WORKSHOP REPORT

Maximizing the impact of digital supports in Mathematics Learning Support in Higher Education – An overview of the 9th Annual IMLSN Workshop

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Abstract

In this article we give a short description of the 9th Annual Workshop of the Irish Mathematics Learning Support Network (IMLSN). The workshop theme was 'Maximizing the impact of digital supports in Mathematics Learning Support in Higher Education'. We briefly describe the Irish Mathematics Learning Support Network (IMLSN) and outline the factors that motivated this workshop theme. We will also discuss the presentations, some of the issues that were raised during the workshop and we close with some brief conclusions on this very successful event.

Keywords: Digital support, mathematics support, higher education.

1. Introduction

The 9th Annual Workshop of the Irish Mathematics Learning Support Network (IMLSN) Workshop was held in the new Science Centre at University College Dublin (UCD) on Friday May 29th 2015.

Maths Learning Support (MLS) is now an established part of the Higher Education landscape both in Ireland and the UK (Gill et al., 2008; Perkin et al., 2012). As a reflection of the increasing importance of MLS to Irish Higher Educational Institutions (HEIs) an annual workshop on MLS has been held at various locations around Ireland since 2006. These workshops have proven invaluable to the MLS community as a forum for sharing ideas and for disseminating 'best practice' in the field. They have attracted delegates from all over Ireland and the UK. Further information, including some of the presentations, from these workshops can be found on the IMLSN website (IMLSN, 2015).

There were 39 delegates in attendance at the UCD workshop including visitors from Norway (University of Agder), Canada (University of British Columbia), the United States (Stanford University), as well as keynote speakers from the UK (Loughborough University, University of Glasgow, Ulster University and the Open University). There were 18 Irish Higher Education Institutions represented at the workshop. Companies such as Google, Folens and Infonalis were also represented.

The UCD Registrar and Deputy Vice-president Professor Mark Rogers opened the event and he emphasised the importance of ensuring that an evidence-based approach is taken when examining the effectiveness of maths support centres. In particular, he commended the recent large-scale evaluation report of the IMLSN (O'Sullivan et al., 2014) and stressed the importance of inculcating this research culture across the sector.

Professor Rogers recalled the origins of the Maths Support Centre (MSC) at UCD. It originally started in a small, out-of-the way room and its mission was to support students in making the mathematical transition to university. However, as Professor Rogers stated, the centre has developed enormously since then with the MSC's mission in 2015 significantly changed to enhance the mathematical learning of all students throughout the university. He remarked that the seminal moment in the UCD MSC's history was the move to 'centre stage' within the university with the location change to the main campus library in 2013. This location change has meant that not only do the students who need the maths support the most are assisted but that the enhancement of all maths learners across the university is catered for.

The Registrar also spoke about looking to the future and highlighted how maths support has to be cognisant of the needs of the students in the digital space. He highlighted his excitement with the UCD MSC's pilot project of a digital system which provides the lecturers and module coordinators of all students who visit the MSC, with real time anonymous feedback on the mathematical issues their students are experiencing. This ability to affect the learning in the classroom as it is happening because of feedback from the MSC via this digital data management system is of particular interest to him and he is looking forward to seeing this rolled out to the Academic Writing Centre, which is also housed in the Library Link space.

2. Keynote Speakers

2.1. *Chris Sangwin, Loughborough University. Using GeoGebra as a problem solving tool*

In this talk the speaker demonstrated, via an interactive session, how the free software GeoGebra (http://www.geogebra.at) could be used as a dynamic problem-solving tool in mathematics. The speaker outlined how he has used the Moore Method of instruction for many years now and how via GeoGebra, this enables a user to undertake direct experiments in mathematics to test a conjecture or explore some area of mathematics. This is particularly useful in elementary mathematics where simple algebraic expressions and graphs often have a strong interplay. GeoGebra has a potentially very useful role in mathematics support, providing students of all abilities with an opportunity to visualise and experiment. The speaker also reported on experiences of using this software to support a problem solving class with higher achieving students. The speaker ended with some encouraging words to anyone wishing to take the plunge into incorporating mathematical software into their practice; once one is 'willing to play' there are benefits in private maths play, use in lectures, students' presentations and in the maths support centre setting.

Figure 1. Delegates at the IMLSN Workshop

Figure 2. Chris Sangwin presenting an interactive keynote on GeoGebra

2.2. Shazia Ahmed, University of Glasgow. Providing academic support and improving transition into university life through Facebook groups

In this presentation, the speaker outlined an initiative to provide academic support to students through the use of Facebook groups. This initiative was first established four years ago for Level 1 Mathematics and Computing Science students in order to evaluate whether this could be a viable alternative to traditional Peer Assisted Learning (PAL) sessions. The speaker noted that Facebook was chosen over the virtual learning environment Moodle because of the high engagement levels with Facebook among students: in the Digital Native survey in 2011, 89.2% responders stated that they access their Facebook account at least once a day.

The speaker then described the day-to-day workings of these Facebook groups: they are closed groups, which are initiated and moderated by support staff. Senior students are also invited to join, and the speaker noted that their input has proven to be invaluable: they answer questions from junior students, that staff are often unable to answer, helping to alleviate concerns from those beginning university, and continuing to help them throughout their university careers. In addition, these groups are used by students to share questions with each other, and virtual PAL sessions happen spontaneously. Students also share resources, ask when and where lectures and labs are and generally support each other. Many examples of such interactions were included in this presentation as well as feedback from students who had made use of this service. Among the positive points noted in the student feedback was the sense of community that the Facebook groups created.

In the second half of this presentation, the speaker outlined in more detail how the Facebook groups can be used to ease the transition to university. It was noted that there are many entry points into the University of Glasgow, this leads to a diverse student body and gives rise to many transition issues, such as unfamiliarity with formal terminology or commuting large distances to attend university. In order to assist incoming students with these matters, a pre-entry Facebook group for incoming College of Science and Engineering students has been set up. Examples of conversations that arose in this group were given, and it was evident that students find this group to be very useful in coping with these transition issues.

The presentation concluded with the results of a recent evaluation survey involving 4th year students, who were the first cohort where Facebook groups were formally introduced in the manner outlined previously. It was found that the majority of students joined in first year, students found the groups to be very useful academically and the main reason that students gave for not joining the groups that was given was that the students 'didn't know about them'.

2.3. *Madonna Herron, Ulster University. Using pencasts to extend and enrich the student learning experience*

This keynote was on the topic of using pencasts to enrich the learning experience of students in mathematics and engineering programmes at Ulster University. The speaker began by describing the equipment used to create the pencasts, the Livescribe 3 smartpen with Livescribe paper and the Livescribe+ App, which is compatible with the IOS8+ or Android KitKat v4.4.2 operating systems. Some advantages of using pencasts over screencasts were given, such as the ease of use, the portability of the devices and the fact that no editing is required. The speaker also outlined some of the benefits for the students of pencasts, including the ability to provide step-by-step solutions with rich audio explanations, which can be replayed at any time and from any location.

Using screenshots and screencasts the speaker demonstrated the process involved in producing pencasts and noted that the pencasts produced can be emailed to students or uploaded directly to the Blackboard virtual learning environment. It was noted that the screencasts produced by the speaker are used by students in Ulster University for self-directed learning and self-assessment and are also used to provide one-to-one support to students.

One piece of feedback from a student noted that being able to see mathematical operations carried out, with commentary audio, was one of the advantages of pencasts over other study aids, such as textbooks.

The presentation concluded with the observation that while pencasts are a very useful education tool, they do require a significant amount of work and time to create. The speaker gave many useful tips on how best to approach creating a pencast, such as the use of a script or the pre-drawing of some elements of the pencast in advance and stressed the importance of gaining feedback from students, so that the pencasts can continue to be refined.

3. Contributed Speakers

3.1. *Cormac Breen*, Ciaran O Sullivan[1] and Damian Cox[2]. Mathematics Learning Support across a Multi-Campus Institution: A Trial of Virtual Support*

In this presentation, the speaker outlined a study that was undertaken across three institutions intending to form the Technological University for Dublin: Dublin Institute of Technology (DIT)*, Institute of Technology Blanchardstown[2] and Institute of Technology Tallaght[1]. This study consisted of a survey that was circulated to both staff and students in each of the three institutes. This survey was an attempt to identify the students' needs for Mathematics Learning Support (MLS) in each of the institutes as well as the preferred method of provision of MLS, on a scale ranging from exclusively online to exclusively in person. The main results of the survey were that the majority of staff (71%) and students (69%) surveyed were in favour of having MLS provided either exclusively or mostly in person. There was a strong preference among both staff (66%) and students (50%) that some portion of this MLS be provided online. Another notable result of the survey was the difference in opinion between staff and students on the topic that students would most need MLS with. Students across the three institutes picked Calculus as the main topic, while staff selected Basic Algebra. The speaker noted that this resonates with tutors' experiences in MLS centres, where students often present with what they believe is a Calculus problem, but they are actually struggling with the underlying algebra.

The speaker then went on to describe a virtual drop-in service that, as a result of the outcomes of the survey, was introduced on a trial basis across the three institutes. The speaker outlined the

technology used, Wacom Intuos Tablets and the Adobe Connect software package. Students in one institute were, using the Wacom Intuos Tablets, able to pose a question on a shared virtual whiteboard in Adobe Connect. The tutor, in another institute, was then able to respond to that question on the same whiteboard and students could have screenshots of the whiteboard sent to their email account. The feedback from the students was quite positive to the concept of virtual drop-in, mostly for the flexibility (both geographical and temporal) that it offered, but were concerned that technical issues, such as a bad connection, could discourage students from making use of the service. The speaker concluded by stating that more trials are planned for the summer, with the aim of having the service running on a wider basis by September 2015.

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3.2. *Nuala Curley, UCD. To collect and analyse useful qualitative data on mathematical difficulties as experienced by students in a Mathematics Support Centre – A challenge?*

This speaker, a PhD student in mathematics education from UCD, spoke about the challenges in collecting and analysing detailed qualitative feedback data generated at a busy maths support centre. The mathematical topic covered by the tutor is available to the module lecturer on a real-time basis.

The speaker explained that in order to identify the mathematical topics and concepts that cause persistent difficulties for students she needed to identify the nature of the data required and then find ways that this could be recorded efficiently. She described her efforts, and those of the maths support tutors, over the last eighteen months to collect this data. The collection period involved eight weeks of intensive collaborative work with 23 tutors to ensure the quality and authenticity of the data collected. The purpose of this research is to identify university students' mathematical 'trouble-spots' in a maths support centre setting and to develop effective supports. Initial details of the research project are described in Curley and Meehan (2015).

A more detailed analysis of the data has revealed that even when identifying and classifying basic mathematical difficulties, it makes more sense to do this within the context of a module, rather than across modules. For example, it was surprising that the number of students seeking help with statistics was similar to that for vectors, despite the statistics content being increased in the Leaving Certificate mathematics syllabus (Project Maths) and vectors no longer being included. It is hoped that the data collected, along with feedback from the module coordinator, will in the future help to predict when and where students will require additional support throughout the semester. Further analysis is ongoing.

3.3. *Jack Parte, Jonathan S. Cole*, and Timothy J. Crawford, Queens University Belfast. Development of an app to support learning in A-level maths*

This talk explained a project involved in producing an app for smart devices to enable modernised learning for A-level maths students. Research in a stakeholder school showed that 94% of pupils surveyed within the upper-secondary level owned a smartphone and most owned a tablet also, emphasising the opportunity for using apps to support learning. The app was developed using iBuildApp, an online app-creation programme that requires no programming. Past exam questions and solutions, notes and video tutorials were included and the topic was vectors, identified by teachers as problematic. Pupils generally found the app easy to use and wanted further development. The videos were popular despite this not ranking highly as a preferred method of

revision previously. Teachers were happy for pupils to use the app to supplement their learning, both in the classroom and outside.

Figure 3. Jonathan Cole discussing the use of an app to support A-level mathematics

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3.4. Gerry Golding, The Open University. Virtual Mathematics Support at the Open University

This speaker outlined the virtual mathematics support centre at the Open University (OU), a pilot project under development in Ireland for Irish students studying service mathematics with the OU. Delivered over the Moodle platform, the virtual centre will offer stage one and stage two students, access to digital mathematics support resources, primarily developed by the OU, but supplemented by links to external resources. Using screencasts, wikis, forums, dedicated context based online workshops, and one to one drop in sessions in our OU Live rooms (Blackboard Collaborate), the project aims to complement our new tuition strategy by providing an alternative learning experience for students struggling with mathematics.

4. Conclusions

The workshop closed with a general discussion of various smaller scale initiatives implemented across several Maths Learning Centres in Ireland. These included:

- Assigning homework exercises to maths support visitors - Diarmuid Ó'Sé, IT Carlow;
- Monitoring and engagement of 'at-risk' students - Eabhnat Ní Fhloinn, Dublin City University;
- Creating 'Hot Topics'; specialist sessions on module prerequisites not covered by lecturers but with which a significant minority of a class struggle - Anthony Cronin, UCD;
- The use of Google spreadsheets to track attendance in a maths support setting - Richard Walsh, University of Limerick;
- Student directed support tutorials using online polling - Cormac Breen, DIT;
- The use of Khan Academy in providing targeted online support and as a means of monitoring engagement with resources - Fiona Lawless, Dundalk Institute of Technology.

During a conversation with Shazia Ahmed the local organisers felt it would be of benefit to the maths support communities in both Ireland and Scotland to have a joint Irish and Scottish Maths Support conference in 2016 and the IMLSN committee has broadly welcomed this idea. In general, the workshop was a great success, facilitating the sharing of new ideas and further strengthening the collaborative links that exist between providers of MLS across Ireland, the UK and beyond. Any person interested in viewing these talks can do so from the online video of the day which is hosted on the IMLSN website (IMLSN, 2015).

5. Acknowledgments

6. References

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