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MONITORING STUDENTS' ENGAGEMENT WITH MATHEMATICS AT THIRD LEVEL

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In this paper we will give an overview of a monitoring scheme that was set up in the 2010-11 academic year by the Department of Mathematics and Statistics at the National University of Ireland Maynooth. We monitored first year students' submission of assignments, their attendance at tutorials and their engagement with an online mathematics proficiency course. Students who failed to engage appropriately were contacted by the department. The contact was initially by email, but then progressed to a letter from the head of department, and onto a meeting with a member of staff for students who continued with their pattern of non-engagement. We will discuss the background to this scheme, and how the monitoring project operated. We will look at the effectiveness of the scheme by analysing its impact on students' levels and quality of engagement. In particular we will present evidence that the monitoring scheme has significantly increased levels of engagement.

INTRODUCTION

Most universities have introduced supports for first year mathematics students; these supports often take the form of small group tutorials, drop-in centres, or remedial courses. These supports are resource intensive and therefore it is sensible to investigate their effectiveness. Research on this topic has shown (Lee *et al*, 2007; Mac an Bhaird *et al*, 2009) that such supports can have a positive impact on the retention of students and on their grades. However, as highlighted in both Pell and Croft (2008) and Mac an Bhaird *et al* (2009), it is often the case that the students who are most in need of help with mathematics do not use these support systems.

There have been some studies of interventions that try to address university students' engagement levels. Richie and Hargrove (2004) report on the impact of a scheme where students with low levels of lecture attendance were contacted by telephone. When compared to students in the control group (who had similar levels of attendance but who were not contacted), students in the intervention group displayed fewer absences, better grades and a higher rate of retention into the next year. Hudson (2005) describes the implementation of a pilot 'early alert warning system' at a US university. The project monitored first year absenteeism using a web-based recording system, and students with high levels of absenteeism were subsequently contacted. Students who were contacted responded positively, and the project appears to have improved retention. Indeed, a recent report on college retention (Lotkowski *et al,* 2004) listed as one of its recommendations that colleges and universities should "Implement an early alert, assessment, and monitoring system based on…attendance records..."

In an effort to increase attendance at tutorials as well as assignment submission rates, the Department of Mathematics and Statistics at NUIM initiated a monitoring scheme in the academic year 2010/11. Students who consistently missed tutorials or failed to submit assignments were contacted by the first author via email. If the behaviour persisted, the students were sent a letter asking them to meet the course coordinator and if they still did not engage they were contacted by the head of department. In this paper, we will describe the scheme in detail. We will also evaluate the impact of the scheme by comparing

engagement levels of students in 2010/11 with those of students in 2009/10 when no such scheme was in place.

THE MONITORING SCHEME

At the National University of Ireland Maynooth (NUIM) first year mathematics students are taught in large group lectures supported by small group tutorials. In addition, students submit assignments each week; these assignments are graded and returned in tutorials. Each tutor is responsible for keeping accurate records of assignment grades and tutorial attendance for each of their tutorial groups.

The monitor (first author) was given access to these records on a weekly basis and created her own record system containing data pertaining to all the first year students. She used this data to monitor the students' engagement with the tutorial and assignment system. Prior to the commencement of the project, the authors decided that any of the following constituted a lack of engagement with the tutorial/assignment system: a student missing two tutorials in a row; a student missing two assignments in a row; or a student missing one tutorial and one assignment in the same week. The monitor was also given access to the departmental file containing medical certificates from students that excused them from missing any tutorials or assignments, which she noted on her records. These excused absences were taken into account when looking at students' engagement with the system.

There were three levels of communication sent out by the monitor to students who were not engaging with the tutorial system; the precise details of each communication were decided upon by the authors at the start of the project. When a student was seen not to be engaging for the first time, they were sent an e-mail by the monitor. The e-mail pointed out the importance of tutorials and assignments and urged the student to address the fact that they were not engaging. It also reminded them of all the free supports available to them. If their behaviour continued, the monitor sent the student a letter from the department which again reminded them of the importance of engaging and also requested them to meet with their course co-ordinator. If, after receiving this letter, the student still did not engage, then they were sent a second, stronger letter. This letter was similar to the previous letter but written in a much stronger manner and signed by the head of department. If a student continued their pattern of non-engagement after receiving the second stronger letter, then they were not sent any further communication in that semester.

This process was repeated in semester 2 and all registered students started with a clean slate. Any communication a student may have received in semester 1 had no bearing on communications sent in semester 2. Many of the students replied to the communications that they received and either admitted to their lack of engagement and gave an explanation saying they would try to do better, or they challenged the contents of the communication. In all cases these were referred to the second author, who would reply to students' individually and stress that the monitoring scheme was for the students' benefit; he would also address any other points that the students raised. A similar monitoring scheme was implemented in order to increase engagement with a non-compulsory online mathematics proficiency course, and this is reported on in detail in Burke *et al* (2012).

RESULTS

We will consider the impact of the monitoring scheme on attendance levels and submission rates by comparing the behaviour of students in the year 2010/11 (when the scheme was in operation) to their counterparts in 2009/10 (when there was no effort to

contact students who were not engaging). In 2010/11 there were 536 students registered for mathematics modules in semester 1 and 533 in semester 2. In 2009/10 the numbers were 556 in semester 1 and 519 in semester 2.

Table 1 below shows the numbers of students who were contacted in 2010/11 and the numbers who would have been contacted in 2009/10 if the scheme had been in operation.

Table 1: Highest type of correspondence received over the course of the year.

Year	No Contact	Email	First letter	Stronger Letter	Total
2009/10	291 (51.2%)	109 (19.2%)	47 (8.3%)	121 (21.3%)	568
2010/11	332 (61.1%)	121 (22.3%)	40 (7.4%)	50 (9.2%)	543

The highest level of contact is not independent of the year (chi-square test, $p<0.001$) with students in 2009/10 being more likely to have higher levels of contact from the monitor than students in 2010/11. This indicates that there were more students in 2009/10 (when the monitoring scheme was not in operation) who failed to attend tutorials or submit assignments on a regular basis.

If we compare the engagement levels of students in 2010/11 who were contacted (either by email or letter) with those of the students in 2009/10 who would have been contacted had the monitoring scheme been in place, we see that there is a significant difference between the mean number of assignments submitted in Semester 1 (t-test, p=0.007), and in the number of tutorials attended (t-test, p=0.002). In both cases, the mean is significantly higher for the 2010/11 group.

DISCUSSION

The results presented here suggest that the monitoring scheme has had a positive impact on engagement levels. More than 20% of students in the year 2009/10 (when the scheme was not in place) displayed persistently low levels of engagement however this figure halved after the implementation of our scheme. Both the tutorial attendance and assignment submission rates increased significantly in 2010/11. It was seen in a study of engagement with an online course carried out by Burke *et al* (2012) that students who do not engage at the beginning of a course are very unlikely to change their behaviour patterns later unless some outside intervention takes place. It is our belief that monitoring schemes such as the one described here have a role to play in smoothing the transition from school to university for first year undergraduate students and in improving student retention.

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