Promoting Student Engagement with Mathematics Support

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Abstract

This paper reports the findings of qualitative research undertaken to seek to identify the key reasons why students are not engaging with mathematics support provided by Loughborough University. The research involved a number of focus groups and "on the spot" interviews with 'non-users' from across the campus. Barriers identified included a lack of awareness of the location of support and a fear of embarrassment. Further interviews were conducted with regular users of the support in an attempt to understand how some of these barriers to usage might be overcome. The paper will discuss actions that may be taken to improve student engagement with mathematics support and the issue of how student motivation may affect such action.

Background

It is widely accepted that there has been a decline in the mathematical preparedness of students on entry to universities in the UK and that many students embarking on a degree course lack some basic mathematical skills (L.M.S., I.M.A. & R.S.S. (1995), Sutherland & Pozzi (1995)). A strategy adopted by many universities to respond to this is the establishment of a mathematics support centre, whereby learning support is offered to students, which is additional to that provided by their normal teaching. In 2004, Perkin and Croft (2004) found that 66 out of 106 universities questioned provided mathematics support.

At Loughborough University mathematics support is offered by the Mathematics Learning Support Centre (MLSC). It provides a wide range of support mechanisms including one-to-one support on a drop-in basis, paper-based handouts and computer-based material. As a result of the MLSC's success in supporting students and similar work at Coventry University, both Loughborough University and Coventry University were jointly awarded Centre for Excellence in Teaching and Learning (CETL) status in 2005. A new centre, **sigma**, has been established between the two universities and the funding that the CETL award brings is currently being used to expand and enhance the provision of mathematics and statistics support.

Introduction

The MLSC at Loughborough University is highly valued by staff and students and recognised as an integral part of the University (Croft (2000)). The success of the MLSC is evident through its popularity amongst students, with 3926 visits recorded in 2005/6 (Mathematics Education Centre (2006)). However, analysis of recent MLSC usage data has revealed that a large proportion of Science and Engineering students who need mathematics support are not using the centre. In particular, data from 2005/6

reveals that of 626 Engineering and Physics students taking a first year mathematics module, 96 failed at the first attempt. Of those who had failed, it was found that over 90% (or 87 students) had never, or very rarely, accessed the extensive support available via the MLSC. Support provided by the MLSC requires students to be *proactive* and take the initiative in accessing the support available. Consequently, if students are unaware of their weaknesses or lack motivation to seek support, then the support will remain unused. Therefore, it is essential that the reasons behind the lack of uptake of support are identified so that appropriate action can be taken to improve it.

This paper will describe a study conducted in the academic year 2006/7 which sought to identify the reasons why these failing students do not use the MLSC. It will give details of the study itself including the participants and the methodology used. Data from the focus group and interviews will then be analysed and the results of these will be discussed in detail. The paper will then use these findings to suggest possible action to improve the lack of uptake of support.

The Study

Methodology – Phase 1

In the first stage of this research, undergraduate students from Loughborough University who had failed a mathematics module during their first year (in 2005/6 and 2006/7) *and* who had never or rarely used the MLSC were targeted. 179 students met these requirements and were contacted via e-mail (on three separate occasions). Seven students responded, and they were interviewed individually, in a group setting or via a focus group. All sessions were led by one of the authors of this paper, Symonds, and the discussions were recorded using a digital voice recorder.

To obtain additional data, "on the spot" interviews were conducted with a variety of students across the university campus. Students were recruited on three separate occasions and from two locations, namely the Students' Union and the campus library. 85 students (who had a mathematical component in their course) were questioned in this manner, of which 10 met the original requirements (and so were part of the 179 targeted students). Of the remaining 75 students, 60 had never or rarely used the centre but had passed their mathematics module, two had used the centre but failed their mathematics module and 13 had used the centre and passed their mathematics module. For all 85 students, their responses were recorded in writing by the same author.

Methodology – Phase 2

The second stage of the research was conducted in a similar manner. Students who were identified as being regular users of the centre (10 or more visits) in 2006/7 were targeted. 105 students met these requirements. However, 27 of these students were no longer studying at Loughborough University. The remaining 78 students were contacted via e-mail, and nine responded.

A further eight participants were recruited by approaching students in the MLSC on

several occasions. The seventeen students were interviewed individually (by the same author, Symonds) and all sessions were recorded using a digital voice recorder.

Barriers preventing students using the centre

Analysis of the Phase 1 data reveals that a number of factors may have contributed to the lack of uptake of mathematics support by failing students. Theses reasons can be seen in Table 1 below. A more detailed discussion of these reasons is presented in Symonds, Lawson & Robinson (2007).

Reason	Total number of responses (77)			
	Focus Group / Interviews	"On the spot" Interviews		Tot.
	Non-user and failed (7)	Non-user and failed (10)	Non-user and passed (60)	
Lack of awareness of the location of the MLSC	4	2	21	**27**
Lack of awareness of the facilities available in the MLSC	0	4	17	**21**
Lack of awareness of the need of mathematics support	8	0	10	**18**
Too many problems that need addressing	2	0	0	**2**
Fear of embarrassment / intimidation / demoralisation	5	4	10	**19**
Mathematics support perceived as not appropriate for non-STEM* students	0	0	8	**8**

* STEM covers science, technology and engineering and mathematics

Table 1: Reasons given for non-use of the MLSC

It can be seen that some of the barriers preventing students from using the centre are relatively 'simple', for example a lack of awareness of the location of the MLSC. Although the centre is regularly advertised, it appears that many students are still unaware of its location and, therefore, do not access its support facilities. However, there also appear to be more complicated issues that act as a barrier. In particular, the data reveals that many students do not appear to be monitoring or directing their own learning and, consequently, they are unaware that they need support. From the focus group and interview data it appears that this is caused by two main factors. The first is a lack of motivation by the students. The second is that students are failing to manage their time effectively in order to cope with the demands and workload of their courses.

How regular users overcome barriers

To understand how some of the barriers discussed above might be overcome, regular users of the centre were asked specifically if these barriers had influenced their usage. A

discussion of their responses is given below.

Lack of awareness of the MLSC's location and its facilities

For the majority of the regular users (12 out of 17) awareness of the MSLC was not an issue, they had already known where it was before they needed to use it. Those from the Mathematics and Physics departments indicated that they were aware of the MLSC's location because the centre is within their department building and so they pass it on a day-to-day basis when attending their lecture/tutorial sessions. Others were aware of its location due to the rigorous advertising of the centre.

The five students who felt that they did have to overcome this barrier said that they had actively sought out the MLSC's location - they took the initiative to find the centre. These students regarded themselves as generally motivated individuals and so when they felt the need for mathematics support, they went out to find the centre.

In terms of awareness of the MLSC's facilities and resources, 14 students agreed they had not known such details about the centre before they had used it. However, these students felt that this was not a barrier, since they were aware that some type of support in mathematics was available and this information was enough to motivate them to investigate the centre.

Lack of awareness of the need for help

The 17 regular users of the centre were asked if they were ever unaware of their need for mathematics support, which may have prevented them from using the centre at some point. The majority of the students (15) expressed that this was never the case. Their responses indicated that the students interviewed were academically engaged and motivated, since they had attended their lectures/tutorials regularly and had frequently completed problem sheets. This suggests that, unlike the non-users of the centre, these students were monitoring and directing their own learning and were aware of the need for help. In addition, five of the students said that since they had felt weak in mathematics during their prior education, they were aware that they would need support at university and had therefore intended to use the MLSC from the outset.

Too many problems

For most regular users this was not an issue. There were two students who had at times felt that the amount of problems they were encountering was overwhelming. However, unlike the non-users, this had motivated them to seek out help from the MLSC as they felt that without it they would undoubtedly fail. These students indicated that once they had made their first visit they had felt welcome to come back with their problems, despite being behind in their work.

Perceived to be not appropriate for non-STEM students

Of the 17 students interviewed, only four were from non-STEM departments. Of these

four, three students indicated that initially they had felt that the centre was not for them because of their discipline. These students overcame this barrier largely due to encouragement from MLSC staff and friends. In particular, all three students said that a tutor from the centre had advertised the centre during one of their lecture slots, encouraging students from their department to use the support. It was also indicated by the students that they had felt it was easier to come to the centre with a group of friends, since these provided moral support.

Embarrassment, intimidation and demoralisation

Only four students felt that they had had to overcome feelings of embarrassment before using the centre. They had initially felt too intimidated to ask for support but their need for help and the advantages of receiving the support outweighed their misgivings. In particular, such students felt that the pressure of the amount of work and the fear of failure were more important to them than feeling embarrassed. Two of the students also indicated that the encouragement of a friend helped them to overcome such feelings.

The remaining 13 students said that they did not mind asking for help for a number of reasons. Some students were familiar in asking and receiving extra support from their experience prior to university. Others indicated that they preferred to ask for help from a tutor in the centre, since they perceived the MLSC staff as more friendly and approachable than their own lecturers.

Discussion

From student feedback, at face value there are a number of straightforward explanations as to why some students are not accessing the support provided by the MLSC. Based on these reasons, as outlined above, we suggest that the MLSC needs a more extensive advertising campaign to engage students in using the support facilities. In a previous paper (Symonds, Lawson & Robinson (2007)), possible suggested action to improve the uptake of support included increased advertising via posters, leaflets and lecturer recommendation (particularly within non-STEM departments), actively seeking out students who need mathematics support and recruiting staff members who are familiar to the students (lecturers from other departments, besides Mathematics, and post-graduate helpers).

However, analysis of the responses from the regular users indicates that such reasons had initially prevented a number of these students from using the centre. Nonetheless, these 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 be enough to improve the uptake of support amongst failing students?

A common theme that emerged from the analysis of the regular users' responses was that of motivation and engagement. Generally, students who use the centre regularly tend to be frequently attending timetabled lecture and tutorial sessions and regularly monitoring their own learning by completing problem sheets. Consequently they are aware of any mathematics difficulties and the need of support.

In addition such students are motivated to seek help by a desire to improve their performance. These students are aware that they must work hard to achieve their goals; indeed, many aspire to the top grades. Whilst, on one level, all the students interviewed wanted to pass their mathematics module, among the non-users of the centre, it appears that their motivation to pass was not enough to make them take action.

In terms of encouraging students to use mathematics support, the issue of motivation needs to be considered. If a student is not intrinsically motivated then it may be possible to provide extrinsic motivation. Since the desire to succeed does not seem to be a sufficiently strong extrinsic factor in improving engagement with the support provided, then we must consider alternative methods of extrinsically motivating students. Such methods could involve changing the general teaching approach of mathematics, for example by introducing problem-based learning (Pedersen (2003), Bragg (2005)) or an inquiry-based approach (Crabtree (2004)) which are claimed to significantly enhancement motivation and engagement.

It is acknowledged that further research is needed to investigate if such action would be successful in motivating students to engage with mathematics support. Our findings suggest that simple actions (such as improved advertising) could bring some improvement in the uptake of support; however, for many students the reasons for not accessing the support are complex and need deeper analysis.

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