

# Student non-engagement with mathematics learning supports

CIARÁN MAC AN BHAIRD<sup>\*†</sup>, OLIVIA FITZMAURICE<sup>‡</sup>, EABHNAT NÍ FHLOINN<sup>§</sup> AND  
CIARÁN O'SULLIVAN<sup>¶</sup>

<sup>†</sup>National University of Ireland Maynooth, Co. Kildare, Ireland, <sup>‡</sup>University of Limerick, Co. Limerick, Ireland,  
<sup>§</sup>Dublin City University, Co. Dublin, Ireland and <sup>¶</sup>Institute of Technology, Tallaght, Co. Dublin, Ireland

\*Email: [ciaranmacanbhaird@gmail.com](mailto:ciaranmacanbhaird@gmail.com)

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Large numbers of students entering higher education take some level of mathematics as part of their degrees, and it is widely reported that a considerable minority of these students demonstrate a lack of the basic mathematical skills that they require to succeed. A common response has been the establishment of mathematics learning supports to give students the opportunity to reach the levels required. Research has shown that in general, although the supports appear to impact positively on students who avail of them, a significant number of students do not engage appropriately. This article presents preliminary findings from a national survey carried out at nine Higher Education Institutions in Ireland, focusing on the reasons given by students for their lack of engagement with the extra supports. It looks at the students' mathematical backgrounds; the type of institution they attend, and discusses what these students reported would encourage them to avail of the supports.

## I. Introduction

More and more students entering Higher Education Institutions (HEIs) are taking courses in mathematics and statistics, in part because of the recent increase in recognition for and emphasis on the importance of STEM (Science, Technology, Engineering and Mathematics) subjects to society (Expert Group on Future Skills Needs, 2008; Engineers Ireland, 2010). However, a significant number of first year students do not appear to be adequately prepared for mathematics in HEIs and they often exhibit very weak mathematical backgrounds. This well-documented problem, often labelled the 'Maths Problem', is common place in HEIs in Ireland, the UK and elsewhere (OECD, 2003; Gill *et al.*, 2010; Lawson *et al.*, 2012).

A standard response has been the establishment of mathematics learning support (MLS) initiatives, for example in the form of Mathematics Learning Support Centres (MLSCs), which are now available in the majority of HEIs in Ireland and the UK (Gill *et al.*, 2008; Perkin *et al.*, 2012). The Irish Mathematics Learning Support Network (IMLSN) was established in 2009 to promote and support individuals and HEIs involved in the provision of MLS in Ireland, similar to the highly effective **sigma** (The Centre of Excellence in Mathematics and Statistics Support) network (<http://sigma-network.ac.uk/>) based in England and Wales.

A crucial aspect in the successful provision of MLS is that it be comprehensively evaluated on a regular basis to establish best practice (Matthews *et al.*, 2012). Systems of qualitative and or quantitative evaluation are now commonplace in the wider MLS community. Research suggests that appropriate engagement with MLS can have a positive impact on student retention and progression (Lee *et al.*, 2008; Mac an Bhaird, *et al.*, 2009). However, the main challenge that remains for practitioners is to ensure high levels of appropriate student engagement with MLS. In particular, some research has shown that a minority of the students most in need of support do not avail of it (Pell & Croft, 2008; Mac an Bhaird *et al.*, 2009). One of the aims of the IMLSN's survey of student opinion on MLS was to investigate a national picture of student non-engagement with MLS.

In this article, a brief overview of the 'Maths Problem' nationally and internationally is presented and the establishment of MLS initiatives as a response to the problem. The evaluation of MLS and the problem of student engagement with MLS are considered. In particular, how the IMLSN developed its national survey is discussed and the outcomes of the survey in terms of student non-engagement, their mathematical backgrounds, the type of HEI they attended and their suggestions on how they could be encouraged to engage are all explored. Finally, there is a brief discussion of what, if anything can be done to address the engagement levels of those students most in need of support who do not currently avail of it.

## 2. Literature review

For many years in the international academic community, there has been widespread unease about the number of students who are entering HEIs without many of the basic mathematical skills that they require. This 'Maths Problem' is very well described in an Irish context by O'Donoghue (2004), as outlined in Gill & O'Donoghue (2007). O'Donoghue described a number of overlapping themes including: the mathematical deficiencies of students upon entry; pre-requisite mathematical knowledge and skills; mathematical preparedness/under-preparedness; mathematics at the school/university interface; issues in service mathematics teaching; numeracy/mathematical literacy. Various aspects of the 'Maths Problem' in Ireland have also been investigated: for example, Lynch *et al.* (2003) and Hourigan & O'Donoghue (2007) both considered the teaching and learning of mathematics at second level, and some details of the problems that are apparent at third level. Outside of Ireland, considerable research is also available: for example, Sutherland & Dewhurst (1999) discussed how the 'Maths Problem' impacted on a wide range of disciplines in a range of universities across the UK. Rylands & Coady (2009) found that universities and colleges worldwide have seen an increase in failure rates for first year mathematics courses because of the 'Maths Problem'. Lawson *et al.* (2012) contains a detailed overview of the history of the 'Maths Problem'.

The 'Maths Problem' and corresponding low achievement in mathematics have significant negative consequences. In 1999, the OECD viewed it as a contributing factor in low enrolment and retention rates in science and technology courses (OECD, 1999). An Irish Government body (Expert Group on Future Skills Needs, 2008) outlined the need for improving 'our national mathematical achievement' and highlighted the importance of mathematics knowledge to the economy in Ireland. Similar reports across the world have highlighted the importance of mathematics to our future prosperity, for example in the UK (Vorderman, 2011) and Australia (McInnes & James, 1995).

The provision of MLS is one response from HEIs to try to address the 'Maths Problem'. The main aim of MLS is to assist students in overcoming their mathematical difficulties, and the main target group (in line with our national survey) is first year students. This emphasis on provision of MLS to first year students resonates with Hourigan & O'Donoghue (2007) who state that mathematical deficiencies need to be addressed as early as possible in students' time in higher education. In Ireland,

most HEIs now offer some form of MLS (Gill *et al.*, 2008). In the UK, the level of MLS provision in HEIs is above 85% of those surveyed (Perkin *et al.*, 2012) and so it is clear that MLS is becoming an integral part of the support that any student should expect to receive within a HEI. Perkin *et al.* (2012) give a very good overview of the growth of the MLS sector in the UK. MLS is also available in other countries, for example in Australia (MacGillivray, 2008).

Continuous thorough evaluation of MLS is critically important to the establishment of best practice, the maintenance of these services for students who need them and ensuring that the service provided meets students' needs (Gill *et al.*, 2010). There are a number of papers available on the type of suitable evaluation depending on the MLS provided. The 2012 **sigma** report (Matthews *et al.*, 2012) gives a thorough review of the literature relating to the evaluation of MLS while MacGillivray & Croft (2010) contains a comprehensive overview and analysis of the issues at hand.

Much of the research focuses on evaluating the impact of MLS by using the success rate of attendees as a metric, for example Mac an Bhaird *et al.* (2009) and Symonds *et al.* (2007). Several of these papers report on the positive impact on the most 'at-risk' students, and show improved student retention. However, many of these studies have also shown that a significant minority of students who are most in need of MLS do not avail of it and, indeed, do not engage with mathematics in general. As a consequence, many researchers have begun to consider the type of student using MLS (Croft & Grove, 2006; Mac an Bhaird & O'Shea, 2009). Pell & Croft (2008) found that first-year Engineering students who received top grades were more likely to attend the MLSC than those who failed or who just passed the module. Similar results have been reported in MacGillivray (2009). Student feedback has also been recognized as crucial for measuring the effectiveness of MLS (Lawson *et al.*, 2001; Gill & O'Donoghue, 2007). Ní Fhloinn (2008) looked at the role of student feedback in such an evaluation in Dublin City University (DCU), merging qualitative and quantitative data, and found that using a combination of both gave a more complete picture of the MLSC.

The reasons for student non-engagement with MLS and mathematics are a complex area of research. Some authors have found that the fear of showing a lack of knowledge or ability negatively impacts on students' willingness to ask questions (Ryan *et al.*, 2001; MacGillivray, 2009). Grehan (2013) focused on the fears that students expressed and how these fears prevented them from engaging with mathematics during their first year at NUIM. Many of these factors were also identified in a study of students at Loughborough University (Symonds, 2008).

### 3. Methodology

One of the main challenges facing MLSCs in Ireland is securing sufficient permanent funding; most receive temporary funding and are easy targets for cutbacks in times of austerity. Thus, one of the initial aims of the IMLSN was a thorough evaluation of students' opinions on MLS with a view to establishing evidence for the benefits of MLS on an institutional, national and international basis.

To establish best practice, a review of the literature on both MLS evaluation and the use of questionnaires (Research Methods in Education, 2001; Green & Croft, 2012) was conducted. It was decided to use an anonymous questionnaire for this study since the use of questionnaires to evaluate MLS is commonplace (Croft, 2000; Ní Fhloinn, 2008) and samples of questionnaires used to evaluate MLS in HEIs across Ireland were collected. A workshop on the design of surveys and questionnaires and on the use of the statistical tools such as Rasch analysis and NVivo analysis was organized by the IMLSN committee. Subsequently, a pilot questionnaire was developed to clarify the best methods for analysing the questionnaire data. The questionnaire had three main sections. The first section was to gather information regarding the students' background, and the student then was required to complete one of the remaining two sections depending on whether or not he/she had engaged with the MLS

available. The questions were a combination of open questions and questions which required a response on a five-point Likert scale. It was decided based on the literature review to target only first year service mathematics students because they are generally the most relevant to MLS in terms of issues of retention and progression.

The pilot questionnaire was distributed at the end of the 2009–2010 academic year to a total of 100 students across five HEIs and the feedback was analysed in summer 2010. Expert statistical advice was sought to ensure the validity and reliability of the questions and some adjustments were made. The finalized questionnaire (see Appendix A) was sent to members of staff involved in MLS in HEIs in Ireland. These staff members were asked to distribute paper copies in the appropriate lectures during the second semester of the 2010–2011 academic year. The questionnaires were completed in nine HEIs: DCU, Institute of Technology (IoT) Blanchardstown, IoT Carlow, IoT Tallaght, IoT Tralee, National University of Ireland (NUI) Galway, NUI Maynooth, University College Dublin and the University of Limerick. The quantitative and qualitative data was inputted into SPSS. We used Grounded Theory, as laid out by Strauss & Corbin (1998), to analyse the large quantity of data. Instead of forming a theory and using the analysis of your research to find evidence supporting that theory, Grounded Theory allows for an open-ended approach. The theory emerges from the data itself. Initial coding of the data gives rise to labels, subsequent coding groups these labels into concepts and categories. We report on the categories that emerged in this article. The authors carried out the coding process independently and then compared for verification.

## 4. Results

A total of 1633 completed questionnaires were received from the nine HEIs. In all, 587 (36.1%) of those surveyed had availed of MLS services and 1046 (63.9%) had not. The engagement levels varied across the different HEIs, from 40.9% of respondents in one to 3.1% in another. This requires more detailed investigation but many factors may contribute to this spread such as variations in the number of students surveyed, the availability of MLS and the overall size of the HEI in question. This article focuses on the non-attendees (respondents to Section C) and the reasons given for their non-engagement (Question 16). The breakdown of the responses is analysed using the students' mathematical background (Section A, Questions 4, 5 and 6) and they are also analysed based on what type of HEI they attended. Finally, an analysis of the student responses as to what would encourage them to use the supports provided (Question 17) is presented with the link between these responses and the students' mathematical background being considered.

### 4.1 Analysis of Q16 responses: why students did not use MLS

*4.1.1 Overview of responses to Q16—why students did not use MLS* Students were asked why they did not avail of MLS and we gave seven fixed options, based on the most common feedback from analyses of evaluation forms already used in MLSCs. In all, 1024 of the 1041 non-attendees responded. A breakdown of their 1472 responses and the percentage of students who gave each response is given in Table 1 (students could select more than one option).

A total of 133 students selected 'Other Reason' and were asked to specify what these were. In all, 123 reasons were given, 60 fell under (at least one) of the other six fixed options given in Q16 and some students gave more than one reason. In all, 51 (of 60) said that they did not need help and gave a variety of positive reasons: that they might need help in the future 'Did not need help with maths for Christmas exam but in second semester I have found the calculus hard and may use it before the

TABLE 1. 1472 responses to Q16 from 1024 non-attendees

Q16 response options	Do not need help	Times do not suit	Did not know where it was	Hate Maths	Embarrassed or afraid to go	Never heard of the MLC	Other reason
No. of responses	501	295	186	151	119	87	133
As a % of respondents	48.83%	28.81%	18.16%	14.75%	11.62%	8.5%	12.99%

summer exam’; the existing traditional class structures were sufficient ‘Had many tutorials to deal with any problems encountered and this helped so didn’t need the MLSC’; or their study methods were working fine ‘I can often figure out problems if I go over the notes or ask a friend to give me a hand’.

The remaining 63 comments did not fall into any of the other six fixed options. The majority of these fell into three main categories: 33 referred to laziness or lack of motivation to attend or engage with mathematics: ‘To be honest lectures are so boring and slow that doing anymore would kill me altogether’; 12 referred to MLSC structures such as being unsure of how it worked, they had heard negative comments or they had attempted to go but it was too busy ‘When I went in there were too many people. I could not get a seat, I did not bother afterwards’; and 9 referred to being too busy or having a lack of time: ‘I have a busy schedule and find it hard to make time to go’.

Students who ticked one of the fixed options were also asked to comment. The majority (141) of these 185 comments were consistent with the options they selected, 96 saying that they did not need help ‘If I do need help later on in my degree I will use the service as I have heard good reports and it had been suggested in my classes by various lecturers’ and 33 saying the opening hours did not suit. Of the remaining 44 comments: 21 referred to MLSC Structures ‘Better advertisement about MLSC would make me more aware of MLSC’ and 3 referred to issues of motivation ‘I always had intentions to go, however I never got around to it’.

Initial analysis seems to suggest that most students are not using MLS because they believe they do not need help; however, several comments highlight the complexity of the situation, e.g. ‘I feel that maths is a subject that you either get or don’t get. And the MLSC would be of no use to me’. To gain additional insight, responses were analysed further using the students’ mathematical backgrounds.

*4.1.2 Responses to Q16 analysed using Leaving Certificate Level and Grade* First of all the answers broken down by the students’ Leaving Certificate (LC) Mathematics Level were considered. The LC is a high-stakes exam at the end of second-level education in the Republic of Ireland and mathematics is a compulsory subject which can be taken at Higher (HL), Ordinary (OL) and Foundation levels. Typically, a minimum of OL mathematics is required to take service mathematics courses in HEIs and this is evident from the breakdown of HL and OL respondents in our survey, where 396 non-attendees had taken LC mathematics at HL and 602 had taken LC mathematics at OL. The remaining 27 respondents had either initially done Foundation Level, did not give their grade, or had done their second-level education outside of the Republic of Ireland and are excluded in the analysis which follows. A breakdown of the 522 responses from the 396 HL students and the 903 responses from the 602 OL students is given in Table 2.

A chi-square test with  $p < 0.001$  shows that there is a significant relationship between LC level and answers given. For example, students doing HL were more likely to say that they did not need help than those doing OL. HL students were also less likely to say that they were afraid or embarrassed to go or to say that they hated maths when compared to OL. None of this is unexpected, students who

TABLE 2. Breakdown of answers to Q16 based on LC Level

Q16 response options	Do not need help	Never heard of the MLC	Did not know where it was	Times do not suit	Embarrassed or afraid to go	Hate Maths	Other reason
No. of HL responses	274	20	55	71	29	22	51
As a % of HL respondents	69.19%	5.05%	13.89%	17.93%	7.32%	5.56%	12.88%
No. of OL responses	205	65	130	211	88	125	79
As a % of OL respondents	34.05%	10.8%	21.59%	35.05%	14.62%	20.76%	13.12%

have taken HL would generally be considered to have greater ability, and have more confidence in their ability than OL students. OL students were more likely than HL students to say that they had never heard of the MLSC, did not know where it was, the times did not suit them, they hated maths or that they were afraid or embarrassed to go. This is concerning as OL students are a main target of MLS and it highlights the range of issues involved in increasing student engagement.

The responses to Q16 were also examined based on the grade breakdown within the LC levels. This ranges from A1 to D3 and was asked in Q5 of the survey. Analysis shows that there is a statistically significant relationship (Exact test  $p < 0.001$ ) between LC grades in HL and answers given; for example the higher the HL grade, the more likely students were to say that they did not need help. However, this response was still the main answer in lower HL grades. When the responses of students with OL grades were examined, there was also a statistically significant relationship (Monte Carlo test  $p = 0.009$ ), so again the higher their OL grades, the more likely they were to say that they did not need help.

*4.1.3 Responses to Q16 analysed using type of HEI attended and LC Level* In this section, the breakdown of responses (Table 3) based on the type of institution that the students attended, either an Institute of Technology (IoT) or a University (Uni.) is considered. We consider the responses of the 299 IoT and 699 University students who had an OL or HL LC result. Before considering these comparisons, it is important to highlight the different and complementary roles and missions that Universities and IoTs have within the higher education system in Ireland. At undergraduate level, Universities focus on Level 8 (Honours Degree programmes), for example, in 2011–2012, 97% of full-time undergraduate students in Universities were level 8. IoTs emphasize career-focused higher education offering level 8 programmes but also programmes Level 7 (Ordinary Degrees) and Level 6 (Higher Certificates). For example, in 2011–2012, in IoTs 52% of full-time undergraduate students were level 8, 38% were on level 7 and 9% were level 6. IoTs also have a larger proportion of mature and disadvantaged entrants and are stronger than Universities in part-time and flexible provision. Universities are more active in research at post-graduate level, have a higher proportion of research activity and a much higher proportion of national and international research funding while IoTs are involved in less research activity in a smaller number of focused areas concentrating on industry-focused research and innovation. (HEA report, 2013)

A chi-square test shows that there is a significant relationship ( $p < 0.001$ ) between the response given and the type of institution attended. For example, students in University were more likely than in IoTs to be afraid or embarrassed to go to the MLSC, but they were more likely to have heard of the MLSC than IoT students.

As outlined previously, IoTs have a different mission to that of Universities and so tend to have a lower threshold of entry requirements. They usually teach a range of programme levels (6–8) to first



TABLE 3. Breakdown of answers to Q16 based on type of HEI attended

Q16 response options	Do not need help	Never heard of the MLC	Did not know where it was	Times do not suit	Embarrassed or afraid to go	Hate Maths	Other reason
No. of IoT responses	150	53	49	96	27	40	17
As a % of IoT respondents	50.17%	17.73%	16.39%	32.11%	9.03%	13.38%	5.69%
No. of Uni. responses	329	32	136	186	90	107	113
As a % of Uni. respondents	47.07%	4.58%	19.46%	26.61%	12.88%	15.31%	16.17%

year students, whereas Universities teach almost exclusively students on level 8 programmes. This is largely reflected in the breakdown of HL and OL LC level by HEI from the survey data. In IoTs, out of 299 responses, 40 (13.38%) were HL and 259 (86.62%) were OL, and in University, out of 699 responses, 356 (50.93%) were HL and 343 (49.07%) were OL. To deal with the lack of homogeneity in LC profile, it was decided that breaking down responses in each type of institution separately by LC level would prove informative. First, the analysis for the IoTs is considered (Table 4).

A chi-square test on IoT students shows (with  $p=0.263$ ), there was no significant relationship between LC level and answers given. This is not unexpected due to the diverse mathematical backgrounds of these students. Next the analysis for the Universities is considered (Table 5).

A chi-square test shows that there is a significant relationship ( $p < 0.001$ ) between the LC level of University students and types of answers, again this is not unexpected. For example, HL students were more likely than OL to state that they did not need help, but OL students were more likely to state that they had not heard of the MSC, did not know where it was or that the times did not suit, they were embarrassed or afraid to go or that they hated maths. Among the HL students, there is a significant relationship between the grade they got and the answers they gave (Monte Carlo test,  $p=0.005$ ) and this was also the case among the OL university students (Monte Carlo test,  $p=0.013$ ). Of the 81 OL students who said that they did not need help, 78 gave a grade breakdown and 48.7% (38) of these were B1 or lower. In other words, they would generally be considered to be ‘at-risk’ of failing using a criterion used at some Universities in Ireland (Grehan, 2013).

*4.1.4 Responses to Q16 analysed using data on if and when students changed LC Level* In Q6 students were asked if they had dropped down from HL to OL, when they had done this. Students follow the LC syllabus in fifth and sixth year and those who are taking HL are normally allowed to change down to OL at any time. They were given four options: before Christmas in fifth year; before the end of fifth year; before Christmas in sixth year; after mocks in sixth year (mocks are trial LC exams usually held in February or March, the LC is in June). Of those students who changed to OL, the percentage of each group who said that they did not need help with maths are listed in Table 6. There was a statistically significant (Monte Carlo test,  $p=0.005$ ) relationship between when students dropped down to OL and the answers they gave; in general, the later they made the change, the less likely they were to say that they required help.

*4.2 Analysis of Q17 responses: What would encourage students to use the MLSC?*

In Q17, non-attendees were asked to comment on what would encourage them avail of the MLSC. We considered the 665 responses from students whose LC grade was known. There were 269 responses

TABLE 4. Breakdown of answers to Q16 from IoTs based on LC level

Q16 response options	Do not need help	Never heard of the MLC	Did not know where it was	Times do not suit	Embarrassed or afraid to go	Hate Maths	Other reason
No. of HL responses	26	6	5	11	1	2	1
As a % of HL respondents	65%	15%	12.5%	27.5%	2.5%	5%	2.5%
No. of OL responses	124	47	44	85	26	38	15
As a % of OL respondents	47.88%	18.15%	16.99%	32.82%	10.04%	14.67%	5.79%

TABLE 5. Breakdown of answers to Q16 from Universities based on LC Level

Q16 response options	Do not need help	Never heard of the MLC	Did not know where it was	Times do not suit	Embarrassed or afraid to go	Hate Maths	Other reason
No. of HL responses	248	14	50	60	28	20	49
As a % of HL respondents	69.66%	3.93%	14.04%	16.85%	7.87%	5.62%	13.76%
No. of OL responses	81	18	86	126	62	87	64
As a % of OL respondents	23.62%	5.25%	25.07%	36.73%	18.08%	25.36%	18.66%

TABLE 6. Breakdown of answers to Q16 if students had changed LC Level

When changed from HL to OL	Before Christmas in fifth year	Before the end of fifth year	Before Christmas in sixth year	After mocks in sixth year
% who said they did not need help	30.8%	28.3%	32%	59.1%

from HL, 90 from OL A and 306 from OL B1 or lower ( $OL \leq B1$ ). Analysis of the responses placed the majority of the suggestions into two main categories: (1) if they needed help; and (2) comments on MLS structures. When a chi-square test was conducted, the results were statistically significant ( $p < 0.001$ ) showing that the stronger the mathematical background of the student, the more likely that their response would fall into the first category; the weaker the student, the more likely they were to fall into the second category of commenting on MLS structures.

*4.2.1 Analysis using LC Level of Category 1: They would attend if they needed help* Of the 269 responses from HL students, 126 (46.8%) said they would go if they needed help 'If I begin to struggle with my course I'll probably look for help then'. Of the 90 responses from OL A students, 32 (35.6%) said they would go if they needed help 'If I needed the MLSC's services that is encouragement enough for me'. The final 306 responses from the remaining  $OL \leq B1$  students, show that 97 (31.7%) said they would go if they needed help 'If I was failing desperately and could not understand the notes'. Comments given were consistent with comments in Q16.



*4.2.2 Analysis using LC Level of Category 2: Comments on MLS Structures* Comments on MLS structures were considered to have the most potential for providing insights in the context of the main research question, so this category of comments was further analysed to break them down into subcategories. The same three subcategories emerged for each group.

Examining the 269 responses from HL students, there were 113 (42%) comments regarding MLS structures. The main subcategories that emerged were: 28 (10.4 %) referring to the need for further information: ‘Didn’t know when to go or how to ask for help on specific areas’; 25 (9.3%) referred to the opening hours: ‘More hours in place so I could go when it suited my timetable’; and 26 (9.7%) referred to specific services: ‘More user relatable maths, i.e. applicable examples relating to material things makes it more appealing and relatable’.

Examining the 90 responses from OL A students, there were 50 (55.5%) comments regarding MLS structures. Further breakdown revealed that: 24 (26.7 %) referred to the need for further information: ‘More information available because I don’t actually know what they do’; 10 (11.1%) referred to opening hours: ‘More hours for it to open; more workshops instead of just once a week as I would definitely go’; and 8 (8.9 %) referred to specific services: ‘If they have certain timetables for different groups so you’re not arriving in with final year students who need it more than myself’.

Examining the 306 responses from the remaining  $OL \leq B1$  students, there were 189 (61.8%) comments regarding MLS structures. Further analysis revealed that: 55 (18%) referred to additional information: ‘If we were told about them more and knew when they were on’; 46 (15%) referred to opening hours: ‘The support tutorials could be on earlier. The MLSC should be opened all the time so I might avail of its services’; and 39 (12.7%) referred to specific services: ‘If they did a time for a certain year, for instance, Semester two maths for marketing management at 3pm today’.

*4.2.3 Other categories of responses to Q17* The majority of the remaining comments on what would encourage students to attend fell into six categories: Feedback ‘Positive feedback from friends who have used the MLSC would encourage me to go if needed’; Friends/Groups ‘If my friends had problems also with maths and we went as a group for help’; Tutors ‘Friendly tutors who are helpful and patient’; Coursework/Lecturer ‘I would not understand some part of maths/the lecturer would be terrible’; Rewards ‘If you got a percentage of final grade for going’; and Motivation ‘It comes down to my attitude towards maths; I always feel defeated by it so don’t feel enthusiastic about doing it’.

## 5. Conclusion

In this article, student responses to a national survey on MLS were considered, the first survey of this kind. We focussed on students who had not engaged with MLS, and their responses to two questions on MLS, Q16 and Q17 which sought respectively to explore reasons for non-engagement with MLS and to elicit suggestions from non-attendees to MLS as to what might encourage them to attend. Notwithstanding the fact that this very broad cohort of students came from nine different HEIs, with different entry requirements, different service mathematics courses and different levels and types of MLS provision, our preliminary analysis of the data has given a unique and valuable insight into the issue of non-engagement with MLS on a national basis. The results are consistent with results found elsewhere in smaller studies and in individual institutions, and so the outcomes will provide possibly beneficial insights to the wider MLS and mathematics education community.

There are issues with non-attendance and lack of engagement with mathematics in general (Lawson *et al.*, 2001; Gill *et al.*, 2010), MLS is not unique in this respect. In considering responses to Q16, the analysis conducted through this survey found that the main reason given by students for

non-engagement was that they did not need help. When these responses were further investigated, breaking down the mathematical levels and grades, type of HEI attended and when students changed from HL to OL (if they had done so), the analysis shows that the better the mathematical background of the student, the more likely they were to give this response. However, a minority of students with a weak mathematical background also said that they did not need help, which is consistent with existing research (Pell & Croft, 2008; Mac an Bhaird *et al.*, 2009).

Most of the remaining comments were categorized as being to do with the structures of MLS such as a lack of information, unsuitable opening hours or suggestions on how specific services could be provided. The weaker the mathematical background of the student, the more likely they were to make these observations. These comments are consistent with other studies (Symonds, 2008; Grehan, 2013), though Symonds questions if the reasons given by the students are valid and she observed that many of those students who did not overcome these barriers were 'at-risk' and lacked motivation to engage with mathematics and mathematics support. Symonds postulated that because 'at-risk' students were unwilling to attend a drop-in centre (students must decide to attend themselves) that a more proactive approach might have worked better with such students.

Analysis of the responses to Q17 in which students were asked to indicate what would encourage them to avail of MLS indicates that the stronger the mathematical background of students, the more likely they were to say that they would avail of help if needed, whereas the weaker the student, the more likely they made suggestions on MLS structures. While it is difficult to generalize at this stage, there may appear to be some issues with how MLSCs are advertising their services to students, particularly the weaker students. However, if these issues are addressed, it may not necessarily increase engagement levels significantly:

Such students were able to overcome these barriers in order to avail themselves of the support facilities. This poses the question: would simply implementing the above suggestions (advertising, actively seeking out students who need help, staff changes) be enough to improve the uptake of support amongst failing students? (Symonds, 2008, p. 140)

These issues (and others) are dealt with extensively in the 2012 *sigma* report on setting up MLSCs (Mac an Bhaird & Lawson, 2012), with a section on how different types of MLS should be publicized. The initial analysis of the data from the IMLSN survey, and some students' suggestions, strongly support the recommendation that there should be an increased collaboration between those teaching mathematics in HEIs and those providing MLS. Students are often unaware that they need help, so recommendations from members of staff, or indeed fellow students, to avail of MLS can have an influence. It is important that students are made aware of the positive impact that attending MLSCs can have on them, in terms of their grades and their progression.

We continue to analyse the wealth of data that has been generated from the national survey and should generate several more insights and recommendations. A separate paper (Ní Fhloinn *et al.*, 2013) considers gender differences in responses to the survey. For example, in response to Q16, they found that among non-attendees, males were more likely than females to say that they did not need help, but females were more likely (than males) to say that they did not know the location of the MLSC. Part of the future work is to continue with the Grounded Theory analysis of responses to see if further patterns and subcategories emerge, and also to break down the comments and recommendations based on the HEI attended, to get a clearer picture of what is going on in each individual HEI. Another particular avenue of exploration will be the investigation of the responses which mentioned fear or embarrassment and issues of personal motivation, which though these are low in this survey, require further investigation as they are a major factor in other studies (Hannula 2006; Grehan, 2013).

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## Appendix A: Mathematics Support Survey

We are looking for your feedback on the Mathematics Support Centre (MSC) and its services. This evaluation is designed to help us to improve the MSC for you and other students. Even if you have not used the MSC's services, your feedback is important.

### Section A

- Degree Programme:
- Year: **Certificate**   **1<sup>st</sup> year**   **2<sup>nd</sup> year**   **3<sup>rd</sup> year**   **4<sup>th</sup> year**   **Postgrad**  
 Student Category:      **Full-time**              **Part-time**
- Gender:                              **Male**                              **Female**
- Leaving Certificate Mathematics Level (if applicable):  
    **Higher**                      **Ordinary**                      **Foundation**                      **Other**
- Leaving Certificate Mathematics Grade (if applicable):  
**Leaving Cert 1991 or before:**    A    B    C    D    E    Other  
**1992 or after:**    A1   A2   B1   B2   B3   C1   C2   C3   D1   D2   D3    Other
- If you started off doing Leaving Certificate Higher Level Mathematics, but changed to Ordinary Level, roughly when did that happen? (Please circle)  
                                  **Before Christmas in 5<sup>th</sup> year**                      **Before the end of 5<sup>th</sup> year**  
                                  **Before Christmas in 6<sup>th</sup> year**                      **After the Mocks in 6<sup>th</sup> year**                      **N/A**
- Are you registered as a mature student?                              **Yes**                      **No**
- Have you used any of the Maths Support Centre's services (drop-in centre, support workshops, online courses)?                              **Yes**                      **No**

If **YES**, please proceed to **Section B**. If **NO**, please proceed to **Section C**

### Section B (Students who used the MSC)

- Why did you first decide to use the MSC or its services?
- Being as honest as you can, rate the following services that you have used on a scale of 1 to 5 where 1 = Not at all Worthwhile and 5 = Extremely Worthwhile

#### Drop-In Centre

1            2            3            4            5            N/A

Comments/Suggestions: \_\_\_\_\_

#### Online Courses

1            2            3            4            5            N/A

Comments/Suggestions: \_\_\_\_\_

#### Workshops

1            2            3            4            5            N/A

Comments/Suggestions: \_\_\_\_\_

- Did you ever consider dropping out of your course/college because of mathematical difficulties?                              **Yes**                      **No**

Comments: \_\_\_\_\_

12. If yes, has the MSC influenced your decision not to drop out? **Yes** **No**

**Comments:** \_\_\_\_\_

13. Rate how the MSC has helped your confidence in maths on a scale of 1 to 5 where **1 = Not at all Helpful** and **5 = Extremely Helpful**.

1            2            3            4            5            N/A

**Comments:** \_\_\_\_\_

14. Rate how the MSC has impacted on your maths performance (in exams/tests) so far on a scale of 1 to 5 where **1 = No impact at all** and **5 = Has had a large impact**.

1            2            3            4            5            N/A

**Comments:** \_\_\_\_\_

15. Having used some of the MSC's services, rate on a scale of 1 to 5 how you feel the MSC has helped you cope with the mathematical demands of your course where **1 = No help at all** and **5 = Has been a huge help**.

1            2            3            4            5            N/A

**Comments:** \_\_\_\_\_

#### **Section C (Students who did not use the MSC)**

16. If you did not use the MSC, why not? Tick as many reasons as apply:

- I do not need help with Maths
- I never heard of the Mathematics Support Centre
- I did not know where it was
- The times do not suit me
- I was afraid or embarrassed to go
- I hate Maths
- Other (please specify)

**Comments:** \_\_\_\_\_

17. What would encourage you to use the MSC and its services if you needed to?

**Ciarán Mac an Bhaird** received his PhD in Mathematics from NUIM. He has been Manager of the Mathematics Support Centre and a lecturer in the Mathematics and Statistics Department since 2007. He is a committee member of the Irish Mathematics Learning Support Network (IMLSN) and conducts research in Mathematics Education, the History of Mathematics and Algebraic Number Theory.

**Olivia Fitzmaurice** is a lecturer of Mathematics Education at UL. She is a member of the National Centre for Excellence in Mathematics and Science Teaching and Learning (NCE-MSTL), Director of the Mathematics Learning Centre at UL and committee member of the IMLSN. She conducts research in Mathematics Education.



**Eabhnat Ní Fhloinn** is the Director of the Mathematics Learning Centre and lecturer in the School of Mathematical Sciences at DCU. She is a committee member of the IMLSN, and her research interests are in the areas of transition from second level to higher education Mathematics, Mathematics Support and Engineering Mathematics Education.

**Ciarán O'Sullivan** received his MSc in Mathematical Science from UCD and his Higher Diploma in Education from TCD. He has been mathematics educator for 29 years and has been a Mathematics lecturer in the Institute of Technology Tallaght since 1998. He is Chairperson of the IMLSN and conducts research in Mathematics Education and Mathematics as a vehicle for civic engagement.