selection procedures for tutors and a special interest group (SIG) of the IMLSN could be established to collect and devise a best practice list in this area for dissemination to all MLS providers. In terms of recommendation 7 (the running of MLS workshops), another SIG of the IMLSN could be established to collect and collate examples of what works best in this area and disseminate this so as to enable MLS providers to be better informed about what options are available and what has been proven to work.

A particularly interesting statistic from the survey showed that 52% of MLS providers did not offer some form of online MLS. This indicates there is much potential to develop digital capacity in MLS. It also suggests a need to investigate the reasons for the underuse of ICT and whether the digital capacity of students, staff, institutions or MLS resources are relevant factors. Given the complexity of the issues which potentially underlie this, it will probably require structured research of the type which cannot be achieved using a short-term SIG approach but might be better suited to one or several partner institutions, who have research interests in MLS and enhancing digital capacity, collaborating on a more long-term research project.

Finally, in terms of the next iteration of a MLS survey in Ireland, the authors suggest that a similar audit be conducted in 2020 given the ever-changing demographics and mathematical/statistical needs of students in higher education. Following the experience of conducting this audit, the 2020 survey should include dedicated questions on (i) statistics support, given the prominence and growth of this subject area in recent years, and (ii) governance and oversight of MLS structures. Also, any future audit of MLS should involve semi-structured interviews and/or focus groups with both MLS coordinators and tutors to achieve a deeper understanding of relevant issues. Inevitably, funding such a project is crucial and we advise that a significant proportion of any funds awarded in future be dedicated to such a project and be allocated to easing both analysis and expediting publication.

Contents

List of Acronyms

CELA	college of education and liberal arts
CFHE	college of further and higher education
HEI	higher education institution
ICT	information and communications technology
IMLSN	Irish Mathematics Learning Support Network
IoT	institute of technology
MLS	mathematics learning support
MLSC	mathematics learning support centre
MSOR	mathematics, statistics and operational research
NI	Northern Ireland
RoI	Republic of Ireland
SIF	Strategic Innovation Fund
SIG	special interest group
TAFE	technical and further education
Uni	university
VLE	virtual learning environment

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1. Introduction

Mathematics learning support (MLS) is defined here as mathematics and/or statistics support that takes place outside of the traditional model of lectures, tutorials and laboratories, etc.

In the UK, surveys of the extent of MLS provision have been conducted frequently. The first survey, in 2000, was motivated by the knowledge that some universities had commenced MLS and the desire to determine how widespread and effective such support was [1]. All UK universities and some colleges were targeted with a questionnaire on the nature of MLS, staffing and uptake by students. Forty-six out of 95 responding institutions reported having MLS and one-to-one tuition was clearly the most highly valued aspect of MLS for both students and staff [2]. In 2004, a second survey aimed to update the data [3]. This time, only universities were investigated and 66 out of 101 universities offered MLS. The most recently published survey of MLS at UK universities occurred in 2012 in order to establish up to date details of MLS provision and whether dissemination of information about MLS had taken place [4]. Eighty-eight out of 103 UK universities provided MLS at that time. Thus, there has been a steady increase in UK MLS provision [4] and the need for MLS in the UK to continue in the near future is very clear [5].

The most recent audit of MLS in the Republic of Ireland (RoI) was completed in 2008 and involved 13 respondents [6]. Universities, institutes of technology (IoT), and colleges of education and liberal arts (CELA) were contacted and invited to submit a report on their MLS service by responding under the following headings: origins and mission, services provided, institutional support (staffing, physical resources, funding), resources, research, record keeping, measures of success and challenges, and lessons learned. The 13 responses comprised of eight IoTs, four universities and one CELA.

From the growth in the membership of the Irish Mathematics Learning Support Network (IMLSN) and the rise in its activities, it was clear to the IMLSN that the extent of MLS had increased significantly since 2008. Hence the IMLSN decided in 2014 that a comprehensive study of MLS was necessary to establish the current state of MLS including its nature, management, sustainability and associated challenges.

This investigation has involved an audit of MLS at 31 institutions in Northern Ireland (NI) and the RoI. These included all ten universities on the island of Ireland, all 14 IoTs in the RoI, four CELAs and three of the six colleges of further and higher education (CFHE) in NI (Table 1). Thus, they represent a very large proportion of higher education providers in Ireland. Thirty of the 31 institutions responded to the survey. The list of the 31 institutions along with a description of each category of institution is provided in Appendix A.

institution	number in NI	number in RoI	survey sent to	replies from
university	3	7	10	10 (100%)
IoT	0	14	14	13 (93%)
CELA	2	7	4	4 (100%)
CFHE	6	0	3	3 (100%)
totals	11	28	31	30 (97%)

Table 1: Numbers of survey invitations and responses by institution type.

More details of the survey methodology are given in the next section of this report. Section 3 presents the survey results under the six themes of:

- availability and practical operation of MLS
- staffing and tutors
- types of support available
- users of the service
- reporting and evaluation of MLS activities
- challenges and developments

Comparisons with the findings of similar audits in the RoI, UK and Australia are made in section 4. Section 5 contains a detailed discussion of the findings and provides a list of recommendations, which emerged from analysis of the survey data, for MLS practitioners, researchers and education policy makers. With the survey covering higher education providers in both NI and the RoI and having an extensive scope of questions, and with a very high response rate, this investigation offers the most comprehensive insight yet into MLS provision in Ireland.

2. Methodology

In 2014, the IMLSN was awarded funding from the National Forum for the Enhancement of Teaching and Learning in Higher Education under its Disciplinary Network Funding round in order to support three projects – strengthening the IMLSN, building the capacity of MLS tutors and conducting an audit of MLS in Ireland. In November 2014, a special interest group (SIG) of the IMLSN, consisting of the five authors of this report, was formed to investigate the extent of MLS provision in Ireland. A survey of 72 questions covering the six themes listed in section 1 was developed by the SIG.

In February 2015, a pilot version of the survey was tested by five educators (from three different universities, an IoT and a CELA) to improve its readability and refine its effectiveness. These educators have a strong interest in and knowledge of MLS but were not part of the cohort who would be asked to take the final version of the survey. Valuable recommendations arising from this pilot included: ensuring accuracy and consistency of terms such as "institution" (as opposed to "institute"), MLS and MLSC; a reordering, reduction and clarification of some questions to improve the flow of the survey; asking respondents to state whether responses are perception or evidence-based; avoiding the seeding of answers and offering a list of options rather than eliciting free responses, where appropriate; and adding a "save for later" feature to the survey to avoid fatigue as the time to complete the pilot survey was 45 – 60 minutes. The final version of the survey contained 58 questions and is included in Appendix B.

The number of questions in each theme is given in Table 2. Questions 56 and 58 asked for contact details of the respondent while question 57 was only for those institutions without MLS and therefore not associated with one of the six themes.

theme	number of questions	question numbers
availability and practical operation of MLS	17	1 – 8, 11 – 18, 21
staffing and tutors	5	10, 23 – 26
types of support available	6	9, 27 – 29, 31, 32
users of the service	15	30, 33 – 41, 46 – 50
reporting and evaluation of MLS activities	7	42 – 45, 51 – 53
challenges and developments	5	19, 20, 22, 54, 55

Table 2: Questions associated with each theme in the survey.

The online survey was created using DaSurvey (www.dasurvey.com) which allows Boolean logic to be incorporated so that the survey questions would be revealed depending on how the individual respondents answered each question.

In March 2015, using the IMLSN membership database and through personal contacts, the SIG identified individuals considered best placed to take the survey on behalf of their

institution. The final survey was distributed to these contacts by email in April 2015. The results of the survey were analysed in 2015 and early 2016 and this associated report was completed in November 2016. The initial analysis and findings were disseminated internationally at the CETL-MSOR conference in Greenwich, London (September 2015) [7] and nationally at the tenth annual workshop of the IMLSN in the National University of Ireland, Galway (May 2016) [8].

Ethical approval was sought and granted for the collection and publication of data retrieved during this project in accordance with University College Dublin ethics guidelines under Research Ethics Exemption Reference Number LS-E-15-05-Cronin.

3. Research Findings

3.1 Availability and Practical Operation of MLS

This section reports the numbers of institutions in which MLS was available and describes practical aspects of the MLS service in these institutions including location, opening hours, advertising methods and who could avail of MLS.

Twenty-five of the 30 institutions (83%) that completed the survey stated that they offered MLS (Figure 1).

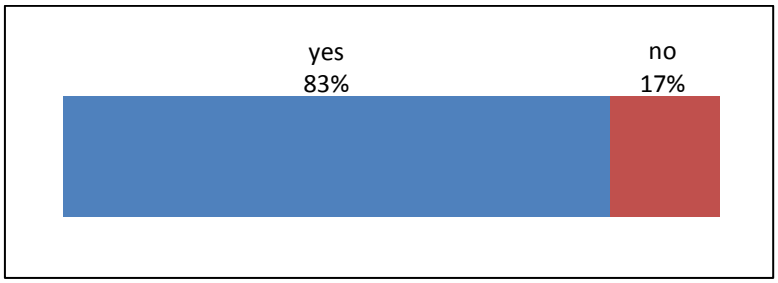

Figure 1: Existence of MLS in the various institutions (n=30).

Table 3 details the existence of MLS by institution type.

	number of institutions	
	MLS available	MLS not available
university	9	1
IoT	11	2
CELA	3	1
CFHE	2	1

Table 3: Existence of MLS by institution type (n=30).

3.1.1 Institutions providing MLS

Figure 2 indicates when MLS was first established in the various institutions that provided this information.

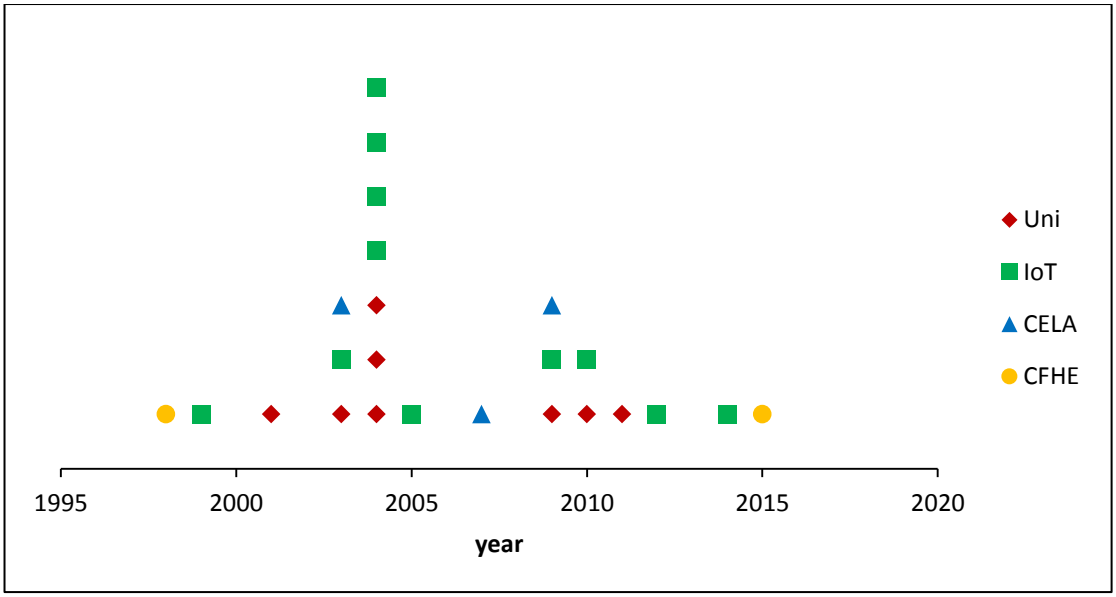

Figure 2: Timeline showing when MLS was first established in the institutions surveyed (n=24).

The earliest example was in a college of further and higher education in NI where MLS has been provided through essential skills numeracy programmes over the last 15 – 20 years and through more informal support classes for engineering mathematics. Essential skills numeracy is a requirement for all students in the college without GCSE[†] mathematics grade C and is a nationally accredited adult qualification. This college does not have a mathematics learning support centre (MLSC). Note that, while MLS is a general term, a MLSC is defined as a physical entity with a focus on providing MLS in a centrally coordinated way.

The first IoT to provide MLS was IoT Blanchardstown with support provided intermittently since 1999. No MLSC exists; rather, the support is offered through clinics associated with a particular module. The first MLSC was established in 2001 in the University of Limerick. During the period 2003 – 2005, there was a large growth in MLS provision with eight MLSCs opening in three universities and five IoTs. This was due in part to funding provided by the Higher Education Authority's Information Technology Investment Fund and its follow-on funding source, the Strategic Innovation Fund (SIF), which were aimed at improving retention in the higher education sector. There was little expansion of MLS in Ireland during the next three years. However, since 2009, MLS provision has extended to include all but one of the universities surveyed and all but two of the IoTs surveyed.

The survey responses suggested that any developments in the operation and structure of MLS provision in particular institutions depended on individual circumstances. In most cases (88% of institutions that provided MLS), the support, once started, has not been

[†] The General Certificate of Secondary Education (GCSE) is the national secondary-education qualification in a specific subject typically taken by school students aged 14 – 16 in NI, England and Wales.

discontinued. However, while some reported growth, one institution described a reduction in the service provided in recent years due to resource constraints. Two institutions currently with a MLSC experienced a short break of one or two years in their provision – in one case, this was due to the initial funding being for only one year; in the other case, support ceased for a year despite having been in existence for the previous eight years.

3.1.2 Institutions not providing MLS

The five institutions at which MLS was not offered included one university, two IoTs, one CELA and one CFHE. This indicates that the type of educational institution was not a factor in the availability of this kind of support. Two of these institutions (an IoT and a CFHE) cited funding issues as a reason for not offering MLS. The IoT respondent stated that MLS had been set up with SIF funding but was discontinued. The CFHE provided free classes in numeracy but reported being unable to offer MLS on a formal, ongoing basis. The CELA respondent referred to mathematics being offered through regular module delivery and not as MLS outside of this while the university respondent mentioned generic support and links to resources via module websites.

"The online nature of our teaching and learning means that a physical drop-in centre is not a practical option. We do offer generic support to all our students and do provide links to resources on all our module websites." [university]

Responses from the CELA, CFHE and one IoT indicated that there were no plans to establish MLS in their institutions. There was no comment from the second IoT on this question of potentially establishing MLS. The university representative described plans to establish a virtual MLSC.

"This will be an interactive website that will allow students to learn independently through the use of screencasts and videos, join workshops on specific mathematical topics or avail of one-to-one support if necessary." [university]

From this point onwards in the presentation of the research findings, the data is based on the responses from the 25 institutions who stated that they provided MLS.

3.1.3 Profile of students who can avail of MLS

Figure 3 indicates which students were eligible to avail of MLS.

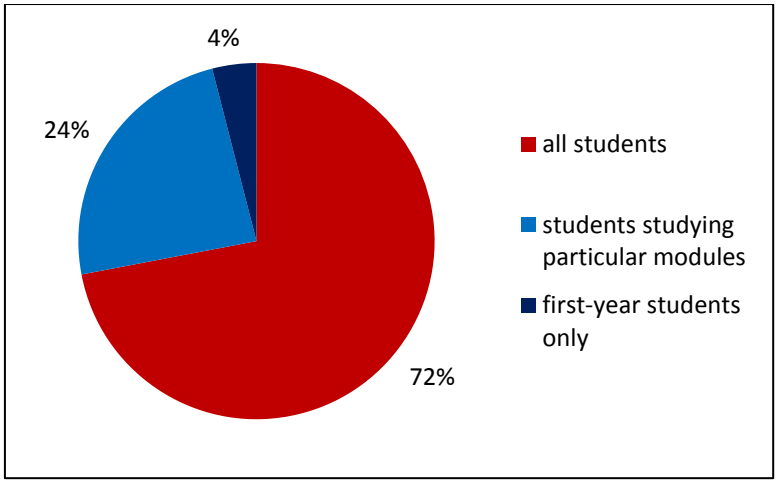

Figure 3: Profile of students who could access MLS (n=25).

In a large majority (72%) of institutions, all registered students could access MLS. Note that this question allowed a free response and it is clear that "all students" had a different meaning for different respondents. Within the 18 responses in this category, three specifically referred to undergraduate and postgraduate students being eligible to pursue MLS, three stated that access[‡] students were included, one said that only undergraduates could avail of MLS, one specified that MLS was available to full-time students only and two elaborated that part-time students were also included. Six respondents stated that access to MLS was limited to students registered for specific modules, for example, students studying mathematics, engineering, computing, science, etc. One institution, a university, offered support only to first-year students.

At two universities, MLS was also offered as a free drop-in service to secondary-school pupils while another university supported such pupils in the lead up to the Leaving Certificate[§] examinations.

3.1.4 Promoting MLS to students

As evidenced by Figure 4, most institutions used a range of methods to advertise the availability of MLS. Responses were received from 25 institutions with the most popular advertising methods being posters, emails, websites, through lecture announcements and promotion during first-year induction.

[‡] Students typically from groups underrepresented in higher education, including students with disabilities, mature students and students from socio-economic or educationally disadvantaged backgrounds. http://www.hea.ie/en/policy/national-access-office/introduction

[§] The Leaving Certificate is the national secondary-education terminal qualification in the RoI. It is the primary criterion used by higher education institutions in the RoI to determine which students are offered places on their programmes.

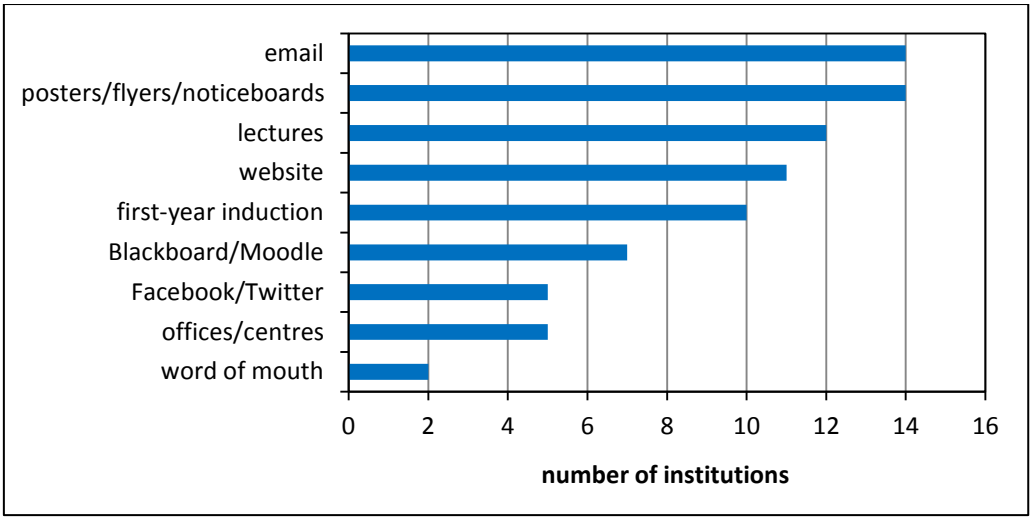

Figure 4: Method of MLS advertisement to students (n=25).

The category labelled "lectures" included both announcements made in lectures by the lecturer and also people coming into the lecture to advertise MLS. There was some ambiguity whether it was the institution's website or the MLSC's website that was being referred to. The "offices/centres" cited included the access office, mature student society, library and disability services. It should be noted that this question did not ask for any assessment of the effectiveness of these methods. However, one respondent highlighted that posters were consistently ranked very low as a means of encouraging or reminding students to attend the MLSC.

3.1.5 Prevalence of MLSCs

Sixteen of the 25 institutions that offered MLS provided the support through a MLSC (Figure 5).

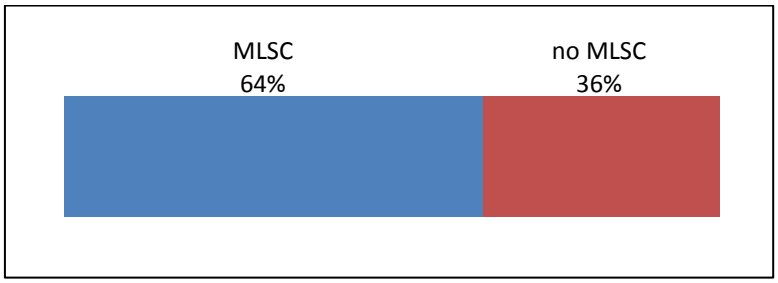

Figure 5: MLS provided through a MLSC (n=25).

Those institutions not having a MLSC included two universities, three IoTs, three CELAs and one CFHE. Thus, 78% of universities and 73% of IoTs had a MLSC in place. Table 4 summarises the existence of a MLSC according to the type of institution.

	number of institutions	
	MLSC	no MLSC
university	7	2
IoT	8	3
CELA	0	3
CFHE	1	1

Table 4: Existence of MLSC by institution type (n=25).

Institutions not having a MLSC tended to offer more informal support. Four respondents referred to a drop-in facility, four indicated that tutorials were arranged as needed or when staff were available while one university operated a peer support system for first-year students.

3.1.6 Location and nature of space assigned to MLS

The location of the MLS service might be considered a vital factor influencing its viability and success. Figure 6 indicates that a wide variety of locations were used, although being centred in the mathematics department or a more general academic hub or learning resource centre were most popular. Most MLSCs (67%) were found in a neutral environment such as a learning resource centre or library but 33% of MLSCs were based in the mathematics department.

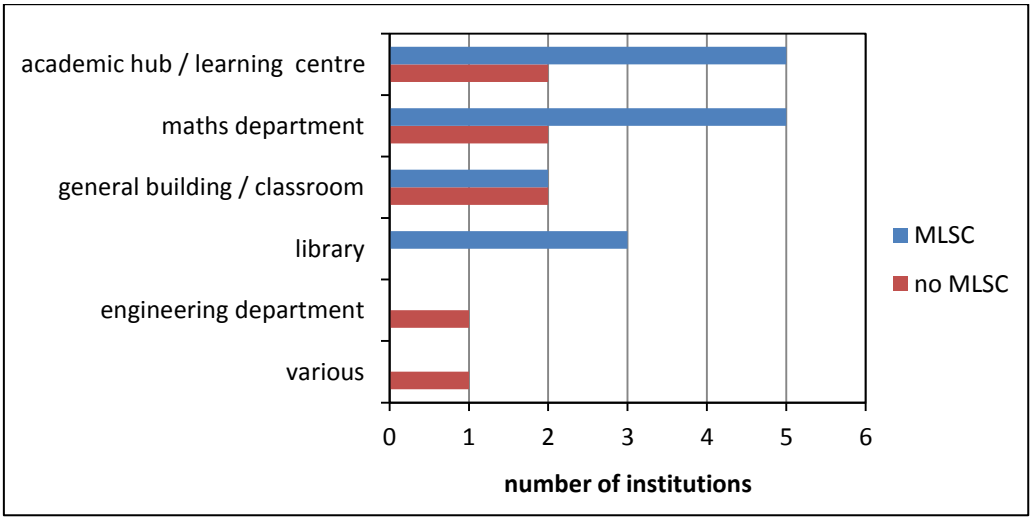

Figure 6: Location of MLS provision (n=23).

A large majority (80%) of the institutions that provided MLS had a dedicated space to do so (Figure 7).

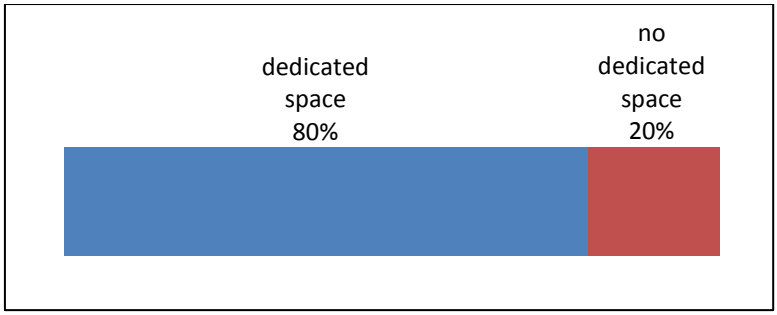

Figure 7: Dedicated space for MLS service (n=25).

Those institutions without a dedicated space included three universities, one IoT and one CELA. Interestingly, two institutions which had a MLSC reported that they did not have a dedicated space – one was based in the library, having had to move several times, where the furniture was not ideal, maths resources could not be placed in the room and other (non-MLS) students tried to use the room for general study; another used a lecture room and therefore could not leave MLS resources there.

The survey showed that the nature of the space used for MLS was very diverse. Some respondents provided extensive details of their MLS space and the following three examples have been included to depict various layouts:

Maynooth University is well equipped, its MLSC being a large room with 12 round tables each seating eight students and 20 smaller tables with rearrangeable seating. The room has whiteboards, blackboards, bookshelves and a lecture podium with computer console to facilitate workshops. This space is shared with writing support but problems with this arrangement are very rare, even though both support services may be operating simultaneously.

Dublin City University has a large, bright room which seats at least 40 students around large tables. The furniture was purpose-bought and can be rearranged to suit different needs. There is whiteboard wall paint and a mobile whiteboard. This MLSC is located in a prominent position in the library but the space reverts to the library in the summer months. This space was acquired for MLS only recently following ten years using a small meeting room in a less attractive location and student attendance numbers have almost tripled since the move. Writing support is located next door in a separate room. The respondent indicated that this arrangement is ideal as the nature of these types of support is very different – MLS needs a large, open-plan room that can accommodate both independent and collaborative learning.

Limerick IoT has a learning support unit and the MLSC shares this space with other supports. They have one large room with ten computers, a whiteboard and tables of various sizes to suit group work or individual tuition. They also have two rooms with whiteboards for groups of up to 15 students.

Other arrangements typically involved one or two rooms with whiteboards and computers with access to internet and mathematics resources. Some institutions used small rooms for more private consultations while others simply used classrooms. One respondent had use of a dedicated room for MLS but commented that, with a capacity for 14 students, this space was too small to meet the demand from students.

In most institutions (63%), the space used for MLS was shared, primarily with other academic support such as writing or study skills (Figure 8).

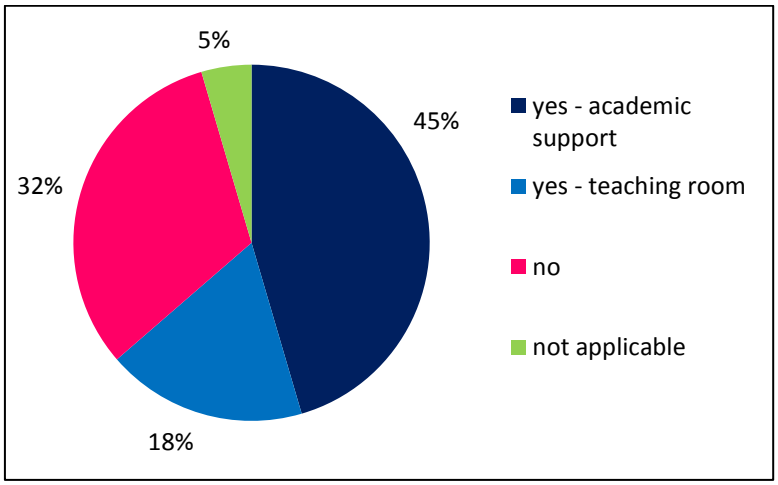

Figure 8: MLS physical space shared with other supports or services (n=22).

Some used ordinary classrooms for MLS and therefore had to work around everyday teaching requirements. The response classified as "not applicable" represented a more unusual form of MLS which was based on a peer support system for first-year students. Half of those whose MLS space was shared with others provided comments with most (five out of seven comments) indicating the arrangement to be satisfactory. However, the inability to leave resources in a room also used as a teaching room was a disadvantage while another respondent reported some confusion for students in identifying the appropriate tutor when MLS and writing support shared the room. An interesting comment intimated at the importance of promoting and associating a mathematics identity with the MLS space; this was hindered when the space was shared.

Despite the variety in locations, there was a general level of satisfaction among respondents concerning the location of their MLS service (Figure 9).

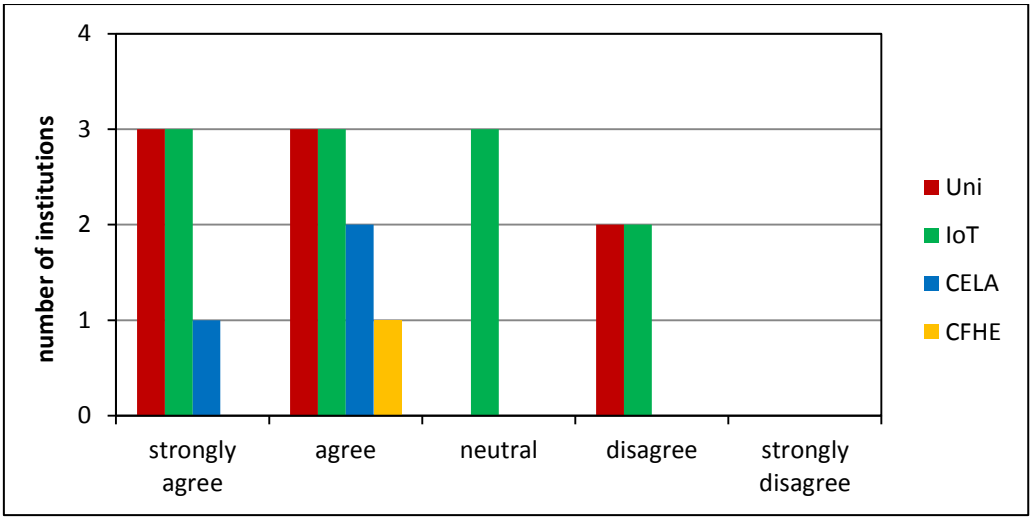

Figure 9: Responses when asked whether the MLSC was appropriately located (n=23).

Note that, while the question referred to the MLSC location, most of those without a specific centre (seven of the nine without a MLSC) also answered. Therefore, the responses were interpreted with regard to MLS more generally. Four respondents disagreed that their MLS provision was located appropriately. All four had a MLSC in operation and a dedicated space, but two stated a preference to be situated in the library.

3.1.7 Opening hours

Availability of MLS depends on the opening hours and this varied widely between institutions (Figure 10).

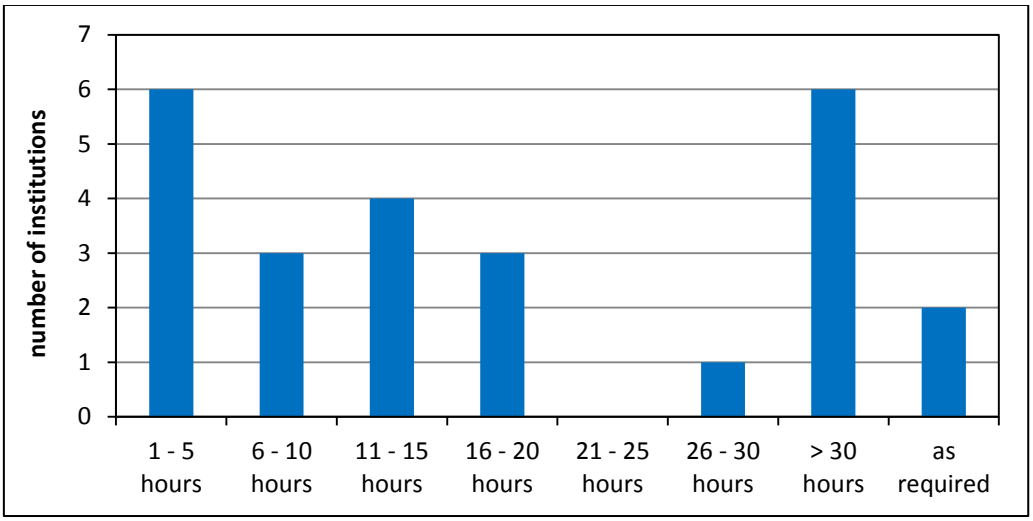

Figure 10: Number of hours per week the MLS provision was open (n=25).

In 24% of institutions, five hours per week at most of (face-to-face) MLS was available while another 24% of institutions offered more than 30 hours per week. There was no evidence of

MLS available at weekends in any institution. Within both the university and IoT sectors, there was a disparity in opening practices. In universities, MLS service hours ranged from "a few" to 48 hours per (semester) week with a mean value of 22.1 hours; in IoTs, opening times ranged from three hours to 55 hours per week and the mean was 18.8 hours. The nine institutions offering at most ten hours per week included three universities and five IoTs; the seven institutions opening for more than 25 hours per week included four universities and three IoTs. MLS was provided in evenings (after 5.30 pm) in 44% of institutions although this service was less prevalent in universities where 33% remained open late. Unusually, one IoT provided only an evening service, opening 5 – 7 pm two days a week.

In some cases, opening hours were adjusted depending on the proximity of exams and targeted revision sessions were offered. MLS was available throughout the term in most institutions although, in a small number of cases, support did not begin until the second or third week. It is noteworthy that, in 60% of institutions, the MLS service was closed during examination periods (Figure 11). This practice was observed across all types of institution with the exception of the two CFHEs which remained open at exam time.

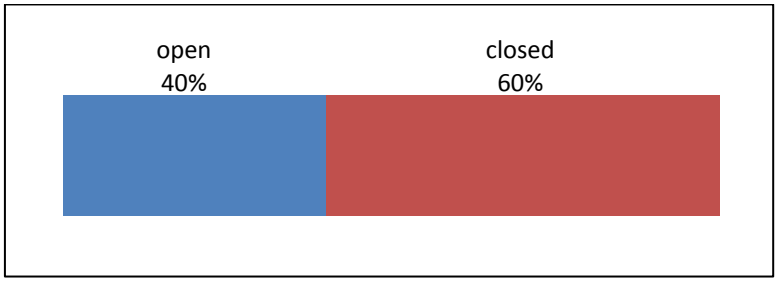

Figure 11: MLS provision open during exam times (n=25).

3.1.8 Stability of MLS

The stability of MLS was explored by asking those who had a MLSC to state whether the MLSC was permanent or subject to (annual) review (Figure 12). In only seven (44%) of the 16 institutions having a MLSC could the centre be described as permanent. Another seven MLSCs were subject to annual review. One of the respondents who replied "other" explained that he had a permanent post in the university but had to apply annually for funding for tutors to sustain the MLSC.

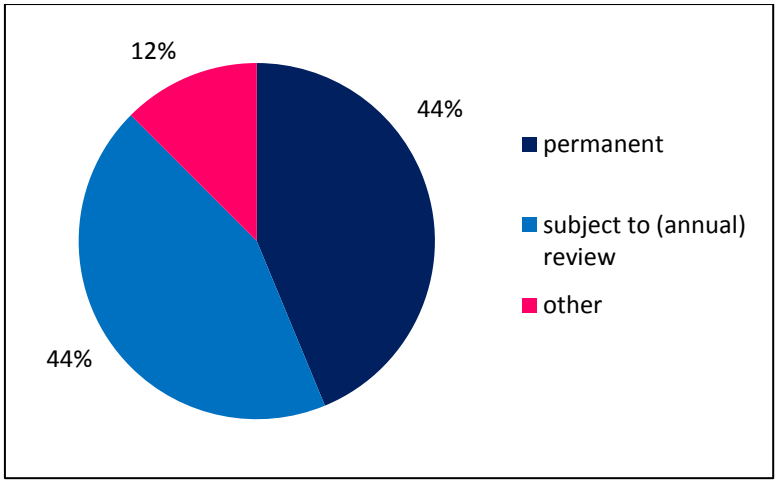

Figure 12: MLSC permanent or subject to review (n=16).

Figure 13 presents an analysis of the status of MLSCs by institution type.

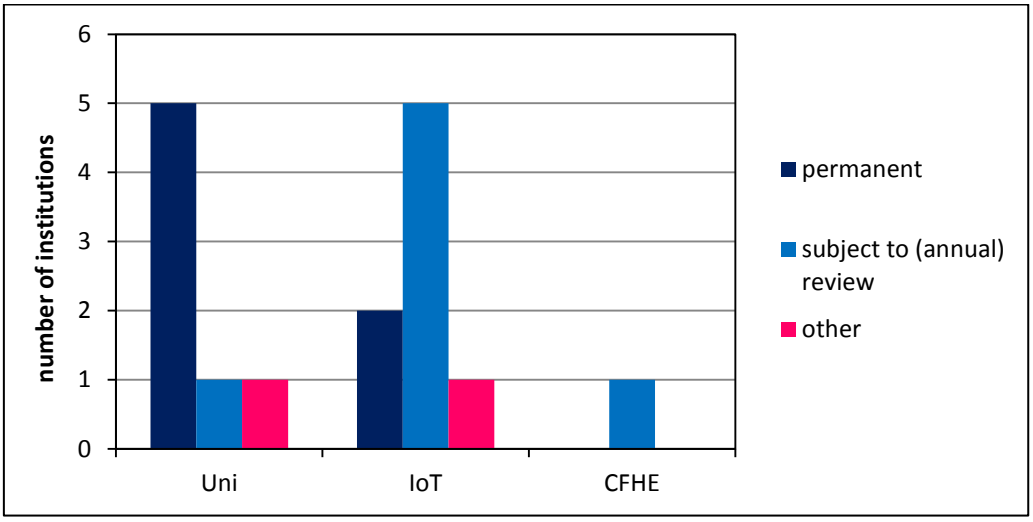

Figure 13: Status of MLSC by institution type (n=16).

There was a clear difference between the university and IoT sectors with MLSCs having a more permanent status in universities. There were no MLSCs in the CELA sector. Although the question referred specifically to the MLSC, replies were also received from four institutions where MLS was offered but not through a centre. In two of these cases, where MLS was provided more informally, the support was also subject to review. Thus, the current system of providing MLS was permanent in only 40% of the 20 institutions that answered this question. Five institutions did not respond to this question and it is known that MLS was non-existent in another five institutions.

3.2 Staffing and Tutors

The survey has highlighted the extent of the growth of MLS in higher education in Ireland over the last 20 years (Figure 2). It has also shown that, in a large majority of cases, the support, once provided, was not discontinued. Indeed, many respondents expressed the desire to extend their service (see section 3.6). Continuation and development in MLS provision inevitably creates a need for dedicated, or at least partly dedicated, management and tutors. The success of any service is dependent on its staff; further, the status of the service within the institution is often reflected in the status given to its staff. The survey results provided details of the staffing arrangements for the 25 institutions that provided MLS.

3.2.1 Staff numbers

The staff numbers involved in MLS are considered in Figure 14.

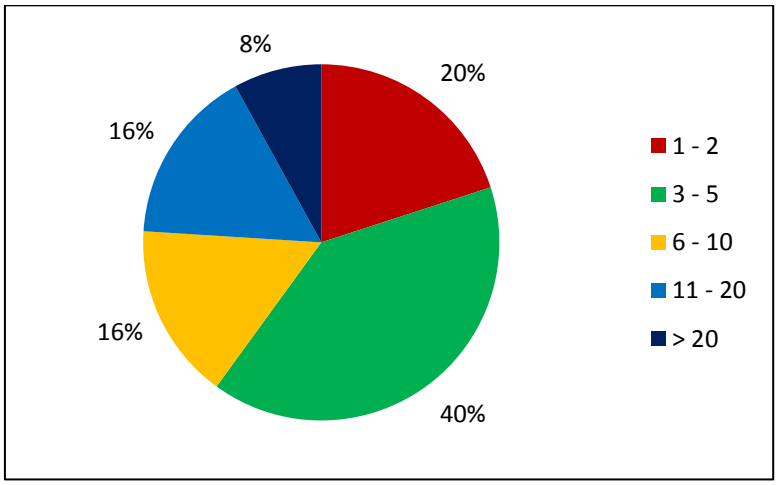

Figure 14: Percentage of institutions having a given number of staff (n=25).

This figure shows that 20% of institutions (five institutions) had a staff of only one or two responsible for their MLS service. These five included three IoTs and two CELAs. In a further 40% of institutions (ten institutions), there were between three and five staff engaged in MLS. This group consisted of three universities, four IoTs, two CFHEs and one CELA. The six institutions (five universities and one IoT) with the highest staff numbers (more than ten) had well established systems of MLS – all had a MLSC, five had someone specifically contracted as manager and MLS had been in existence for over ten years in four cases.

3.2.2 Manager/coordinator of MLS

Note that the designation "manager" is typically used when MLS is provided through a formal centre. However, this report uses "manager" to refer to the person responsible for coordinating MLS more generally, including situations where a MLSC does not exist.

Figure 15 displays the various contract types held by managers. In only nine institutions (36% of institutions having MLS) was the role of manager full time. A further seven institutions incorporated the role of manager as part of the lecturing or administrative duties of a staff member. Three institutions had a voluntary manager, suggesting that the staff member was not given a reduction in their lecturing hours to manage the MLS offering. There was no specific manager of MLS in four institutions (three IoTs and one university). Two of these had special arrangements, with MLS being provided only to certain students within a module or through peer support. In the other two cases, coordination of MLS occurred more generally through learning centres.

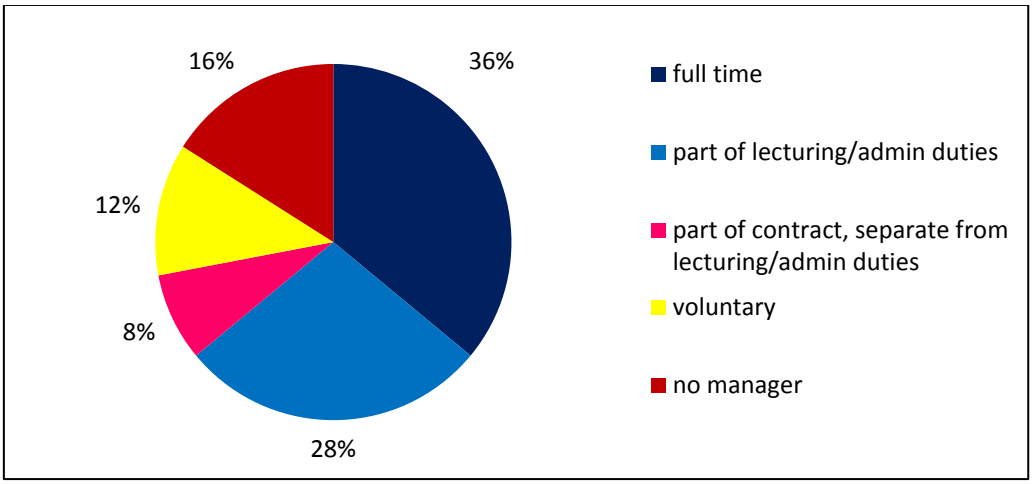

Figure 15: Status of the role of manager/coordinator of MLS (n=25).

The survey data indicated that the nature of the role of manager was not strongly correlated with the type of institution. Table 5 shows that 33% of managers in the university sector were full time with 36% the corresponding figure for IoTs. However, the lack of a specific manager for MLS was relatively more common in IoTs.

	Uni	IoT	CELA	CFHE
full time	3	4	1	1
part of lecturing/admin duties	2	4	1	0
part of contract, separate from lecturing/admin duties	2	0	0	0
voluntary	1	0	1	1
no manager	1	3	0	0

Table 5: Status of managerial role by institution type (n=25).

There was a strong correlation between the nature of the role of manager and the opening hours of MLS. Of the ten institutions offering more than 15 hours of MLS per week, six had full-time managers while in three the role was performed as part of contracted duties. None of the six institutions where at most five hours of MLS were available each week had a full-

time manager. In fact, for three of these institutions, there was no manager at all and in another the manager was operating purely on a voluntary basis.

3.2.3 Profile of tutors

The various categories of staff from which institutions sourced staff to provide MLS are displayed in Figure 16. Respondents could select from staff categories listed in the survey question.

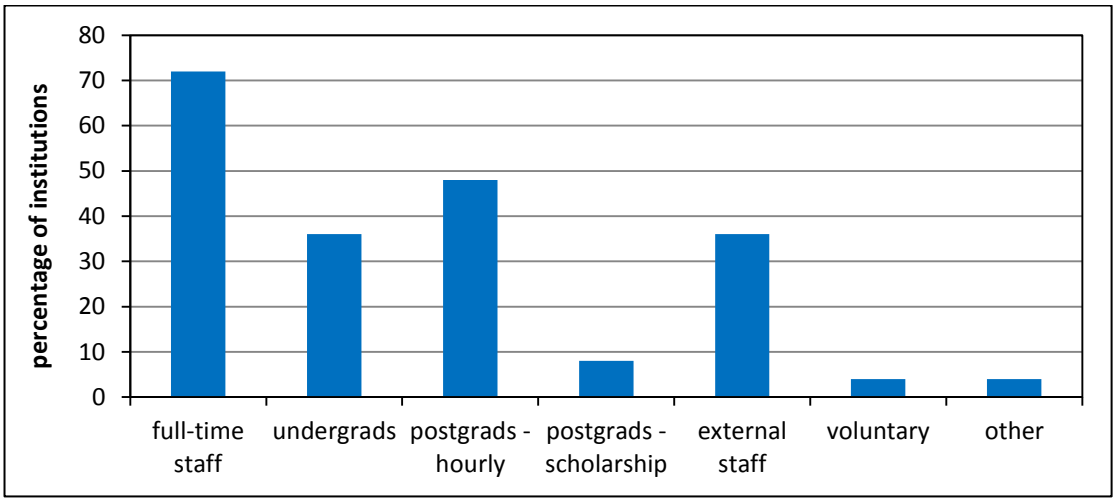

Figure 16: Percentage of institutions procuring MLS staff from various categories (n=25).

The most common type of staffing was full-time institutional staff; at least one staff member was from this source in 72% of institutions. Only one institution, a university, had voluntary staff – in this case, eight volunteers worked alongside undergraduate and postgraduate students and other tutors to provide MLS. Twelve of the 25 institutions (48%) employed postgraduate students while nine (36%) hired staff from outside their institution. These included retired secondary-school teachers and part-time (or professional) tutors who worked in several institutions. Nine institutions (mainly universities) involved undergraduate students in providing MLS to their peers.

Results showed that 52% of institutions engaged MLS staff from one category only: ten used full-time institutional staff only, two used undergraduates only and one used hourly-paid postgraduates only. The remaining 48% of institutions used staff from a variety of sources. Note that the question responses differentiated between postgraduates who were required to tutor for their institution as part of their scholarship and postgraduates who were paid by the hour.

When the data showing staff categories was broken down by institution type (Table 6), it was clear that universities availed of staff from a wide range of categories while IoTs were more reliant on their own full-time staff. The CFHEs relied solely on their full-time staff to provide MLS.

	full-time staff	undergrads	postgrads – hourly	postgrads – scholarship	external staff	voluntary	other
Uni (n=9)	5	6	6	2	4	1	1
IoT (n=11)	9	2	5	0	5	0	0
CELA (n=3)	2	1	1	0	0	0	0
CFHE (n=2)	2	0	0	0	0	0	0

Table 6: Numbers of institutions, by institution type, procuring MLS staff from various categories (n=25).

Overall, it is evident from Figure 16 that the primary source of tutors in MLS was institutional staff and students. A key difficulty for some institutions was the ability to secure and retain suitably qualified tutors; this is discussed further in section 3.6 of this report.

3.2.4 Tutor recruitment and training

Twenty-two institutions gave details of their tutor recruitment process. Institutional staff and students were the main recruitment target. At one university, all mathematics staff were expected to be involved in the provision of MLS. There was a variety of approaches to recruiting students as tutors. On-campus advertising through the careers or departmental website was used in six institutions to advertise for potential tutors. One university successfully used mathdep (online distribution list) to identify tutors. Postgraduate students could be contacted about the posts informally (six institutions) or through a recommendation from a colleague or supervisor. In one case, they were required to contribute to MLS. One university identified the top undergraduate mathematics students and invited them to participate and gain experience working in a MLSC. Only nine respondents referred to an interview process with just one stating that the applicant must demonstrate their teaching skills, while three required submission of a CV.

In the year that the audit was conducted, a training programme for tutors was provided in 44% of the institutions that offered MLS but no such training existed in 52% of institutions (Figure 17). Of the 11 institutions that offered training, nine supplied further details. These details indicated that the initial training could involve just an individual meeting (one institution) or a two- or three-hour course (three institutions) although two institutions offered a full day's training (provided by a specialist from the UK's Higher Education Academy in one case). Topics covered as part of training included protocol, good tutoring practice, mathematical thinking, group work and common problems. Two respondents mentioned the use of tutor training material developed by the IMLSN and the **sigma**

network[**]. Only one referred to involvement of a disability learning adviser to guide on tutoring strategies for particular groups of students. Ongoing mentoring and review meetings were common practice for tutors in institutions that provided training, occurring in six of the nine institutions that provided details.

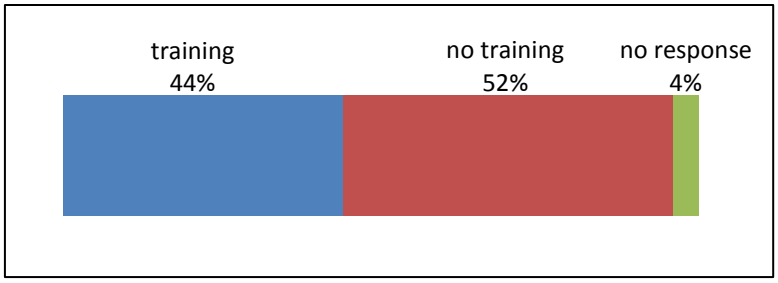

Figure 17: Training programme for tutors (n=25).

3.3 Types of MLS Available

This section outlines the types of MLS available for students.

3.3.1 Face-to-face support

Figure 18 shows the face-to-face MLS services broken down into three categories: drop-in, appointment and workshop for small groups.

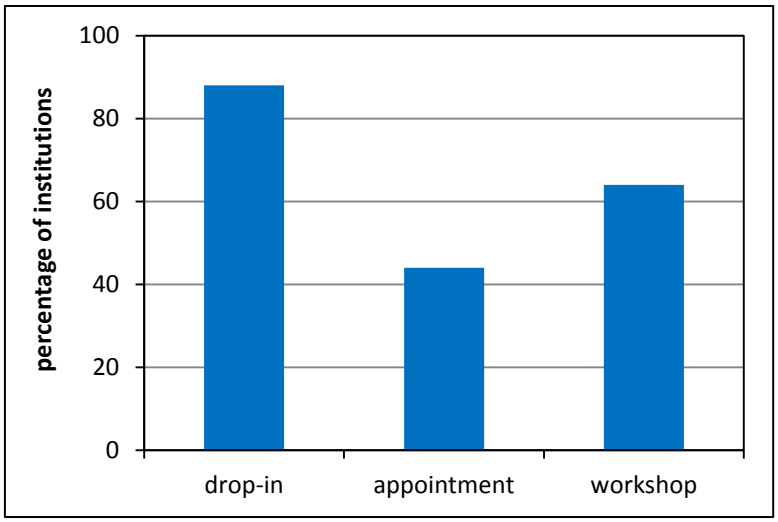

Figure 18: Percentage of institutions providing face-to-face MLS (n=25).

The drop-in service was the most common form of MLS provided with 88% of respondents indicating that they offered this service. Workshops were offered at 64% of institutions

[**] **sigma** (Centre for Excellence in Mathematics and Statistics Support) was established in 2005 and forms a collaborative network of practitioners in the provision of mathematics and statistics support for England and Wales.

while 44% offered an appointment-based service. All 25 institutions provided at least one form of face-to-face MLS. In seven institutions, the face-to-face support consisted solely of a drop-in service, while only one respondent indicated that only workshops were offered. None of the respondents selected the appointment category without selecting at least one of the other two options. Therefore, in 32% of institutions offering MLS – four universities, three IoTs and one CELA – only one form of face-to-face support existed.

It was clear from the responses that workshops took various forms including specialised sessions on a topic of common difficulty, a course for mature students, and study group and examination preparation sessions. Figure 19 shows how the workshops were initiated. Survey respondents could select more than one option and the percentages are with respect to the number of institutions offering workshops.

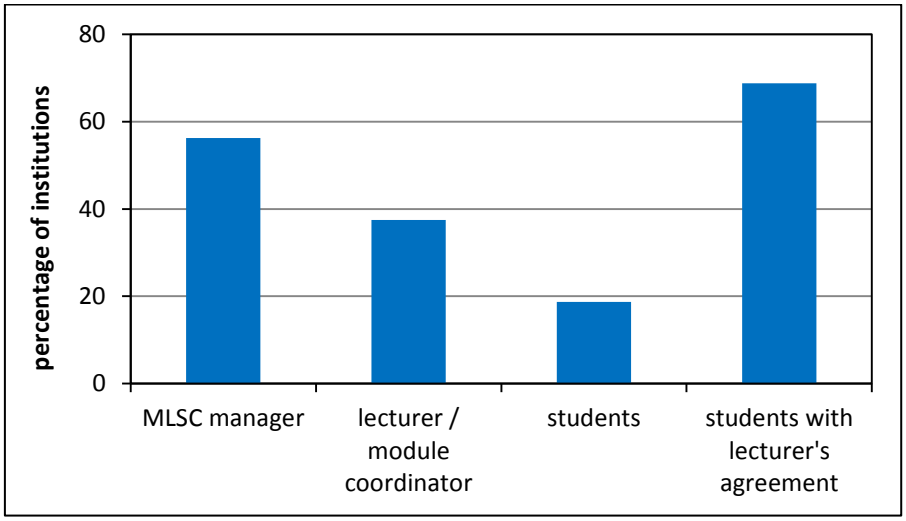

Figure 19: Those who request/initiate the workshops (n=16).

In 56% of institutions, the MLSC manager took the initiative in providing workshops, and in 81% of institutions, the workshops were requested by students, either directly or in conjunction with their lecturer. The results are encouraging in that they indicate a large degree of flexibility on the part of MLS providers to respond to requests for specialised sessions from students and lecturers.

Figure 20 displays the periods when MLS workshops were available.

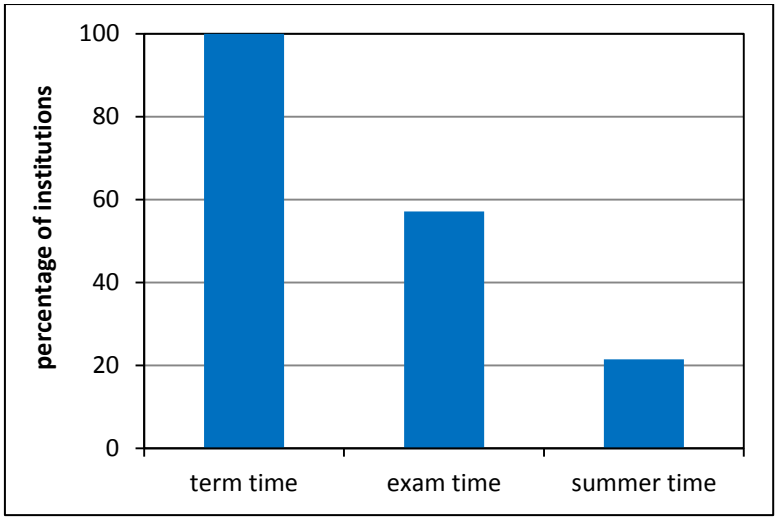

Figure 20: Times when workshops were provided (n=14).

All of the institutions that offered workshops did so during the teaching terms and 57% of these institutions also provided workshops at examination time. Three institutions (a university and two IoTs) organised workshops during the summer; one respondent indicated that these were targeted at particular groups such as mature students, access students or students with disabilities.

3.3.2 Online support

Online MLS can take many forms, from simply supplying access to lecture notes, past exam papers and links to useful websites, etc., to the use of commercial mathematical software such as Maple or MyMathLab. The more advanced information and communications technology (ICT) offerings use a computer-based tutorial and assessment system such as CALMAT or Maple TA, or may even provide synchronous chat/messaging or a virtual drop-in service.

The survey asked whether online MLS was offered. If so, respondents could select multiple items from a list of ten describing various forms of online MLS. Figure 21 indicates that 48% of MLS providers (12 out of 25) offered online support. However, most (69%) of those not currently offering online MLS planned to do so (Figure 22).

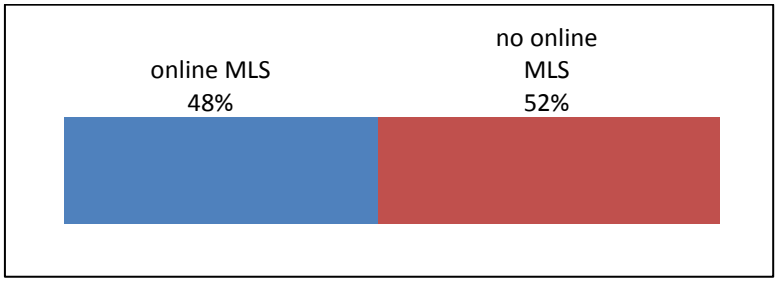

Figure 21: Current availability of online MLS (n=25).

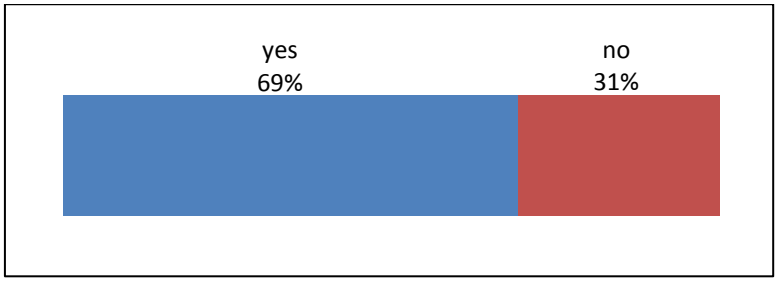

Figure 22: Planning to introduce some form of online MLS (n=13).

Online MLS was relatively more common within the university sector when compared to IoTs – two thirds of universities offered this service compared to 45% of IoTs (Table 7).

	number of institutions	
	online MLS	no online MLS
university	6	3
IoT	5	6
CELA	0	3
CFHE	1	1

Table 7: Current availability of online MLS by institution type (n=25).

Figure 23 supplies details on the types of online MLS available.

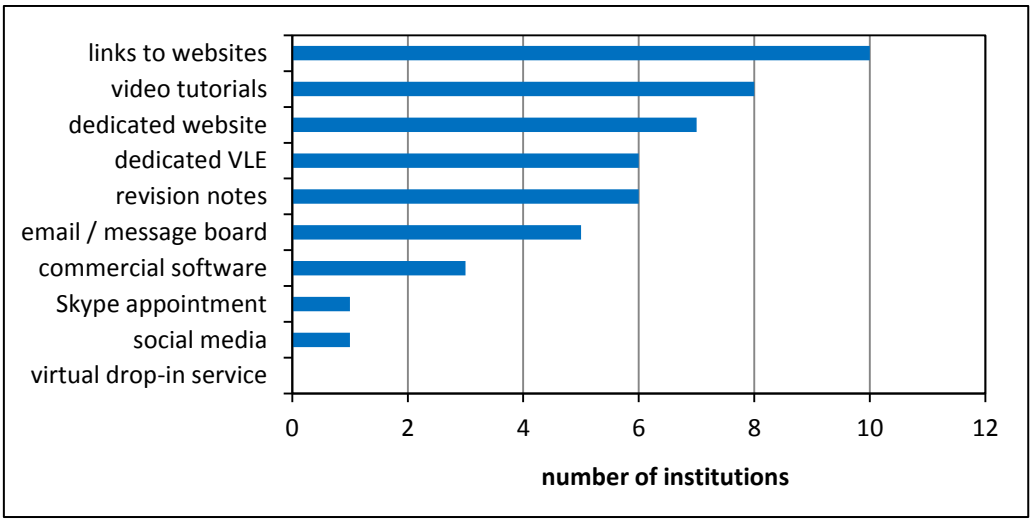

Figure 23: Forms of online MLS available (n=12).

All but two of the 12 respondents offered a variety of online support. Links to websites (such as mathcentre) and video tutorials were most widespread. A dedicated website or virtual learning environment (VLE) and revision notes were also relatively common. Only

one institution surveyed listed social media as an available form of MLS. MLS via Skype appointments was equally rare. A virtual drop-in service was not offered at any institution surveyed.

Survey participants were asked what the students thought of online MLS compared to face-to-face MLS. Thirteen responses were received with seven indicating a belief that students preferred the face-to-face support. This was said to be more effective since it obviously enables students to talk through their problems. It was reported that some students could easily get lost when using just an online form of MLS. One person advised that face-to-face MLS was needed, particularly for weaker students, to build their confidence. While face-to-face support was generally considered to be more valuable, online MLS did not attract many negative comments. Indeed, the usefulness of having both types of support was noted by five institutions since students have their individual preferences and avail of whatever service is convenient at the time.

3.4 Users of MLS

This section outlines the means and forms of keeping records in MLS. The survey not only sought validation of the prevalence of this custom but also endeavoured to explore the issues of the configuration of the data collected and the method of collecting and capturing this data.

3.4.1 Record keeping

There were 25 responses on the issue of maintaining records of student visits – 20 institutions indicated that they maintained records and five said that they did not. Figure 24 shows how this record keeping was done by those who kept such records.

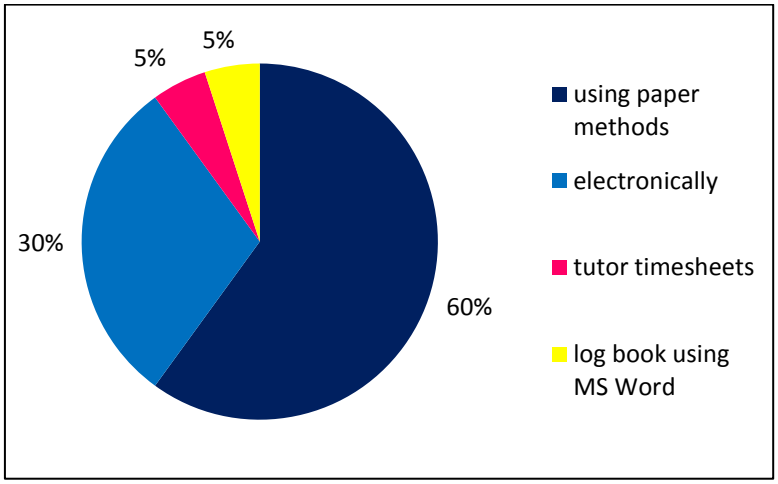

Figure 24: Means by which MLS data on student visits was recorded (n=20).

Those who did keep records were asked to detail what was recorded; this is presented in Figure 25 where the percentages are with respect to the number of institutions that kept records.

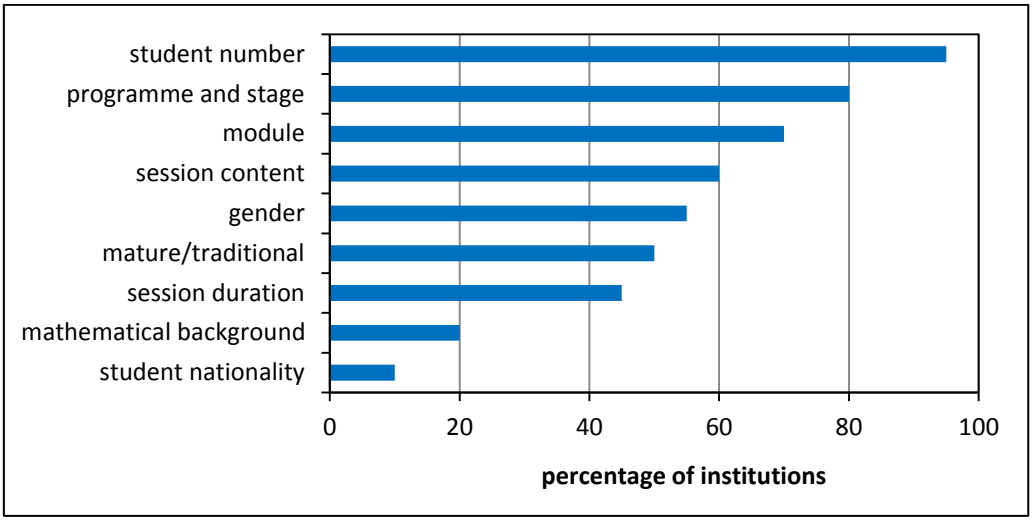

Figure 25: Percentage of institutions that recorded stated data (n=20).

3.4.2 Student profile

Survey participants were asked to estimate a percentage to describe the academic stage profile of the students who made use of their MLS provision. First-year undergraduates were very clearly the main users of MLS, in general. The majority (68%) of institutions said that between 45% and 70% of their MLS visitors were students from first-year undergraduate courses and the mean estimated percentage for first years was 55%. Only in two institutions were first-year students not the main users of the service. In two exceptional cases, 95% and 100% of the student visitors were from first year. The mean estimated percentage for second-year undergraduates was 22% and the maximum percentage for this group in any one institution was 41%. For third-year students, the mean reported percentage was 10% and the maximum was 35%. The corresponding data for students in fourth year was 4% (mean) and 18% (maximum).

Postgraduate usage of MLS was relatively very low. The mean reported percentage was 3% although, in one exceptional case, postgraduate students represented 30% of MLS visitors. This respondent noted a significant growth in students accessing statistics support, particularly postgraduates.

Students not in these categories (e.g. pre-registered or second-level students) represented a very low proportion of MLS visitors.

The responses to the survey indicated that a variety of student profiles existed within MLS. Some respondents indicated that their MLS service targeted first years and one MLS service stated that they were specifically for undergraduate students only. One explained that the

vast majority of first-year visitors were from large service mathematics courses. In another response, the large number of first years included many who had not studied A-level[††] mathematics at secondary school. Another respondent expressed the belief that final-year students, having matured as they progressed through their studies, were more open to availing of MLS. Three respondents observed that use of MLS by final-year and/or postgraduate students was increasing.

Table 8 is based on the 22 responses to the question investigating the discipline profile of the students who made use of MLS provision. (Two responses were based only on anecdotal evidence.) The table indicates the number of institutions which supported students studying in these disciplines, the number of institutions in which the highest proportion of MLS users were from the given discipline, and the highest percentage in any institution for student visitors from a particular discipline.

discipline	**number of institutions supporting students of this discipline**	**number of institutions in which highest proportion of MLS users are from this discipline**	**highest percentage in any institution of MLS users from this discipline**
engineering	18	12[‡‡]	100%
science	17	7	100%
business	14	0	31%
arts	9	1	80%
nursing	6	0	20%
medicine	4	0	5%
agriculture	2	0	6%[§§]
other	10	2	100%

Table 8: Discipline of MLS users by percentages within institutions (n=22).

The data showed that MLS pervaded almost every discipline within an institution with engineering, science and business (in that order) being the most popular users. The "other" category included education, computer science, law, health, sport and exercise. The two institutions in which most MLS users were from the "other" category were both CELAs. Sixteen of the 22 respondents provided MLS to students from at least three disciplines. This emphasises that, while MLS tutors may be asked to help with a certain topic in mathematics, they need to be sufficiently capable of dealing with the mathematics applied in a wide range of contexts.

[††] The General Certificate of Education Advanced Level (A-level) is the national secondary-education terminal qualification in a specific subject typically taken by school students aged 17 – 18 in NI, England and Wales.

[‡‡] Engineering and science students were counted together in one institution; in another institution, engineering and science students had the equal highest percentage.

[§§] Agriculture was included in the science discipline in one institution.

Survey participants were also asked to describe the status profile of the MLS users by estimating a percentage associated with the following categories: traditional, non-traditional, registered with disability support, international, other. Non-traditional is taken to mean mature students and students who did not enter the institution via the standard route, e.g. HEAR[***] (Higher Education Access Route) students. There were 19 responses to this question with two of these stating that this information was not recorded or that they had insufficient records to complete the question. A further respondent stated that the number of international students or students registered with a disability was not recorded. The limited information received for this question is given in Table 9.

status	number of institutions				
	0 – 10%	11 – 25%	26 – 50%	51 – 75%	76 – 100%
traditional	1	1	5	3	5
non-traditional	4	5	4	3	0
disability	6	2	0	0	1
international	5	2	0	0	0

Table 9: Status of MLS users by percentage bands within institutions (n=19).

One response did not give a breakdown of the student visitor profile but did state that mature students, though very small in number, made proportionally more use of the MLS provision. This pattern seemed evident in other institutions also. In one university and one IoT, non-traditional students accounted for about 60% of those seeking MLS. Five universities provided numerical data in response to this question, showing that the estimated proportion for traditional students ranged from 38% to 90% while the corresponding range for non-traditional students was 5 – 61%. Data from seven IoTs showed that the estimated proportions for traditional and non-traditional students ranged from 41 – 80% and 20 – 59% respectively in those institutions. Overall, the survey results for student academic stage, discipline and status profile highlighted the diversity of the population requiring MLS in higher education.

3.4.3 Common areas of mathematical difficulty

MLS providers were asked to list what they believed to be the three most common mathematical (or statistical) topics students availing of MLS have difficulties with. There were 23 responses to this question and Figure 26 presents the frequency with which certain topics were mentioned.

[***] HEAR students are students who have recently sat the Leaving Certificate in a RoI secondary school, are aged under 23 years, resident in the RoI and have been assessed as being socio-economically disadvantaged due to financial and socio-cultural factors. Approximately half of HEAR students gain entry to higher education institutions with lower Leaving Certificate grades than traditional students.

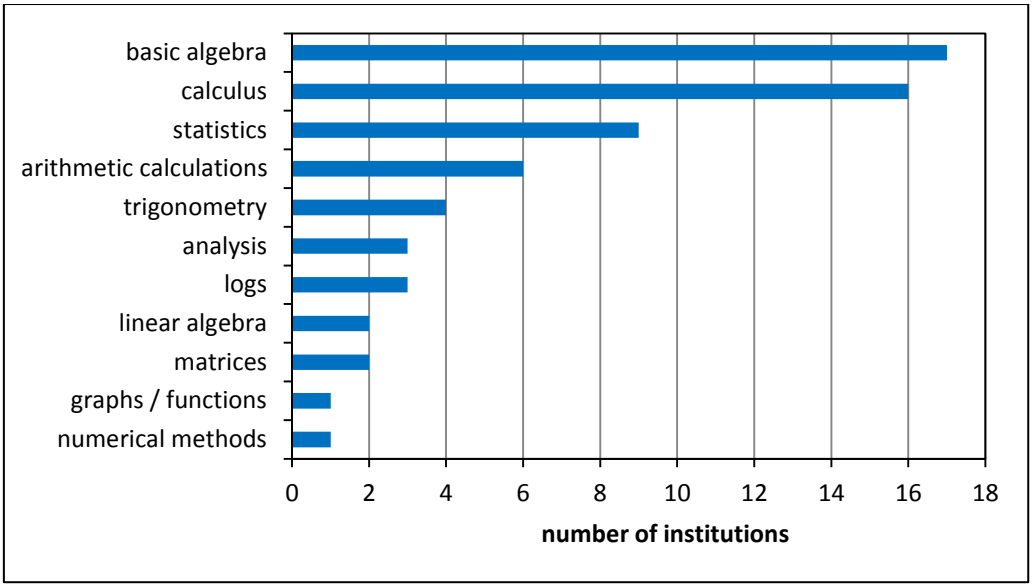

Figure 26: Count of common mathematical difficulties identified by MLS providers (n=23).

Basic algebra and calculus stood out as the main topics causing difficulty. In particular, manipulation of formulae was mentioned by seven respondents. Problem topics grouped under "statistics" included probability, hypothesis testing and linear regression. Three respondents specifically referred to fractions – this topic is included within "arithmetic calculations". Some more general sources of difficulty were suggested including a lack of confidence to interpret questions appropriately, an inability to apply mathematics, and an unwillingness to learn a new topic where there was a lack of understanding from previous encounters at secondary level.

3.4.4 Uptake of support

Respondents were asked to rate in order of popularity what forms of MLS were most frequently used by students; this was a free-response question and at most five answers were requested.

Figure 27 confirms that one-to-one support was most popular, by far, being the top choice for students in 14 institutions. Small group tutorials and online resources were rated, by respondents, as being of similar popularity among students. Less popular, but registering as second or third choices at about one fifth of the institutions, were worksheets on problematic topics and supplementary workshops. It is noted that not all of these types of MLS were offered in all institutions.

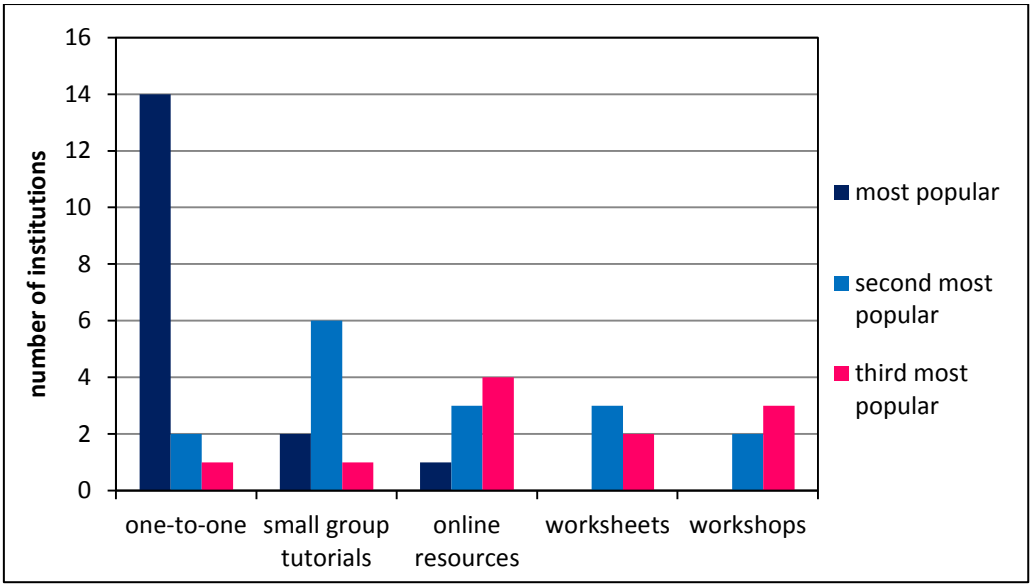

Figure 27: Forms of MLS most frequently used by students (n=23).

Respondents were also asked to state, in their opinion, what aspects of their MLS provision were most effective for student learning and whether they had any evidence for this opinion. Nineteen responses were received with the vast majority (84%) based on opinion. Three responses cited evidence but did not elaborate in any detail – one university respondent stated that data analysis showed that one-to-one drop-in was most effective, followed by group sessions; another university respondent stated that one-to-one MLS was most effective with feedback suggesting students have benefitted greatly from it; an IoT respondent stated that small group tuition worked best, as confirmed by student feedback. Among the opinion-based responses, there was a strong indication (11 out of 16 responses) that one-to-one support was best since it can be adapted to an individual student's needs, the work can be done at the student's pace with a focus on understanding, and it is easy to obtain clarification of any issues. Two responses specifically mentioned the open, approachable and friendly nature of the support as being of importance. One commented that drop-in support had been poorly attended and that students seemed to value the guaranteed one-on-one contact time with a tutor that comes with an appointment-based system. Small groups were thought by some to be most effective – one noted anecdotal evidence of peer group learning which occurred informally in the drop-in centre while another said that students were more likely to attend for MLS if a friend was also attending. Students actively working on practice questions and getting feedback was also suggested as an effective learning strategy. Another respondent claimed that handing in and receiving feedback on practice problem sheets coupled with a follow-up session based on this feedback was the most effective form of MLS in their institution.

The durations of student visits for MLS were investigated and the results, mainly anecdotal (13 from 21 responses), are presented in Figure 28.

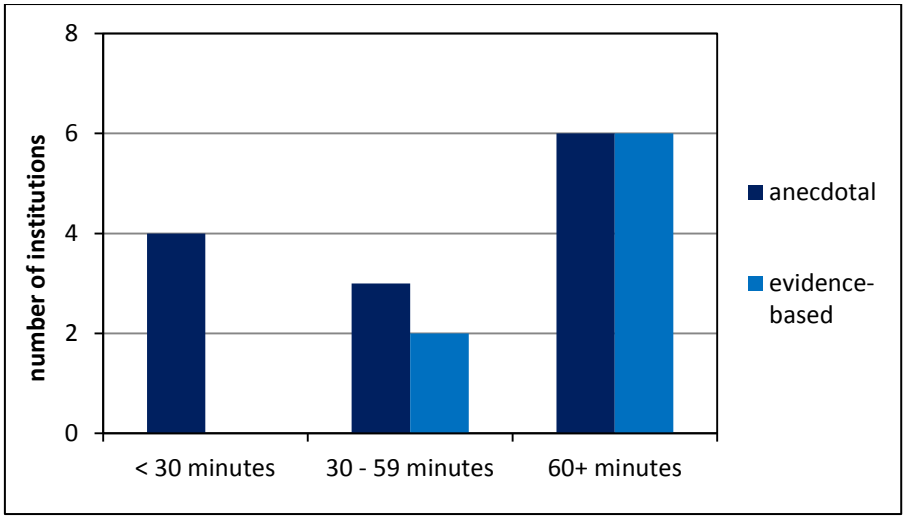

Figure 28: Average duration of a student visit (n=21).

This data emphasises the time-consuming nature of MLS with each visit lasting at least an hour, on average, in most institutions. Interestingly, one respondent stated that they have evidence that visits of a statistical nature take 20% longer, on average, than mathematical queries. One reported that students often stayed for between two and three hours. Another indicated that students in their institution were initially restricted to four one-hour sessions.

Respondents were asked an open question to describe how the number of student visitors to their MLS provision varied over the year. The key trends are listed in Table 10.

slow/busy times in MLS	**number of institutions**
slow to start	8
busy near mid-term exams / continuous assessment	9
busy end of semester	7
slow end of semester	2
busy near exam time	7
busy summer / resit exam time	2

Table 10: Trends of student engagement with MLS (n=20).

Eight centres stated that the attendance numbers were low at the beginning of the semester but two centres found it busy at this time due to visits from mature students. During the teaching period, busy times coincided with assessments and the approach to exams. One observed increasing attendance following mid-term assessment results and feedback while another mentioned a lull in attendance associated with assessments occurring in other subjects. Two respondents commented on busy times outside of the normal teaching

period. One centre offered a programme of specialised topics at Easter, which was popular, and also stated that the summer (four consecutive weeks of MLS) was very busy in the lead up to autumn exams. Another respondent referred to increased numbers in the summer due to resit exams and postgraduate dissertation queries (often related to statistics).

3.4.5 Feedback from students

MLS providers were asked if they sought feedback from their students. There were 25 responses which are presented in Figure 29.

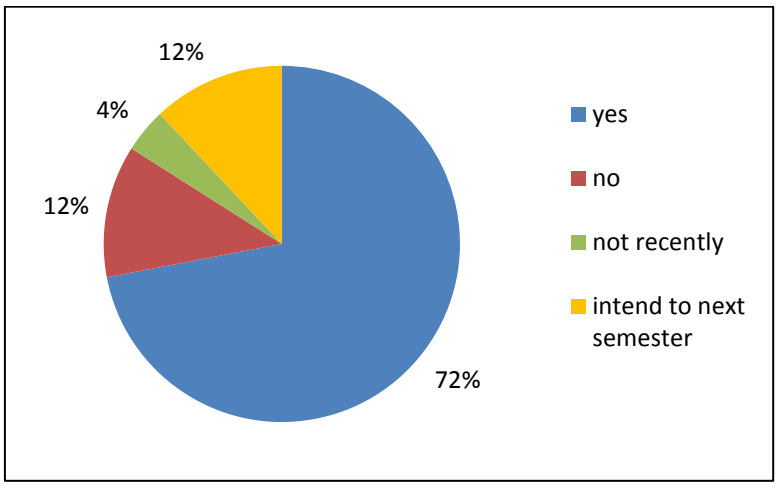

Figure 29: Feedback sought from students (n=25).

A large majority (72%) sought feedback from their students and some (12%) intended to do so. Those who requested feedback (or have done previously) were asked to detail how the feedback was obtained. The 18 responses, some indicating multiple methods of feedback, are displayed in Figure 30.

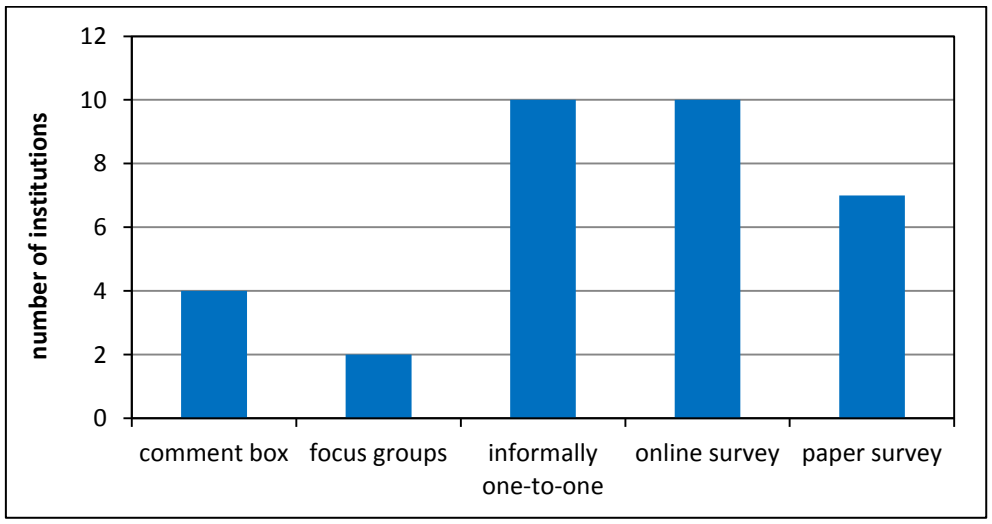

Figure 30: How student feedback on MLS visits was obtained (n=18).

3.5 Reporting and Evaluation of MLS Activities

This section presents the main findings for the questions relating to reporting and evaluation of the various MLS activities.

3.5.1 Reporting of MLS activities

Fourteen of the 25 institutions with MLS produced a regular report, generally annually (11 institutions), on their work (Figure 31). Ten did not produce a regular report although two of these indicated that they intended to do so.

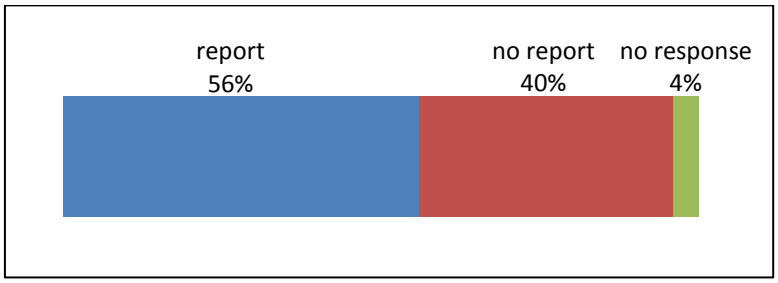

Figure 31: Production of a regular report on MLS activities (n=25).

Institutions commonly reported usage statistics including attendance or engagement with the various activities. About one third (36%) of those producing a report provided data on student grades; two respondents referred to a first-year numeracy test and diagnostic test. It was not always clear whether those reporting examination results or pass rates were referring to assessments conducted by the MLSCs or were providing analysis of how students who used MLS performed in their academic modules (or both). In two universities, the report contained student evaluations of the MLS services. Three universities, in addition to reporting on the operation and activities of the MLSC, stated that they analysed their MLS provision – this analysis referred to usage patterns, student evaluations and student grades. One university benchmarked its MLSC against others both nationally and internationally.

Where a report was produced, it was sent to institutional management in ten cases (71%). In three cases, the report was made available to all staff, typically through the institution's website. In two cases, the access office received a report while there were two instances of the report being distributed to heads of relevant departments. One respondent stated that the report was disseminated only internally within the mathematics department. In two institutions – a university and an IoT – reporting specifically to students occurred in addition to reporting to staff; in one case, summary statistics were included in the student handbook and undergraduate prospectus while the other institution informed students of the outcomes of the student evaluation and impact on grades.

3.5.2 Publication of MLS research or evaluation

Within the institutions providing MLS, a relatively large minority (36%) of survey participants or their predecessors have been involved in publishing on this topic (Figure 32). Those with prior publications were split almost equally between universities (four) and IoTs (five).

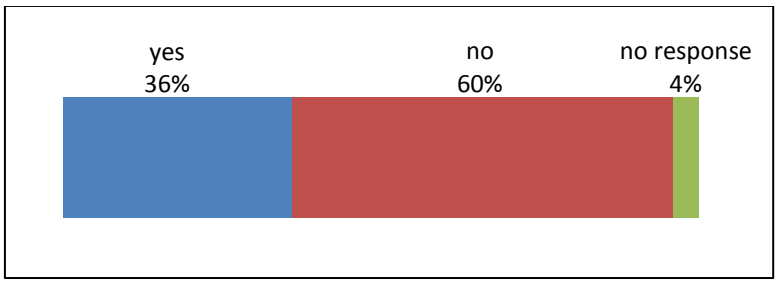

Figure 32: Involvement in publishing papers on the topic of MLS (n=25).

3.5.3 Independent evaluation of MLS

Around one third of survey participants (32%) stated that their MLS service had been independently evaluated (Figure 33). This group included universities (three), IoTs (three), a CELA and a CFHE and, in most cases (seven out of eight), MLS had commenced before 2006. Thus, while independent evaluation has been conducted in a variety of institutional types, most institutions represented in the survey had not so benefited.

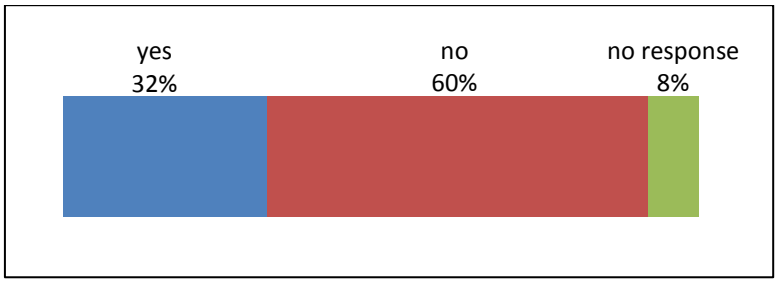

Figure 33: Independent evaluation of MLS service, either internally or externally (n=25).

3.5.4 MLS and lecturing staff

A key group of external stakeholders for MLS consists of the institution's lecturers. The survey indicated that, not only was there a very high level of awareness by lecturers of MLS provision, but that connections were strong. This was evidenced by the fact that in 88% of institutions lecturers could refer students for support on particular topics (Figure 34). It is noted that these results represent the opinions of the MLS staff who responded to the survey rather than the views of the lecturers themselves.

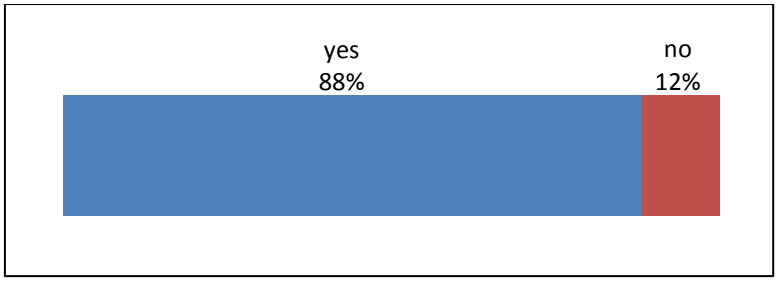

Figure 34: Lecturer able to refer a student to MLS for support on a specific topic (n=25).

Furthermore, there was a widespread belief on the part of the MLS staff who took this survey that lecturers were very supportive of the MLS provision with 80% of respondents either agreeing or agreeing strongly with this sentiment (Figure 35). In only two institutions – both universities – did the MLS provider disagree that lecturers were very supportive. Of the three who were neutral on this topic, two represented universities.

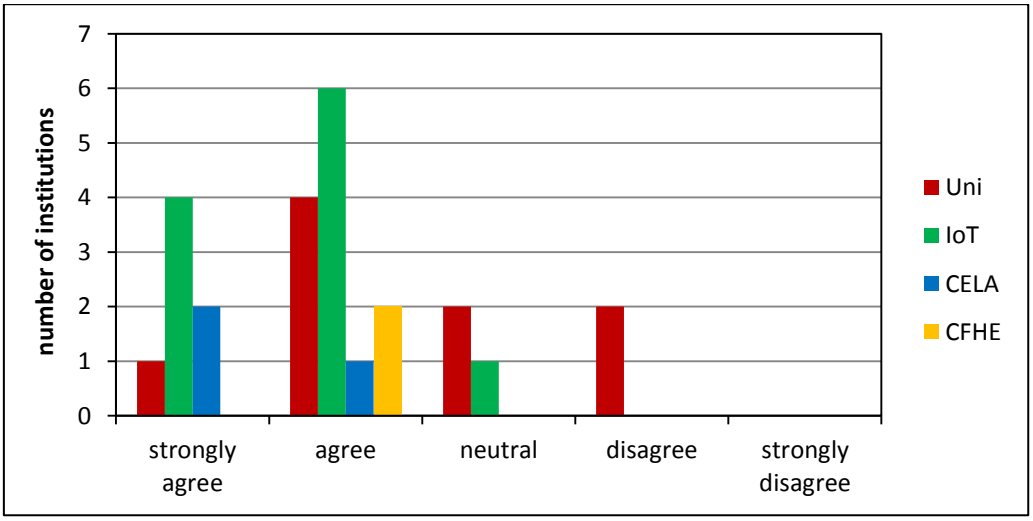

Figure 35: Responses when asked whether subject lecturers in the institution were very supportive of the MLS provision (n=25).

There was evidence of subject lecturers being influenced by MLS in some institutions. While ten of the 20 respondents to this question were unaware of lecturers having adjusted their practice due to the existence of MLS, and another stating emphatically that this had not happened, seven (three from universities and four from IoTs) could report examples of lecturers making positive changes. Comments from all seven institutions are summarised below:

- One lecturer gave formative feedback on homework following observations by MLS staff that students did not understand why they were losing marks. Another lecturer spent extra time on a particular topic after hearing that large numbers of students attended the MLSC for help with it. [university]

- A series of low-stakes assessments has been included by one lecturer. (In this institution, the staff providing MLS are mainly subject lecturers; therefore they have a particularly valuable insight into the student learning experience.) More generally, lecturers have been adjusting their practice due to the influence of the institution's student engagement and retention initiative with which the MLSC is linked. [IoT]
- Hot topic feedback from the MLSC has been used by "many" lecturers to identify topics to recap in lecture time. "Some" have changed the structure of their module's delivery as a result of consulting MLSC feedback. [university]
- When giving feedback on assessment, or in response to evidence of students' low self-efficacy, attendance at MLS is recommended by maths lecturers. [IoT]
- Contact details for MLS have been put on module webpages by "a lot" of lecturers. [IoT]
- Attendance at the MLSC has been factored into continuous assessment to encourage students to partake of MLS. [IoT]
- One lecturer advises students to view the MLS website and resources. [university]

In another of the MLSCs, a report was returned to course coordinators who then informed the lecturer to adjust the lesson to suit the needs of the students. Thus, there was a closed loop involving the lecturer, student and MLSC; however, it was not yet clear how lecturers responded to the feedback.

In another institution, lecturers directed students to MLS for a crash course on matrices, rather than change first-year module content, following a change in school leaving certificate syllabus. This approach does not seem to be in line with the main purpose of MLS provision.

3.6 Challenges and Developments

This section reports on the current challenges for MLS providers and looks forward to potential developments or improvements in matters related to MLS.

3.6.1 Key challenges

The survey asked participants to rank the challenges faced by their MLS service. Six potential challenges – reaching the non-engaging students, getting students to engage earlier, accessing the central student database, availing of good tutors, securing a suitable location, and funding shortages – were listed but the survey respondents had the option of adding other challenges.

The two challenges associated with a lack of student engagement were very clearly identified as being the most difficult with 19 of the 22 respondents ranking at least one of them amongst their two most difficult challenges (Table 11). Reaching the non-engaging students who need support was ranked most difficult by seven institutions and second most difficult by nine institutions. Ten of these 16 institutions had a MLSC, all but one had a drop-

in service and about half offered online support, suggesting that simply making services available and convenient was not enough to enable engagement with them. Getting students to engage earlier in the term was ranked most difficult by seven institutions and second most difficult by seven institutions. The problem of lack of engagement was faced by institutions of all types, including those in which MLS has been established for many years. In the small number of cases where lack of engagement was not ranked as a top challenge, there did not seem to be any unusual promotional efforts in place with MLS being highlighted to students through announcements in lectures or at induction activities, the institution website or by email. It is noted that student engagement was a challenge in these institutions also, just not the main challenge.

challenge	**number of institutions in which challenge is ranked**						
	most difficult	second most difficult	third most difficult	fourth most difficult	fifth most difficult	sixth most difficult	seventh most difficult
reaching non-engaging students	7	9	3		1		
getting students to engage earlier	7	7	4	3			
funding shortages	2	5	2	3	2	1	
availability of good tutors	2	2	4	4	3		1
location	1		3	3		6	
access to central student database				5	5	2	
lack of dedicated manager role	1						
good statistics tutors					1		

Table 11: Challenges facing MLS provision ranked in order of difficulty (n=22).

Across all of the respondents, the third most difficult challenge was funding; it was ranked most difficult and second most difficult challenge by two and five institutions respectively (two universities, three IoTs, one CELA and one CFHE). This was closely followed by the challenge of having good tutors available throughout the year; this was the top challenge for two universities and the second most difficult challenge for two other universities.

Location was the main challenge for just one institution (a university); this respondent believed that moving MLS from a student guidance centre to the main library would be beneficial. Reaching the non-engagers was also a key challenge at this institution and the respondent seemed to consider the two issues being linked to some extent. Accessing the

student database was not a concern for most institutions and never rated highly as a challenge.

Apart from the six challenges provided in the survey, only three other challenges were offered by participants. In one institution, the lack of a dedicated manager for MLS was deemed to be the top challenge while another referred to the difficulty in obtaining good tutors in statistics. Another respondent stated the difficulty in encouraging students to take up MLS following their compulsory numeracy test in first year.

3.6.2 Funding of MLS

The survey included some additional questions on funding since this was anticipated to be a topic of concern for most. Figure 36 presents the primary sources of funding for MLS.

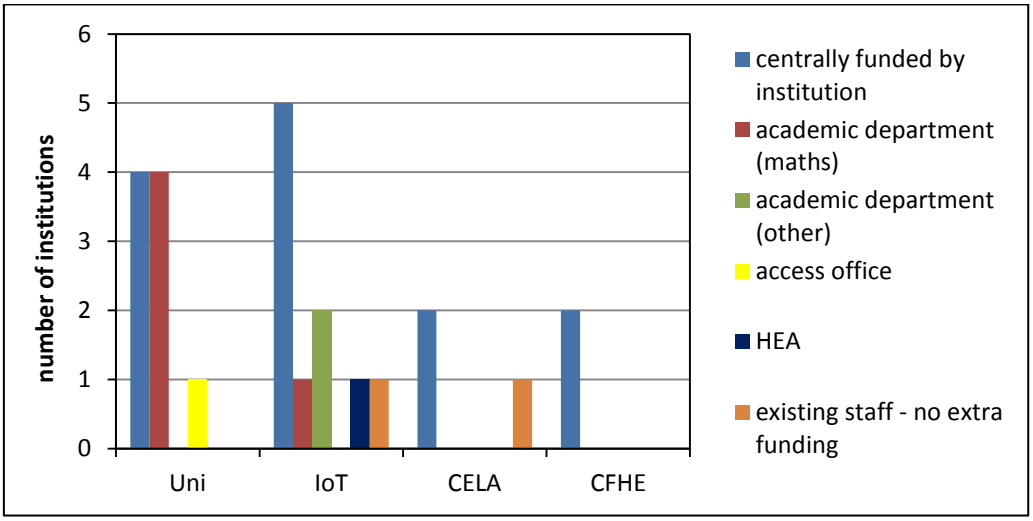

Figure 36: Primary sources of funding for MLS (n=24).

In just over half (54%) of the institutions, funding was provided centrally while academic departments were responsible for funding in 29% of cases.

Figure 37 indicates that 60% of MLS providers believed that their service was adequately funded.

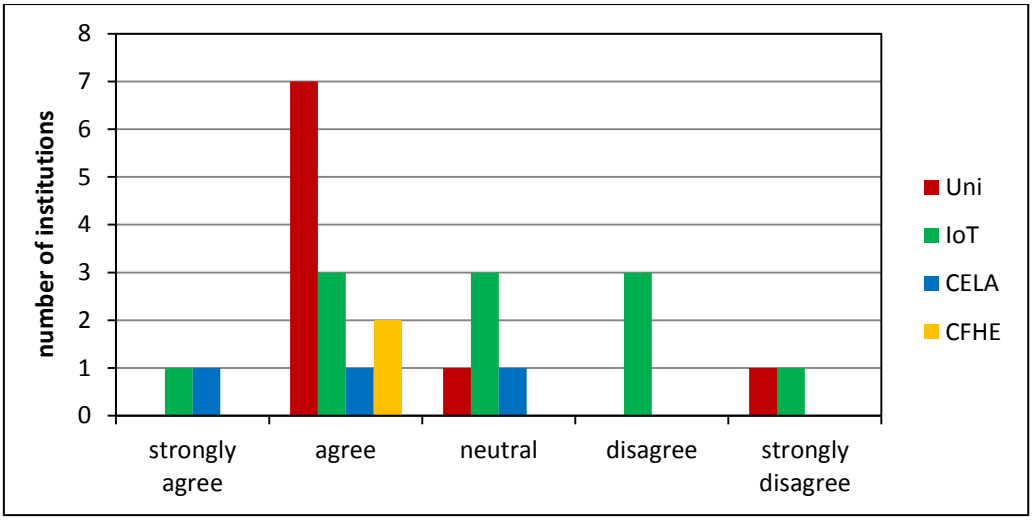

Figure 37: Responses when asked whether the institution's MLS provision was adequately funded (n=25).

Five respondents (20%), representing one university and four IoTs, either disagreed or disagreed strongly with that statement. One explained how, due to recent resource constraints, the number of available hours of MLS was halved, exam revision workshops were discontinued and all MLS provided was restricted to afternoons; this had a damaging effect with students seeing the service as inadequate. The data did not suggest that IoT staff in general disagreed that their MLS provision was adequately funded – another four IoT respondents were of the opposite opinion.

3.6.3 Suggestions for development and improvement

In a free-response question, the survey participants were asked to outline how they would like to see their MLS provision developed or improved should unlimited funding exist. A total of 77 suggestions were made by 23 respondents. These have been grouped into themes and are listed in Table 12.

The most common desire, expressed by nine respondents (39%), was to have longer opening hours. The most common themes were location/space and support/materials with 19 suggestions in each. In particular, four respondents proposed a dedicated space for MLS and four mentioned having a larger space. Location was important with three respondents indicating a preference for a drop-in service close to or in the library. Dedicated MLSCs for statistics and engineering maths were suggested by a university and CFHE respectively. Many suggested developing or establishing new methods of MLS. For example, four respondents proposed expanding their provision of specialised workshops. Some would improve their MLS materials through mathematics software on dedicated computers, for example. Two respondents expressed a desire to encourage more peer-to-peer support.

theme	specific suggestion	number of institutions
location and space	Dedicated space	4
	Larger space	4
	Better furniture/facilities	3
	Better location	2
	Relocate close to library	2
	Relocate to library	1
	Develop drop-in centre	1
	Dedicated centre for statistics support	1
	Dedicated centre for engineering maths	1
support and materials	Provide specialised workshops	4
	Encourage more peer-to-peer learning	2
	Improve online support	2
	Develop supports	2
	More books	2
	Laptops and mathematics software	2
	Computer-aided system for MLS	1
	Interactive whiteboards	1
	Establish drop-in centre	1
	Extra drop-in centre	1
	Academic advising	1
tutors	More	6
	Contract	3
	Permanent	1
	Training	1
	For statistics support	1
administrative structure	Dedicated manager	3
	Dedicated administrator / retention officer	2
	Oversight committee / coordination	2
	Identify and track students who would benefit from MLS	2
	Guaranteed multi-annual budget for planning ahead	1
	Incremental pay scale	1
hours	More hours of MLS	9
recruitment of students needing MLS	Employ student ambassadors	2
	Reach more students	1
outreach	Develop MLS service for secondary-level students	1
	MLS open to the public	1
	Develop modules in mathematics education	1
other	Develop students' transferable skills	1

Table 12: Frequency table of suggestions for development or improvement of MLS provision (n=23).

The third most popular category of suggestions related to tutors. Indeed, the need for more tutors was the second most common specific suggestion, made by six respondents (26%), while an improvement in contracts for tutors was referred to by three respondents.

Eleven suggestions related to the administrative operation of MLS. There were five references to having a dedicated manager or administrator while two respondents would like to invest in identifying and tracking students who would benefit from MLS. One respondent stressed the importance of a budget guaranteed for some years in advance to enable better planning of MLS provision.

Three suggestions related to extending MLS beyond the institution's typical customers. One respondent wanted to improve the drop-in service offered to secondary-school pupils. Another proposed offering MLS to the public more generally, including providing short courses to parents of GCSE pupils (mathematics is a mandatory subject at GCSE level, age 14 – 16, in NI). A further suggestion involved developing modules in mathematics education for incorporation into teacher-training courses.

Finally, through a free-response question, the survey sought participants' views on how the IMLSN could help them. Seventeen responses containing 22 suggestions were received and these have been collated into four themes (Table 13).

theme	specific comment	number of institutions
reporting and disseminating best practice	Information on best practice is useful	2
	Reports help strengthen the case for additional resources	2
	Surveys and reports help to improve local MLS provision	1
	Provide evidence that MLS makes a difference for students	1
developing and sharing resources	Development of materials / innovative resources	2
	Sharing resources	2
	Development of a competitive maths game	1
sharing experiences	Sharing experiences	4
	Opportunities to collaborate	1
	Information on funding sources	1
promotional activities	Raising profile of MLS and MLSCs	2
	Lobbying institutions	1
	Lobbying government	1
	Emphasising importance of funding	1

Table 13: Frequency table of comments on how the IMLSN could help institutions' MLS service (n=17).

Reporting and disseminating best practice was noted by six respondents (from one university and five IoTs). This was appreciated, not just in terms of improving an institution's MLS provision, but also helping strengthen the case for increased resources, as illustrated by the following comments from the survey.

"The surveys and reports [the IMLSN] produces are very useful as a backdrop for trying to improve the local MLS provision."

"The recent MLS report and its results will be useful in arguing a case for more resources."

"Provide evidence that MLS makes a difference without undermining learning outcomes."

Five respondents (from one university, three IoTs and one CFHE) desired the development and sharing of resources for MLS. A total of six comments on the topic of sharing experiences were listed by four respondents (one university, two IoTs and one CELA). One referred to "opportunities to collaborate in generating shared, national data", another suggested integrating more fully with the IMLSN "to avail of the collective expertise and support already available there" while another reported having previously received support through being assigned a mentor from the IMLSN. Three respondents, all from universities, made a total of five comments relating to a promotional function for the IMLSN – raising the profile of MLS, lobbying institutions and governments and emphasising the importance of funding.

Further to the 17 responses described above, one stated that the IMLSN could do nothing in addition to what it is already doing. Another, in response to whether the IMLSN could help with regard to the challenges facing the MLS service, stated that "most of the issues are down to the students themselves" and that "non-engagement is difficult to combat". Finally, another two respondents (both from CELAs) were "not sure" of how the IMLSN could help; one of these reported being from a very small institution with specific procedures in place which seemed to be working.

4. Comparison with other Audits

4.1 Comparison of the 2008 and 2015 Ireland Audits

This section compares the key findings of the 2008 and 2015 Ireland audits in an attempt to provide a synopsis of the changes in MLS provision over this period. For the 2008 audit, universities, IoTs and CELAs in the RoI were invited to supply a report on their MLS provision by commenting with regard to certain specified attributes including services provided, staffing, resources, record keeping, challenges and lessons learned [6]. The scope of the 2015 audit was extended to cover institutions in NI also. Given the differences in methodologies and reporting styles of the two audits, it is not possible to provide a definitive comparison but rather an insight into the development of MLS.

The extent of the growth in MLS at higher education institutions (HEIs) since 2008 is the first most notable change. In 2008, 13 institutions submitted a report on their MLS provision; universities (four) and IoTs (eight) represented 92% of this total. By 2015, the number of institutions in the RoI known to offer MLS had increased by about 50% to 20 with 90% of these being universities (seven) and IoTs (11). One of the IoTs that reported MLS activities in 2008 no longer offered MLS by 2015. Table 14 compares the MLS provision for 2008 and 2015 as a percentage of the number of institutions offering MLS in that year and this is followed by a brief discussion under several headings.

4.1.1 Permanence of MLS

In 2008, there were ten MLSCs, some of which operated as part of a broader learning support unit. Of these ten, only four (40%) were permanent. Table 14 indicates a similar proportion of permanent MLSCs in 2015. However, extracting the data for the RoI to enable a more realistic comparison shows that, while the number of MLSCs in the RoI had increased to 13 in 2015, the number of permanent MLSCs had increased only slightly from four to five since 2008. Therefore, the lack of stability of MLS provision remained an issue. It is interesting to note that in 38% of institutions in 2008, MLS was funded primarily from an external source (Higher Education Authority Information Technology Investment Fund, SIF), which in many cases guaranteed the funding for five years, yet by 2015 MLS was funded by external sources in only 4% of institutions. It is reasonable to conclude that, by 2015, the majority of institutions viewed MLS as an essential component in the teaching and learning of mathematics and were thus willing to fund this service (88%). In light of this, it is of concern that most MLSCs in 2015 were not permanent.

characteristic of MLS provision	2008 (n=13)	2015 (n=25)
MLS provided through a MLSC	77%	64%
MLSC is permanent	40%	44%
funded mainly from various sources within institution	54%	88%
funded mainly from external sources	38%	4%
no additional funding	8%	8%
MLS available for all students	54%	72%
opening hours: up to 10 hours per week	38%	36%
opening hours: 11 – 20 hours per week	31%	28%
opening hours: > 20 hours per week	31%	28%
drop-in service available	77%	88%
online MLS available	69%	48%
attendance/usage records maintained	85%	80%
MLS provided by institutional lecturing staff	54%	72%
MLS provided by postgraduate students	46%	48%
tutor training programme in place	15%	44%
rated as a main challenge[†††]: more timely engagement by students	69%	82%
rated as a main challenge: funding	46%	41%
rated as a main challenge: securing suitable tutors	46%	36%

Table 14: Comparison of MLS provision in Ireland in 2008 (n=13) and 2015 (n=25).

4.1.2 Nature and extent of MLS

Comparison of the audits shows that MLS became more widely available, not just in terms of the number of institutions providing it but also in the number of MLS services offered by institutions. There was a considerable increase, from 54% to 72%, in the proportion of institutions making MLS available to all students registered to that institution. The distribution of opening hours was largely unchanged since 2008 – a wide variety in practice continued. The drop-in service was very common in 2008 (77% of institutions) but has become even more so; it was the predominant form of MLS in 2015, being available in 88% of institutions. The number of institutions offering online MLS grew slightly from nine in 2008 to 12 in 2015 but the proportion of institutions offering this type of MLS decreased. It is worth noting that the forms of online MLS have not changed considerably over the years; links to websites, a dedicated website or VLE and revision notes were prevalent in both 2008 and 2015. Use of mathematical software seems to have declined; four of the nine respondents referred to packages such as CALMAT or Maple in 2008 but only three of the 12 institutions with online MLS in 2015 listed commercial software. In contrast, there was a

[†††] For the purpose of this comparison, a challenge ranked by an institution among its top three most difficult challenges in the 2015 audit was said to be a "main" challenge. The 2008 audit had a free-response format so any challenges listed were taken to be "main" challenges.

marked increase in the use of video tutorials from one institution in 2008 to eight institutions in 2015.

4.1.3 Staffing of MLS

There was a big increase in the percentage of institutions that sourced at least some of their MLS tutors from full-time institutional staff, rising from 54% in 2008 to 72% in 2015. This is largely due to the 2015 survey including the universities and CFHEs in NI, all of which relied to some extent on institutional staff to provide MLS, but the statistics indicated small increases in the proportions of universities and IoTs in the RoI using their full-time staff to contribute to MLS. The proportion of institutions using postgraduate students to provide MLS was almost identical in 2008 and 2015. Although the current report expresses concern at the lack of tutor training in 2015 (a training programme existed in 44% of institutions with MLS), there has been a substantial improvement since 2008 when only 15% of institutions had a training programme.

4.1.4 Challenges faced

Finally, it is worth noting that the list of challenges expressed in both audits has not changed greatly. Getting students to engage with MLS in a more timely fashion was a key challenge in 2008 but this problem was even more widespread in 2015. Challenges associated with funding continued to be a concern in just over 40% of institutions. The proportion of respondents rating the recruitment of suitable tutors as a main challenge dropped slightly from 46% in 2008 to 36% in 2015.

4.2 Comparison of the 2012 UK and 2015 Ireland Audits

It is of interest to compare the results of this Ireland audit to the most recently published UK MLS survey of 2012 [4], which also included the universities in NI. (In February 2016, **sigma** conducted an online survey consisting of 23 questions on the delivery and management of mathematics and statistics support within the UK but the results have not yet been published.) The 2012 UK survey consisted of three questions distributed via email to 119 universities in England, Scotland, Wales and NI and 103 responses were received. It is noted that the UK survey included only universities so any comparison is hence limited. The first question asked whether MLS existed at the particular institution and requested details such as location, hours available, who can access the support and usage statistics. The second question asked whether publication of papers (internally or externally) evaluating or describing the MLS provision had occurred. A third question asked whether engineering education support was provided and how it was funded. The results of the first two questions have been reported and some of the UK figures presented here were obtained by analysing the data in the report [4] and an associated article [9].

MLS existed at 88 of the 103 universities (85%) that responded to the UK survey in 2012. Thus, there has been steady growth in MLS provision in the UK from 48% of institutions in

2000 (n=95) to 65% of institutions in 2004 (n=101) to the current level. Ireland has also experienced a large expansion in MLS provision over the last decade and the extent in 2015 (83% of institutions surveyed) was similar to the UK proportion.

4.2.1 Nature and extent of MLS

The most common form of MLS in Ireland in 2015 was the drop-in service, available in 88% of institutions with MLS. Similarly, drop-in MLS was the mainstay of UK provision, offered in 84% of universities with MLS. It is interesting to note that other forms of MLS seem to have been relatively rare in the UK. The data suggested that an appointment-based service was available in only 6% of UK universities while other types of MLS (such as additional support for modules with mathematical content or optional support classes) occurred in 8% of UK universities. These figures are much lower than the corresponding figures for appointments and workshops in Ireland (44% and 64% respectively).

In the UK, MLS provision was deemed "highly visible", defined as being staffed for at least ten hours a week and maintaining a dedicated webpage giving information about MLS, at 34% of universities that provide MLS [4]. In 2015 in Ireland, 56% of institutions with MLS provision offered at least ten hours a week of MLS and 36% referred to a dedicated webpage (although the actual number could be higher since the survey did not specifically ask about this). Thus, at least 24% of institutions in Ireland met the definition of having highly visible MLS provision. However, it was not clear how many UK universities offered at least ten hours a week of MLS but did not also have a webpage (and vice versa) making a direct comparison with the results of the Ireland survey difficult. It was also reported that MLS was available only for first-year undergraduates in some institutions in the UK whereas it was available for all students and staff in others, but no statistics were given.

4.2.2 Staffing of MLS

Interestingly, for those UK universities that offered a drop-in service, in 64 cases (73% of universities with MLS) it was provided by institutional staff only (this means lecturers, full-time staff and hourly-paid staff, but not hourly-paid postgraduates). In another ten universities (11%), the drop-in service was provided by students only – mainly postgraduates but occasionally undergraduates. It was not clear whether staff or students delivered the other forms of MLS. In Ireland, a similar proportion of institutions (72%) provided MLS through institutional staff but the proportion that employed postgraduate students to provide MLS was much higher (48%). Note that many institutions in Ireland used a combination of institutional staff and postgraduates to provide MLS.

Finally, 31% of MLS providers in the UK have produced external publications in the area of MLS; this was very similar to the Ireland figure of 36%. Table 15 displays some of the key statistics described above.

characteristic of MLS provision	UK 2012 (n=88)	Ireland 2015 (n=25)
drop-in service available	84%	88%
appointments available	6%	44%
other forms of MLS / workshops	8%	64%
highly visible	34%	at least 24%
MLS provided by institutional staff‡‡‡	86%	72%
MLS provided by postgraduate students‡‡‡	14%	48%
publications on MLS topics	31%	36%

Table 15: Comparison of MLS provision in the UK in 2012 (n=88) and Ireland in 2015 (n=25).

4.3 Comparison of the 2007 Australia and 2015 Ireland Audits

Before comparing the outcomes of this comprehensive audit of MLS in Ireland with the most recent results from a study based in Australia [10, 11], it is important to note three caveats. Firstly, the Australian study was carried out in 2007, eight years prior to this audit. Secondly, it was targeted solely on the Australian university sector and did not include the technical and further education (TAFE) sector of Australia's higher education provision. This TAFE sector has 42 colleges focussed on vocational higher education and some of these colleges are labelled as IoTs. Finally, the Australian report did not request the same level of detail as performed in the Ireland survey. Despite these caveats, it is interesting to compare some aspects of the Australian report with this report.

The Australian study was based on a web search and telephone enquiries which indicated that 32 of the 39 universities in Australia provided some form of MLS (or MSLS – mathematics and statistics learning support – as it was described in the report). This was followed by an extensive written survey sent by email to these 32 universities; 16 responses (50%) were received.

4.3.1 Existence of MLS

The rates of MLS were similar with 82% of the Australian universities providing MLS and 83% in Ireland. In Australia, funding was generally from central sources (50% of institutions) or the mathematics department (29%) with a small number of cases receiving access or special government funding. There was a similar situation in Ireland with MLS funded centrally in 54% of institutions and by the mathematics department in 21% of cases.

‡‡‡ UK data refers to drop-in service only.

4.3.2 Nature of MLS

Locations of MLS facilities in Australia were split almost equally between mathematics departments (44%) and central (41%) locations. Multiple locations were used in the remaining universities. This contrasted with the picture in Ireland where a central or neutral environment for MLS existed in 61% of institutions. As with Ireland, there was a wide variety in the amount of MLS available; for example, drop-in opening hours ranged from five to 45 hours per week in Australia. The most common form of MLS in Australia was drop-in (72% of universities) but less than half of universities offered workshops (41%) and appointments (38%). The relative popularity of these forms of MLS was the same as in Ireland but provision was more widespread in Ireland. However, the time lag of eight years between the two audits needs to be taken into account.

4.3.3 Students

In Australia, only 9% of universities allowed universal student access to MLS, 66% allowed access to undergraduates only and 6% to postgraduate research students only. This appears to differ significantly to the profile in Ireland where 72% of institutions allowed all students to avail of support. However, the ambiguity in the response "all students" in the Ireland survey has already been noted (section 3.1.3). Interestingly, both reports considered it worthwhile to comment on a salient particular demand for statistics support from postgraduate students.

Unsurprisingly, engineering was the most prominent discipline of MLS users in both regions. Science and business students were the second and third most common users of MLS in Ireland and these disciplines had the equal second highest frequency of MLS in Australia. Table 16 lists some of the key statistics discussed above.

characteristic of MLS provision	**Australia 2007 (n=32)**	**Ireland 2015 (n=25)**
funded centrally	50%	54%
funded by the maths department	29%	21%
located centrally	41%	61%
located in the maths department	44%	30%
drop-in service available	72%	88%
appointments available	38%	44%
workshops available	41%	64%

Table 16: Comparison of MLS provision in Australia in 2007 (n=32) and Ireland in 2015 (n=25).

4.3.4 Challenges and recommendations

The commentary and analysis based on the responses to the written survey sent to the Australian universities were mainly qualitative. Some of the more interesting comments were: "More than half the facilities do not have a full-time person employed in MLS" and "all but two [from the 16 responses] depend on part-time, sessional and/or unpaid staffing". The fact that these comments were made in 2007 and that for Ireland in 2015 only nine of the 25 institutions had a full-time manager for MLS highlights the relatively insecure footing of MLS in higher education in Ireland in 2015. This shortcoming for the Ireland context is further accentuated by the remark in the Australia report that "13 from the 16 responses describe their facility as permanent or long term" whereas in Ireland only 44% of MLSCs enjoyed this confidence. Confidence in endurance is vital for MLS to develop into a resource to enhance students' educational experience and improve student retention.

Four of the main challenges cited in the Ireland report (section 3.6.1) overlapped closely with the concluding commentary in the Australia report. These related to the issues of suitability of location, quality of tutoring, funding and data collection and analysis. However, it is noteworthy that the Australia report made little mention of the issues of student engagement which were a main concern for MLS providers in Ireland.

4.4 Summary International Comparison of MLS Provision

To conclude the comparison of the results of this audit with those of previous audits, some of the key indicators, which have been presented and discussed in sections 4.1 – 4.3, are collated and displayed again. Table 17 shows the extent of MLS provision as a percentage of the number of survey responses. Note that the Australia and UK surveys targeted universities only while the Ireland survey included a range of institution types.

Australia 2007 (n=39)	**UK 2012 (n=103)**	**Ireland 2015 (n=30)**
82%	85%	83%

Table 17: Percentage of institutions with MLS in Australia in 2007 (n=39), the UK in 2012 (n=103) and Ireland in 2015 (n=30).

Table 18 lists some of the features of MLS provision and the percentages are with respect to the number of institutions with MLS. Note that statistics for some aspects of MLS provision were not available in the Australia and UK reports.

characteristic of MLS provision	Australia 2007 (n=32)	UK 2012 (n=88)	Ireland 2015 (n=25)
funded centrally	50%		54%
funded by the maths department	29%		21%
located centrally	41%		61%
located in the maths department	44%		30%
drop-in service available	72%	84%	88%
appointments available	38%	6%	44%
other forms of MLS / workshops	41%	8%	64%
highly visible		34%	at least 24%
MLS provided by institutional staff[§§§]		86%	72%
MLS provided by postgraduate students[§§§]		14%	48%
publications on MLS topics		31%	36%

Table 18: Comparison of MLS provision in Australia in 2007 (n=32), the UK in 2012 (n=88) and Ireland in 2015 (n=25).

[§§§] UK data refers to drop-in service only.

5. Discussion of Research Findings and Recommendations

5.1 Effective Provision and Operation of MLS

Twenty-five of the 30 institutions (83%) that completed the survey stated that they offered MLS[****]. However, a wide variety of practices existed, especially in terms of the opening hours and the location and nature of the space assigned for MLS. Sixteen of the 25 institutions with MLS provided the support through a MLSC.

Despite clear evidence of the value of MLS, reiterated through the recent large-scale survey on student evaluation of MLS [12], and the increase in the number of institutions providing MLS, MLS remains not well established. Of the 16 MLSCs reported in this survey, only seven (44%) could be described as permanent (and one of these has closed since the survey was completed). It is recommended that the embedding of stable and sustainable MLS structures across all relevant HEIs should be a key objective. This reinforces the recommendations of the student evaluation report [12], one of which stated that evidence of the positive contribution of MLS in terms of student transition and retention should be widely disseminated to HEI authorities to highlight the benefit from a financial perspective. The IMLSN has endeavoured to influence policy makers by contributing in May 2016 to the Minister of Education's (RoI) "Call for Consultation on Statement of Strategy 2016-2018". The importance of establishing policy to develop permanent MLS structures was stated and the funding and staffing recommendations of the student evaluation report [12] (which were presented in 2015 to the Houses of the Oireachtas (Parliament and Senate)) were submitted.

Institutions without a MLSC are to be commended for the informal MLS they provide via a drop-in hour at lunchtime or through tutorials or peer support. However, given the widely reported benefits of MLS [13] in terms of students' academic performance, retention and mathematical confidence, it is recommended that each institution sets up a MLSC (as appropriate, according to the nature of the particular institution) to encourage the permanence of MLS and provide a focal point and identity for this service. This reiterates one of the recommendations of the student evaluation report [12] which stated that MLS should be embedded as a permanent fixture in every HEI and should be properly resourced to ensure the best mathematical experience for all students. It also concurs with established advice that MLS "needs to become embedded in the culture of the [institution]" [14] to encourage uptake of support. Recent guidelines for the oversight of MLS further emphasise this point by stating that "mathematics support should be regarded as enhancement provision for all students rather than remedial work for weak students, and so should be of interest to those responsible for enhancing quality in the institution including programme leaders, heads of departments, deans, pro-vice-chancellors, learning development managers, careers advisors and many others" [15].

[****] Since the survey was completed, one university has enforced a significant reduction in its mathematics provision and, as a result, it has ceased providing MLS. Interestingly, the survey respondent had described their MLSC as permanent.

Operational issues in the provision of MLS, such as location and opening hours, generated much data in the survey. For example, two thirds of MLSCs were located in a neutral environment such as a learning resource centre or library but the remaining MLSCs were based in mathematics departments. It would be interesting to consider whether students whose main course of study is not mathematics find such a location easily accessible. The survey responses suggested that, in addition to the centrality or accessibility of the location, the ability to operate from a building with longer opening hours was an important consideration in identifying a suitable location.

Opening hours for MLS varied greatly between institutions with over 30 hours of MLS available per week in 24% of institutions and at most five hours per week available in another 24% of institutions. In a small number of cases, MLS was not available until the second or third week of term. It might be sensible to reconsider this approach to ensure that new students who are struggling with the transition to higher or further education have immediate support. Some MLS providers should also consider the finding of the student evaluation report [12] that a large number of non-users of MLS (17%) indicated that more suitable opening hours would encourage them to avail of MLS; that report suggested that some adjustment of opening hours might be necessary to meet the needs of a significant number of students.

There was no consensus for offering MLS during exam time with 40% of institutions offering MLS and the others not during this time. It is accepted that there are reasons both for and against making MLS available at exam time. Some will want students to have the opportunity to avail of MLS whenever they need it, including when they are preparing for exams, while other institutions deliberately close the MLS service at exam time as they want to develop independent learners during term time and discourage a just-in-time approach to exams.

The issues relating to how MLS is managed and staffed are of crucial importance to the effective running of MLS. The survey data demonstrated very clearly how MLS opening hours were associated with the nature of the managerial role. In institutions where there was no manager specifically for MLS, or the responsibility was taken voluntarily, the available hours of support were generally very low. With only 36% of institutions (with MLS) having a full-time manager, the promotion, provision and development of MLS in many institutions may not be progressing as well as they might. In the summer of 2014, interviews with senior management at 23 English universities showed that they all recognised the vital role of MLS in students' satisfaction, retention, achievement and employability [16]. That investigation also highlighted the needs of the specialised staff working in MLS in terms of training and development. It is important that institutions respond to these needs; therefore, it is recommended that institutions recognise MLS as a priority and devote resources, including a dedicated manager/coordinator, to facilitate the provision of a service which can grow and adapt to meet student requirements. Again, this recommendation reinforces that of the student evaluation report [12] which emphasised that MLS should be properly resourced to ensure the best mathematical experience for all students.

Many of the students who attend MLS services already lack the necessary mathematical skills and confidence in their mathematical ability. Therefore, their initial experience of MLS must be positive, reassuring and confidence building. This aspect was highlighted in data from the student evaluation report [12] which noted that the quality of tutors was vital in students' experience of MLS. The data from the current audit would suggest that aspects of the selection process for tutors vary greatly across the sector. Therefore, it is recommended that the IMLSN facilitates the sharing of best practice in selection procedures for potential tutors.

The survey showed that training for tutors was provided in only 44% of institutions with MLS. It is of concern that tutor training was minimal or non-existent in many institutions. Based on this finding and the earlier student evaluation report [12], which recommended priority be given to bespoke training and development of all MLS staff to optimise the student experience, it is recommended that a thorough training programme should be provided for all MLS tutors based on best practice. It should be noted that the IMLSN has been working on the issue of tutor training for several years. To this end, the IMLSN has recently been involved in designing and providing a standardised training programme for MLS tutors through a SIG on tutor training. The SIG was established in 2014 with the aim of improving the quality of MLS provision through the enhancement of tutors' teaching and communication skills. Subsequently, a programme involving four workshops covering the mathematical background of students and diagnostic test data, listening, explaining and questioning skills, individual student needs, and non-mathematical skills such as counselling, was conducted across three universities in 2015 [17]. Furthermore, the annual workshop[††††] of the IMLSN in May 2016 focussed on the role of tutors of maths and statistics in post-secondary education [8].

The survey has also highlighted a significant reliance on undergraduate and postgraduate students as tutors and, thus, there is a lot of transience in the system. It is recommended that institutions and the IMLSN promote the role of a MLS tutor and explore the concept of longer-term contracts for tutors to ensure these positions are more secure. The establishment of a recognised professional qualification for tutors could also be considered and the possibility of MLS tutors gaining professional development badges for their tutoring is currently being discussed by the IMLSN. In August 2016, a university in the RoI advertised and successfully filled the position of MLSC University Tutor on a full-time medium-term (three-year) contract, the first position of this type in Ireland. In the UK in recent years, several staff involved in the delivery of MLS have been awarded National Teaching Fellowships. In Ireland in 2015, a member of the IMLSN received a National Forum Teaching Expert Award and two National Forum Teaching Hero Awards were given to a member of the IMLSN and an MLS tutor in 2016. The importance of acknowledging and supporting MLS tutors was given further weight by a recent **sigma** guide which stated that "those working in mathematics support should be afforded the same development and recognition opportunities as those undertaking more traditional forms of teaching" [15].

[††††] http://imlsn.own.ie/imlsn10nuigalway/

Recommendation 1
Given the widely reported benefits of MLS in terms of students' academic performance, retention and mathematical confidence, the embedding of stable and sustainable MLS structures across all relevant HEIs should be a key objective, and each institution should set up a MLSC (as appropriate, according to the nature of the particular institution) to encourage the permanence of MLS and provide a focal point and identity for this service.

Recommendation 2
Institutions should recognise MLS as a priority and devote resources, including a dedicated manager/coordinator, to facilitate the provision of a service which can grow and adapt to meet student requirements.

Recommendation 3
The IMLSN should facilitate the sharing of best practice in selection procedures for potential tutors.

Recommendation 4
A thorough training programme should be provided for all MLS tutors based on best practice to ensure that tuition is of the highest quality and to optimise the student experience of MLS.

Recommendation 5
Given the significant reliance on undergraduate and postgraduate students as tutors and the associated transience within MLS, institutions and the IMLSN should promote the role of a MLS tutor and explore the concept of longer-term contracts for tutors to ensure these positions are more secure.

5.2 Types of MLS Available

There have been many qualitative and quantitative investigations [13, 18-22] that strongly suggested MLS makes a significant difference to students who use it appropriately. However, these studies referred to MLS in general and did not commonly distinguish between specific services, e.g. one-to-one versus small group tuition or specialised workshops. The report on student evaluation of MLS [12] concluded that the quality of the one-to-one interaction in MLS provision is crucial. MLS providers in the current survey were largely of the opinion that one-to-one support was best since it can be adapted to an individual student's needs and pace, and it is easy to deal with queries. Two respondents to the survey specifically expressed a desire to facilitate more peer-to-peer learning. This points to the importance of MLS that is both effective and efficient given the time-consuming nature of individual visits.

The drop-in service was the most common form of MLS, being available in 88% of institutions with MLS. Workshops were available in 64% of institutions and an appointment service existed in 44% of institutions. Online MLS was offered in 48% of institutions. Given

the value of the face-to-face approach in building students' confidence [23] and developing a community of practice [24], it is noteworthy that all 25 institutions provided this type of support to some extent. Survey respondents generally considered face-to-face support to be more valuable although online MLS did not attract many negative comments. These views showed some alignment with the student evaluation investigation which found that 83% of students who used the drop-in service rated it as worthwhile while 56% of student users of ICT-enabled support considered it worthwhile [12]. However, only one form of face-to-face MLS existed in 32% of institutions. Five of the eight institutions in this group also did not offer online MLS. Therefore, only one form of MLS was available in 20% of institutions with MLS. While taking account of students' preferences for face-to-face support, and retaining face-to-face support at the core of MLS, it is recommended that MLS providers ensure that a variety of support methods is available for students so that the service is flexible, convenient and caters for the diverse needs and learning styles of students. This recommendation is consistent with established practice [14]. It is acknowledged that some MLS providers are working with limited resources and perhaps providing MLS voluntarily and so expanding MLS provision is not without challenges.

It is surprising that as many as 52% of MLS providers did not offer some form of online MLS given the prevalence of ICT tools in teaching and learning today. For instance, in a recent survey on the use of technology to enhance teaching and learning in higher education, over 60% of academic staff surveyed stated that they used a VLE at least once a day, with 88% making use of a VLE at least once a week [25]. While recognising that the use of a VLE can be very different to making effective use of ICT tools for enhanced learning, common perception suggests that, with the rapid development in software, application of online MLS should have advanced considerably in the last decade. Some of the most recent technological developments have not yet been adapted for MLS to any great extent. For example, despite the popularity of social media in general and some effort to apply it for MLS elsewhere [26], only one institution surveyed mentioned that they offered this form of support.

The survey indicated that many forms of MLS workshops existed and it would be useful to identify best practice bearing in mind that MLS is intended to be supplementary to, and not a replacement for, a programme of lectures and tutorials. It is recommended that research should be conducted to identify best practice for the effective running of, and promotion of student engagement with workshops to ensure that the student learning experience is optimised.

Recommendation 6
While taking account of students' preferences for face-to-face support, and retaining face-to-face support at the core of MLS, MLS providers should ensure that a variety of support methods is available for students so that the service is flexible, convenient and caters for the diverse needs and learning styles of students.

Recommendation 7
Given that many forms of MLS workshops exist, research should be conducted to identify best practice for the effective running of, and promotion of student engagement with workshops to ensure that the student learning experience is optimised.

5.3 Recording, Reporting and Evaluation of MLS

The importance of keeping records relating to the effectiveness of MLS visits has been well rehearsed [27, 28]. Historically, record keeping associated with MLS has been carried out in order to provide evidence to support the lobbying for continued funding. Although the majority (80%) of MLS providers maintained records associated with their work, the survey highlighted various means for doing this and a wide disparity in what details were recorded. While each institution will have its own needs in terms of data recording, MLS providers, especially the newer ones, are encouraged to familiarise themselves with what data is feasible to collect and why it should be collected [13, 29, 30]. For example, records of the number of student visits over the year could be used to optimise expenditure on tutors. Knowing programme and module titles could enable more effective targeting of certain groups of students. An electronic system that links with the central registry system of the relevant institution would greatly simplify record-keeping procedures while automatically supplying a range of relevant information. It was noteworthy that many responses to survey questions were based on opinions or estimates. It is recommended that MLS providers record usage data in electronic format to facilitate more efficient analysis of the data. Having comprehensive and accurate records in this form will also encourage an evidence-based approach to making decisions in managing MLS, promoting the service to students, reporting to senior management and applying for funding.

While MLS providers should maintain electronic records of the usage of their provision (student demographic data, session content and duration, etc.) for the reasons given earlier, it is accepted that alternative approaches are necessary for collecting student feedback on MLS. Paper-based surveys often receive better responses than online surveys. It is recommended that the paper-based survey designed by the IMLSN [12], with local variations as appropriate, be used. It is noted that paper-based surveys come at considerable extra cost and so the electronic version should be an option. Having this standard template as a basis for evaluations in the sector will also enable easier comparison of data from different institutions. This echoes a recommendation of the student evaluation report [12].

Institutions generally possessed an extensive amount of data concerning their MLS service. The results of the survey indicated there was a broad range in how the activities of MLS were being reported although reporting was mainly to senior management. One respondent noted the importance of such reporting for securing the following year's funding. An investigation of senior managers' perspectives at English universities in 2014 demonstrated that decisions about university-wide MLS are made at this level and take wider factors, including student recruitment, retention, achievement and employability, into account [16]. However, there was little evidence of reporting to heads of teaching and learning, to the access or mature student offices, or to students. It might be expected that

this group of stakeholders would potentially benefit by being informed of previous evaluations and the impact of the MLS service. Indeed, the student evaluation report [12] recommended that evidence of the positive contribution of MLS in terms of student retention, confidence and attitude towards mathematics should be communicated to incoming first-year students to encourage engagement with MLS. This points to consideration being given to trying to share in a more comprehensive way among MLS providers how reporting is undertaken. It is recommended that the IMLSN investigates the possibility of establishing a set of guidelines for best practice for such reporting so that relevant stakeholders can benefit from the extensive data available.

There is large interest and involvement in MLS across Ireland and the transfer of knowledge and good practice should be encouraged. The survey results suggested there is a sizeable group of people experienced in dissemination beyond their institution, including internationally, and potentially capable of advising those who want to develop their MLS activities. Taken alongside the finding that MLS activities have been independently evaluated in only 32% of institutions, it is recommended that consideration be given to the facilitation of independent evaluation of MLS activities and the development of appropriate guidelines and metrics for this to encourage the transfer of knowledge and good practice between institutions. In a survey of MLS provision in the UK, conducted by **sigma** in 2016 (results not yet published), one question asked whether any governance and reporting processes were in place and whether there is a steering or advisory group. This hints at the developing nature and embedding of MLS within institutions and the necessary oversight that goes with that.

MLS staff who responded to the survey generally believed that the subject lecturers were very supportive of the MLS provision but only seven (from 20 responses) provided examples of lecturers making positive changes to their practice. The results tentatively suggested that more effort was required in universities (compared to other types of institutions) in convincing lecturers of the usefulness of MLS (Figure 35). Discussion with the relevant MLS staff would be helpful to understand the reasons for their opinions.

It was also found that lecturers could refer students for MLS on a particular topic in almost all institutions (88%). It is recommended that MLS staff should collaborate and make use of institutional connections with module and programme coordinators to assist lecturers who may wish to reflect on their teaching practice to enhance further the learning experience of mathematics for students. This could involve, for example, providing feedback to lecturers on problem topics or students' lack of understanding of assessment marking or feedback, or updating lecturers on the MLS available. This is consistent with the student evaluation report [12] which recommended increased collaboration between those teaching first-year mathematics and those providing MLS. Furthermore, the **sigma** guide on the oversight of MLS advised that consideration should be given as to how valuable structural information garnered in MLSCs (e.g. many students having the same gap in expected knowledge) can be best fed back into curriculum development [15]. This guide also stated that "the effectiveness of MLS can be enhanced by close co-operation between MLS tutors and academic staff teaching mathematically rich modules" [15].

Recommendation 8
MLS providers should record usage data in electronic format to facilitate more efficient analysis of the data and to encourage an evidence-based approach to making decisions in managing MLS, promoting the service to students, reporting to senior management and applying for funding.

Recommendation 9
When collecting student feedback, MLS providers should use the paper-based survey designed by the IMLSN (or an electronic version if this is not feasible), with local variations as appropriate, to enable easier comparison of data from different institutions.

Recommendation 10
The IMLSN should consider establishing a set of guidelines for best practice in reporting MLS activities in order that relevant stakeholders (including (i) institutional senior management, (ii) lecturing staff, (iii) the mature student, access, disability, retention and careers offices and (iv) students) can benefit from the extensive data available.

Recommendation 11
Consideration should be given to the facilitation of independent evaluation of MLS activities and the development of appropriate guidelines and metrics for this to encourage the transfer of knowledge and good practice between institutions.

Recommendation 12
MLS staff should collaborate and make use of institutional connections with module and programme coordinators to assist lecturers who may wish to reflect on their teaching practice to enhance further the learning experience of mathematics for students.

5.4 Challenges and Developments

The survey findings indicated that challenges associated with a lack of student engagement with MLS (difficulties in reaching non-engaging students and students not engaging early enough) were very clearly the leading challenges across institutions of all types. The low uptake of MLS, in particular at the start of the semester, emphasises the need for effective advertising of the benefits of such support. (It could also point to the need for earlier assessment.) This is the time when weaker, first-year students need encouragement as they could quickly feel out of their depth at the beginning of their new programme. It was also striking that basic algebra and calculus were strongly identified by MLS providers as the most problematic areas for students. While this was largely anecdotal, it resonated with the work of Ní Shé et al. [31] which examined the mathematical topics creating most difficulty from the perspectives of both the first-year student and the lecturer. The sequential nature of mathematical development is another reason for the importance for students to engage early with MLS if they need to.

When survey participants were asked how they would like their MLS provision to develop, the need to gain the confidence of staff across the institution was highlighted – they are stakeholders who can encourage uptake of MLS, promote maths as applicable in various careers and help ensure that MLS is better coordinated institution-wide. However, almost half of the suggestions for developing or improving MLS provision related to the location and quality of the space for MLS and MLS activities and materials. In another part of the survey, respondents had emphatically stated that their main challenge concerned a lack of student engagement with MLS. It is notable that, given unlimited funding, the focus was largely on improving the human and physical resources. While, for example, moving the drop-in facility to a location with greater footfall might promote greater uptake of the support, it is not clear what impact many of the suggestions would have on the engagement problem. Perhaps more thought should be given to understanding students' behaviour, including their reasons for not availing of MLS, and developing MLS accordingly. A recent study showed that students' levels of reaction to some critical events (such as difficulty with assignments) in their mathematical education were fundamental to their engagement and subsequent progression [32]. Students reacted either by approaching or avoiding the challenges and the main influences on their behaviour were fear, social interactions, and motivation. Therefore, it is recommended that further research to obtain a deeper understanding of the problems of lack of engagement and to identify solutions be prioritised.

In relation to students not engaging with MLS, the report on student evaluation of MLS [12] stated:

"A significant proportion of responses indicated that enhanced advertising and promotion (in particular of location) of MLS services would also be of assistance in enabling students to engage with MLS."

The current survey found a wide range of methods was used to advertise MLS to students but more work is needed to establish which are most effective. Suggestions from the survey worth further consideration included employing student ambassadors to promote MLS and having a retention officer provide follow-up support to students who have previously received advice. It is interesting that while use of student ambassadors was offered as a suggestion for future development of MLS, no-one cited this as a current promotional method. Recent UK studies [33, 34] have demonstrated how student ambassadors and social media have been employed to promote MLS. It was reported that, while various small changes were made to the provision of a foundation maths module (including more formative assessment, quizzes without calculators and drop-in MLS dedicated to this particular group of students), the greatest impact on the students' attitudes was made by having students from the previous year speak to the current cohort at the start of the module [33]. It is recommended that the IMLSN investigates what advertising techniques are most effective to promote the existence and benefits of MLS and to improve engagement with MLS from the start of the semester and that the involvement of student ambassadors and social media be piloted. This supplements the message of the student evaluation report [12] which recommended that MLS providers should consider more extensive and innovative promotion of MLS to students using best international practice.

Across those surveyed, the third most difficult challenge was funding. Academic departments were reported as responsible for MLS funding in 29% of institutions. In these institutions, should MLS providers wish to seek central or external funding (since MLS is offered across their institutions), their case might be helped by having convincing evidence of the value and impact of MLS. The IMLSN recognises that it has an important role in conducting and publishing research, such as this report and the 2014 evaluation [12], to provide MLS practitioners with an evidence base to support these arguments.

MLS providers indicated that the IMLSN could help them in four main areas – reporting and disseminating best practice; developing and sharing resources; as a facilitator, enabling sharing of experiences or engaging in collaborations or mentoring; and as a promoter of MLS, raising its profile and lobbying institutions and governments[‡‡‡‡]. It is recommended that the IMLSN continues to focus its efforts in these four areas to help MLS providers fulfil their aspirations for developing their service.

Recommendation 13
Given that challenges associated with a lack of student engagement with MLS are very clearly the leading challenges across institutions of all types, further research to obtain a deeper understanding of these problems and to identify solutions should be a priority.

Recommendation 14
The IMLSN should investigate what advertising techniques are most effective to promote the existence and benefits of MLS and to improve engagement with MLS from the start of the semester and, in particular, the involvement of student ambassadors and social media should be piloted.

Recommendation 15
The IMLSN should continue to focus its efforts in four areas – reporting and disseminating best practice, developing and sharing resources, promoting MLS, and enabling sharing of experiences – to help MLS providers fulfil their aspirations for developing their service.

[‡‡‡‡] In October 2015, representatives of the IMLSN presented a report and participated in a Q&A session on student evaluation of MLS to the Joint Committee on Education and Social Protection in the RoI Oireachtas (Parliament and Senate).

6. Conclusions and Future Work

This report has investigated MLS at 30 institutions providing higher education in NI and the RoI. These included ten universities, 13 IoTs, four CELAs and three CFHEs. MLS was available in 25 of these institutions (83%) and was provided through a MLSC in 64% of cases.

In the majority of institutions with MLS (72%), all registered students were permitted to avail of MLS but the extent of the provision varied greatly in terms of opening hours and its nature. In 24% of institutions offering MLS, five hours per week (at most) of physical MLS was available while another 24% of institutions offered more than 30 hours per week. Evening provision of MLS occurred in almost half (44%) of institutions.

The lack of permanence of MLS structures is a serious matter. Only 44% of MLSCs were described as permanent. The precariousness of MLS was emphasised when it was seen to be provided by only one or two staff in 20% of institutions having MLS. There was a full-time manager for MLS in 36% of cases and, given the observed correlation between the nature of the managerial role and opening hours, the lack of such a position is likely to hinder the development of MLS in some institutions. Moreover, training of tutors was minimal or non-existent in many institutions and there was a problem of transience with a significant reliance on undergraduate and postgraduate students as tutors.

It was noteworthy that all 25 institutions with MLS provided at least one of the face-to-face types of MLS given the value of this approach in building students' confidence and developing a community of practice. A drop-in service was most common, available in 88% of institutions with MLS, workshops were offered at 64% of institutions, 44% offered an appointment-based service and 48% had online support. However, in 20% of institutions, only one of the four types of MLS was available. This issue of variety in MLS methods is important to ensure that MLS is flexible and convenient and meets the diverse needs and learning styles of students. The survey findings indicated some room to enhance provision in this regard.

Engineering, science and business were the most common disciplines of MLS users but the overall student population availing of MLS was very diverse. Survey respondents were asked to estimate what percentage of their MLS visitors were from each academic stage, and the mean estimated percentage for first-year undergraduates was 55%. This emphasises that, while first-year students were clearly the main users of MLS, a substantial proportion of the students accessing MLS were beyond first year. Three respondents noted increased use of MLS by final-year and/or postgraduate students and one observed significant growth in students requesting statistics support, particularly postgraduates. The main topics causing difficulty were very definitely basic algebra and calculus. One-to-one support was generally the top choice for students and survey participants strongly believed that this type of support is most effective for student learning since it is adaptable to individual needs.

The survey findings gave encouraging evidence of strong connections between MLS providers and subject lecturers. There was a widespread agreement among the MLS staff

who took the survey that subject lecturers were very supportive of MLS provision. Also, there was evidence of subject lecturers making teaching adjustments due to the influence of MLS. Seven from 20 responses reported examples of lecturers making positive changes such as including more feedback and assessments, dedicating more lecture time on problem topics and changing module delivery structure as a result of consulting MLS feedback.

Many MLS staff were still using paper-based methods for recording data about their MLS provision whereas having the data in electronic format would facilitate its analysis and encourage an evidence-based approach to managing and developing the service.

Major challenges for MLS providers were identified, the most difficult of which were reaching the non-engaging students and getting students to engage earlier. This opinion was widespread; the problem of lack of engagement affected all types of institutions, even those with long established systems of MLS. There is a need to identify and implement effective advertising techniques to make students aware of the existence of MLS and its benefits. However, survey responses demonstrated a strong enthusiasm for and interest in MLS with many ideas for its development and improvement.

There has been considerable growth in the number of institutions offering MLS since the last audit in Ireland in 2008 with nine institutions subsequently establishing MLS and only one of the institutions in the 2008 audit ceasing its provision. Furthermore, there has been a considerable increase, from 54% (n=13) to 72% (n=25), in the proportion of institutions making MLS available to all students since 2008. Also, there has been a large decrease since 2008 in the proportion of institutions where MLS was funded primarily from external sources, giving some encouragement that institutions valued MLS as an essential component in the teaching and learning of mathematics. Although a training programme existed in only 44% of institutions with MLS in 2015, the situation had improved substantially since 2008 when only 15% of institutions had a training programme. The proportion of institutions offering online MLS decreased over this period and there was a decline in the use of mathematical software but a marked increase in the use of video tutorials.

International comparisons of MLS provision, using the most recent survey data, showed a very similar proportion of institutions in Ireland having MLS as in the UK and Australian universities. While drop-in MLS was the mainstay of provision in Ireland and the UK, there was some indication that other forms of MLS (appointments, workshops) were offered more widely in Ireland than in the UK. One notable feature of MLS provision in Australia was that the proportion of MLS facilities that enjoyed permanent or long-term status was much higher than in Ireland. This was particularly remarkable given that the Australian survey had been conducted eight years earlier. Many of the conclusions and recommendations are the same for both the Australia and Ireland reports. Both advise that MLS should be part of institutions' core learning and teaching plans and that MLSCs should have their own identity. They highlight the need for strong, collaborative and complementary connections between MLS providers and lecturers and they recommend having a robust system for capturing and recording information and feedback in order to provide evidence to support decision making.

6.1 Limitation of Research and Future Approaches

Even with thorough planning of the survey questions and testing a pilot version of the survey, the potential for ambiguous responses was not always foreseen. For example, the question asking who can access MLS could have been structured better to avoid the response "all students" and to establish whether MLS was available to undergraduates and/or postgraduates, full-time and/or part-time students, etc. Furthermore, it was clear that MLS is implemented in a wide variety of ways across institutions and it would be useful to obtain more information on matters of interest. Therefore, it is recommended that any future audit of MLS involves some element of semi-structured interviews with both MLS coordinators and tutors to clarify and achieve a deeper understanding of relevant issues. Given the prevalence of responses that mentioned statistics support, the inclusion of a set of dedicated statistics questions as they relate to MLS may be of benefit in future surveys of MLS.

6.2 Future Work

The recommendations presented in this report are targeted at MLS practitioners, researchers and education policy makers. In particular, some recommendations indicate a menu of future work that the IMLSN could consider and this is discussed in this section.

Challenges associated with student engagement are significant for almost all MLS providers and more work is needed in this area. While recommendation 13 points to more research being conducted, recommendation 14 is very practical. Following the successful use of student ambassadors in England, similar schemes should be piloted in various institutions in Ireland. The IMLSN should collate the experiences of MLS providers and students in using these schemes and devise a model for operating them effectively.

The experiences of the IMLSN members should also be harvested with regard to recommendations 3 and 7. Recommendation 3 refers to the wide variety of practices that exist in terms of selection procedures for tutors and a SIG of the IMLSN could be established to collect and devise a best practice list in this area for dissemination to all MLS providers. In terms of recommendation 7 (the running of MLS workshops), another SIG of the IMLSN could be established to collect and collate examples of what works best in this area and disseminate this so as to enable MLS providers to be better informed about what options are available and what has been proven to work.

A particularly interesting statistic from the survey showed that 52% of MLS providers did not offer some form of online MLS. This indicates there is much potential to develop digital capacity in MLS. It also suggests a need to investigate the reasons for the underuse of ICT and whether the digital capacity of students, staff, institutions or MLS resources are relevant factors. Given the complexity of the issues which potentially underlie this area, it will probably require structured research of the type which cannot be achieved using a short-term SIG approach. It might be better suited to one or several partner institutions, who

have research interests in MLS and enhancing digital capacity, collaborating on a more long-term research project.

Finally, in terms of the next iteration of a MLS survey in Ireland, the authors suggest that a similar audit be conducted in 2020 given the ever-changing demographics and mathematical/statistical needs of students in higher education. Based on the experience of conducting this audit, the 2020 survey should include dedicated questions on (i) statistics support, given the prominence and growth of this subject area in recent years, and (ii) governance and oversight of MLS structures. Also, any future audit of MLS should involve semi-structured interviews and/or focus groups with both MLS coordinators and tutors to achieve a deeper understanding of relevant issues. Inevitably, funding such a project is crucial and we advise that a significant proportion of any funds awarded in future be dedicated to such a project and be allocated to ease analysis and expedite publication.

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Appendix A.
List, category and description of institutions involved in the 2015 island of Ireland MLS survey.

institution	category	country
Athlone Institute of Technology	IoT	RoI
Belfast Metropolitan College	CFHE	NI
Cork Institute of Technology	IoT	RoI
Dublin City University	university	RoI
Dublin Institute of Technology	IoT	RoI
Dun Laoghaire Institute of Art, Design and Technology	IoT	RoI
Dundalk Institute of Technology	IoT	RoI
Galway-Mayo Institute of Technology	IoT	RoI
Institute of Technology Blanchardstown	IoT	RoI
Institute of Technology Carlow	IoT	RoI
Institute of Technology Sligo	IoT	RoI
Institute of Technology Tallaght	IoT	RoI
Institute of Technology Tralee	IoT	RoI
Letterkenny Institute of Technology	IoT	RoI
Limerick Institute of Technology	IoT	RoI
Mary Immaculate College, Limerick[§§§§]	CELA	RoI
Maynooth University	university	RoI
National University of Ireland, Galway	university	RoI
North West Regional College, Londonderry and Tyrone	CFHE	NI
Open University	university	NI
Queen's University Belfast	university	NI
South West College, Tyrone and Fermanagh	CFHE	NI
St Mary's University College, Belfast[*****]	CELA	NI
St Patrick's College, Drumcondra[†††††]	CELA	RoI
Stranmillis University College, Belfast[‡‡‡‡‡]	CELA	NI
Trinity College Dublin	university	RoI
Ulster University	university	NI
University College Cork	university	RoI
University College Dublin	university	RoI
University of Limerick	university	RoI
Waterford Institute of Technology	IoT	RoI

[§§§§] degrees and other educational awards are accredited by University of Limerick
[*****] described as a college of Queen's University Belfast
[†††††] described as a college of Dublin City University
[‡‡‡‡‡] described as a college of Queen's University Belfast

Universities and Institutes of Technology (IoTs)

Universities in NI receive public funding and are autonomous. Universities in the RoI are also publicly funded and are generally autonomous. They offer degree programmes at bachelor, master and doctorate level. The IoTs provide career-focussed programmes in areas such as business, science, engineering, linguistics and music mainly to certificate, diploma and degree levels with some master and doctorate levels. Universities are more active in research at postgraduate level while IoTs have more mature and part-time students[§§§§§].

Colleges of Education and Liberal Arts (CELAs)

CELA is a generic term. The four institutions in this group do not all describe themselves using that exact term. They were established to prepare new teachers for the primary school system and offer numerous courses in education at both undergraduate and postgraduate levels. Some have expanded into the liberal arts and humanities. Each of these institutions is linked to a local university.

Colleges of Further and Higher Education (CFHEs)

The CFHEs in NI are publicly funded and provide a wide range of courses spanning essential skills, vocational and technical education and training at second and third level, and higher education (foundation degrees). In the RoI, any education that occurs after second level but does not form part of the third-level system is known as further education. This sector is very diverse encompassing post leaving certificate courses, vocational training opportunities schemes (second chance education for the unemployed), programmes for early school leavers, adult literacy and basic education. Further education colleges in the RoI were not included in this investigation.

In addition to these categories, there are some independent colleges providing higher education in the RoI. While aware of one of these colleges offering MLS, the group as a whole was not investigated.

[§§§§§] For more facts and figures on the higher education sector, see:
https://www.economy-ni.gov.uk/topics/statistics-and-economic-research/higher-education-statistics (NI)
http://www.hea.ie/sites/default/files/hea-key-factsfigures-2014-15.pdf (RoI)

Appendix B.
The 2015 island of Ireland MLS survey questions.

1. Is your institution a university, institute of technology, further education college, teacher training college or other?

2. Is mathematics learning support (MLS) offered in your institution?

If the answer to question 2 was “no”, respondents were asked questions 3, 4, 57 and 58.
If the answer to question 2 was “yes”, respondents were asked questions 5 – 56 inclusive.

3. In your opinion, why do you think there is no MLS offered in your institution?

4. Are any efforts being made to establish MLS in your institution? Please expand on your answer below.

5. Is the MLS offered in your institution provided through a mathematics learning support centre (MLSC)?

6. Further details.

7. Who can access the MLS provided by your institution? e.g. science students only, first years only, every student in the institution, etc.

8. How do you advertise your MLS to students?

9. What services are provided by your MLS offering? Tick all that apply.
   Drop-in
   Appointment
   Workshop for small group of students
   Other

10. Is the role of the manager/coordinator in your MLS offering: full time / part of contract but not part of lecturing/admin duties / part of lecturing/admin duties / voluntary / other?

11. If you have one, is your MLSC (the entity): permanent / subject to (annual) review / other?

12. Do you have a dedicated space for your MLS service?

13. Please give details on space used.

14. For each day of the week that the MLS provision is open, please state the opening hours. If the MLS provision is open during certain weeks of the semester only, or if opening times vary at different times of the year, please detail below.

15. Is your MLS provision open during exam times?

16. Where is your MLS provision located?

17. Please indicate your level of agreement with the given statement: "Our MLSC is appropriately located." You may want to consider things like ease of access, centrally located (high footfall), neutrally located, etc.

18. Is the MLS physical space shared with other supports or services? If so, please specify and comment on how well the arrangement works.

19. How is your MLS provision primarily funded?

20. Please indicate your level of agreement with the following statement: "Our MLS provision is adequately funded."

21. When was MLS provision first established in your institution? Please indicate if the provision was discontinued at any stage.

22. How would you like to see your MLS provision developed/improved (if you had unlimited funding)? Priority list will suffice.

23. Can you give the numbers of each staff category (below) working in your MLS provision for this current academic year?
    Full-time members of staff, e.g. lecturing staff
    Undergraduates
    Volunteers
    Postgraduates – scholarship
    Postgraduates – hourly paid
    Staff hired from outside your institution
    Other

24. How do you recruit your tutors? Please give some details here, e.g. whether you advertise the positions, interview potential tutors, etc.

25. Do you run a training programme for your tutors?

26. If so, please give some details here, e.g. a one-day/one-hour training session, ongoing mentoring, etc.

27. Does your MLS offer online support?

28. If yes, what forms of online support do you offer? (You can choose more than one option.)
    - Revision notes
    - Video tutorials
    - Skype appointment
    - Social media support
    - Virtual drop-in service
    - Email / message board support
    - Links to webpages, e.g. mathcentre
    - Commercial software
    - Dedicated website
    - Dedicated VLE site
    - Other

29. If no, do you plan on introducing some form of online support in the future?

30. What do your student visitors think of online MLS as compared to face-to-face MLS? If you have run a survey, please quote statistics/comments.

31. If you run specialist sessions (workshops, hot topics) for students, are they: (tick all that apply)
    - Initiated by the MLSC coordinator/manager?
    - Requested by the lecturer / module coordinator?
    - Requested by the students with the agreement of the lecturer?
    - Other?

32. Are these specialist sessions organised: (tick all that apply)
    - During term time?
    - During exam time?
    - During summer time?

33. Do you maintain records of student visits?

34. If yes, do you record:
    - Electronically (e.g. use of a sign-in computer, tablet, etc.)?
    - Using paper methods (e.g. a physical sign-in sheet)?
    - Other?

35. If yes, can you please give details of what records are kept:
    - Student number
    - Programme and stage
    - Module
    - Gender
    - Session content

Session duration
Mathematical background
Student nationality
Mature/traditional status
Other

36. Based on the records you keep, please enter an estimate percentage to describe the academic stage profile of the students who make use of your MLS provision.

37. Please elaborate or add comments which you believe might be helpful in response to the previous question.

38. Do you seek feedback from students?

39. If you answered yes, how do you obtain this feedback? (Tick all that apply.)
Using a paper survey.
Using an online survey.
Using focus groups.
Informally, e.g. verbally asking questions.
By providing a continuous facility for offering comments, e.g. a comment box.
Other.

40. Based on the records you keep, please enter an estimate percentage to describe the subject area profile of the students who make use of your MLS provision.

41. Based on the records you keep, please enter an estimate percentage to describe the status profile of the students who make use of your MLS provision.

42. Do you produce a regular report on your MLS activities, e.g. an annual report? Please give details.

43. If yes, do you put this on your website, your institution's website, send it to your institutional management/authority? Please specify.

44. Have you (or your predecessor(s)) published any papers on the topic of MLS, e.g. evaluating or describing your mathematics support provision?

45. Have you ever had your MLS service evaluated (either internally or externally) from anyone other than yourself?

46. Can you list, from your experience, what you believe are the three most common mathematical (or statistical) topics/areas students of your service have difficulties with? Any detail is appreciated.

47. What forms of maths support are most frequently used by students? Please list at most five in order of popularity, e.g. one-to-one support, website resources, in-centre worksheets.

48. What is the average approximate duration of a student visit? Please specify if this is evidence-based or anecdotal.

49. In your opinion, what support services provided by your centre are the most effective for student learning? Please specify if you have any data to back this opinion up.

50. Describe how the number of student visitors to your MLS provision varies over the year.

51. Can a lecturer refer a student to your MLS provision for support on a specific topic?

52. Please indicate your level of agreement with the following statement: "Subject lecturers in my institution are very supportive of our MLS offering."

53. Are you aware of the subject lecturers having adjusted their practice due to the existence of MLS? If so, please give some examples.

54. Can you rank the challenges faced by your MLS service in order of most difficult challenge?

55. Is there anything that the Irish Mathematics Learning Support Network (IMLSN) can do for your institution's MLS service, in general or with respect to the challenges stated in the previous question?

56. We may wish to contact you after completing the survey to clarify some answer(s). If you are happy to be contacted, please enter your phone number and/or email address here.

57. Is there anything that the Irish Mathematics Learning Support Network (IMLSN) can do for you in terms of setting up an MLS service at your institution?

58. We may wish to contact you after completing the survey to clarify some answer(s). If you are happy to be contacted, please enter your phone number and/or email address here.

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