Using blended learning to develop and deliver a Science and Engineering Information Literacy programme at NUI Maynooth

Introduction

There is currently a move in Ireland towards developing further fourth-level education initiatives, and as a result there is a heightened awareness of the importance of generic skills, particularly information literacy, for postgraduate researchers (NUIM, 2007a). This is set against the backdrop of an increasing awareness of the potential need for multiple literacies in the online environment both in Higher Education and in the workplace (Unsworth, 2001). As a result of this initiative, the Faculty of Science and Engineering at the National University of Ireland, Maynooth, in conjunction with Library and Learning Technology staff, developed an Information Literacy module for postgraduate researchers in this Faculty which ran in Semester One of the academic year 2007-2008. This module was delivered in a blended learning environment using face-to-face sessions and the Moodle virtual learning environment. This paper discusses the concept of information literacy and its place in fourth level education. It discusses why information literacy is important and situates it in the wider context of higher education. It outlines how content was tailored to the specific information literacy needs of the Science and Engineering Faculty and showcases the content and format of this module. It describes how the different stakeholders within the university collaborated in the design and delivery of the module and presents a timeframe for the design and delivery of this module. Findings, including student data will be shared. This data includes student feedback, engagement in Moodle and statistics from the VLE. We conclude with our future plans for this Module.

Background

In a society dominated by information, access to information and the ability to act upon it is one of the main dimensions to participation (Delanty, 2000:130)

The opportunities now available for interdisciplinary research and cross-country collaboration were unimaginable 30 years ago. Instant communication allows researchers across the world to work in real time on real projects. Researchers have access to thousands of electronic journals and can cross search databases of library journals while within the Library but also from their offices, labs or homes. Never before has so much information been available. A trip to the Library is no longer a necessity as hundreds if not thousands of library resources can now be accessed with the click of a button.
New tools such as Virtual Learning Environments (VLE) are heavily used for teaching purposes allowing higher education providers to offer courses to students off site and often in other countries. Face to face contact while desirable is no longer necessary. The possibility to offer courses to increasing numbers of students is now aided by new technologies. Previously students were taught in classrooms and laboratories while in the future it is likely that they could be taught via video conferencing, computers, TVs and at a distance. In turn their library resources can also be provided online via the library website or within the confines of a VLE.

In light of these developments we are seeing the introduction of a new literacy, information literacy. Information literacy as defined by the American Library Association is the set of skills needed to find, retrieve, analyse and use information. While librarians have always supported users in finding information now more than ever this is seen as a skill not just for higher education but also as something needed for full participation in a democracy. An information literate person is able to think critically, evaluate information and make informed decisions. It has become increasingly clear that students cannot learn everything they need to know in their field of study in a few years of college. Information literacy equips them with some of the critical skills needed to become independent lifelong learners (ALA website). Although a range of interpretations were developed the most accepted one exists since 1989 and was created by the American Library Association (ALA)

To be information literate a person must be able to recognise when information is needed and have the ability to locate, evaluate and use effectively the needed information. Producing such a citizenry will require that schools and the colleges appreciate and integrate the concept of information literacy into their learning programs... Ultimately information literate people are those who have learned to learn. They know how to learn because they know how knowledge is organised, how to find information and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they always find the information needed for any task or decision at hand.

**Critical skills**

Information literacy, lifelong learning and global citizenship are all concepts which are making their way into mission statements, strategic plans, and planning documents in higher education institutions. They are cherished concepts that are viewed as inherently good (Stevens, 2006:537). NUI Maynooth published a new *Teaching and Learning Strategy* in 2007. This Strategy, and the University’s *Strategic Plan* (NUIM, 2005) which informed its development, include the attraction and retention of greater numbers of non-traditional students, international students, and graduate students, as key goals for the institution. Clearly, the development of information literacy and the use of new technologies for learning and teaching are important for these groups. The *Teaching and Learning Strategy* focuses
on how university goals relate to support for teaching and learning. It identifies core objectives all of which have either a direct or indirect connection with information literacy:

- to draw upon the university’s research strengths to enhance teaching;
- to promote and enhance postgraduate education;
- to foster learner autonomy and the empowerment of learners to continue learning throughout their lives;
- to support the professional development of educators;
- to diversify methods, and promote innovation, in teaching, learning and assessment.

(NUIM, 2007b)

Furthermore, two of the four core ‘themes’ of the strategy reflect the concerns of this module in terms of information literacy, and the effective use of technology in learning: these are Theme 2, Developing graduate education, and Theme 3, Fostering access, fostering lifelong learning (NUIM, 2007b).

4th-level Generic Skills Programme Background

The provision of generic skills training within PhD programmes has been recommended by a number of reports over recent years (HEA, 2003). The National Strategy for Science, Technology and Innovation calls for ‘structured, relevant generic and transferable professional skills training enabling the PhDs produced to develop their careers in diverse sectors of the economy, including intellectual property management and commercialisation skills’ (Forfas, 2005). The Irish Universities Association has stated that ‘the new graduate must not only have specialist knowledge in their field, but also have the range of generic competencies’ (IUA, 2005).

The HEA in partnership with the IRCHSS and IRCSET has also published a set of Graduate Education - Key Guiding Principles (HEA, 2006) in which it states that ‘Graduate education programmes must encompass a breadth within and, where appropriate, across disciplines. Graduate Education should enable the provision of generic skills training to all researchers to meet the challenge of interdisciplinary training. The development of transferable skills is key to the formation of successful graduate education programmes’.

In response to these recommendations, in 2006 the Quality Promotion Office in NUI Maynooth commissioned a detailed analysis of postgraduate skills within the University (Fallon, 2006). This analysis included a far-reaching ‘coal-face’ consultation process with the full spectrum of postgraduate education stakeholders and resulted in a very useful set of low-level recommendations for the design and delivery of 4th-level generic skills training. One of these recommendations was that ‘the design of a central programme of skills training should be faculty led, with academic staff deciding on content,
methods of delivery and scheduling’. Having sourced funding through the HEA to develop an appropriate 4th-level generic skills programme, the University acted on the above recommendation by directing this funding to the individual faculties to develop the programme. A key objective of the proposed generic skills programme for the Faculty of Science and Engineering at NUI Maynooth is that it be designed in full compliance with the above HEA Graduate Education Key Guiding Principles (2006) and further that it also act on the recommendations of the Fallon analysis.

While information literacy is usually described a generic skill Australian research into this field indicates that information literacy is more than a generic skill but rather a complex phenomenon. It presents information literacy as a way of understanding the vast experiences expressed by learners in relation to engaging with information for decision making, problem solving and research. The significance of information literacy is in its potential to encourage deep rather than surface learning and in its potential to transform dependant learners into lifelong learners (Bruce, 2002:5). The shifts that need to take place involve movement from a content orientated approach to teaching and learning to a process orientation and also a shift from a teacher centred to a learner centred approach focusing in particular on an emphasis on understanding the perceptual worlds of students and their pedagogical implications (Bruce, 2002:11). The Information Literacy Module designed and delivered at NUI Maynooth was very much learning centred and focused on research needs of the individual students.

**Information Literacy in Higher Education**

*Information literacy education is the catalyst required to transform the information society of today into the learning society of tomorrow* (Bruce, 2002:1).

Australian researchers lead the way on information literacy initiatives and in particular on the role of information literacy within lifelong learning and global citizenship. Bruce’s argument is that many of today’s educators are concerned with creating learning environments that bring Information and Communication Technology into education instead of focusing on the act of information practice and information use. By bringing these information practices into the curriculum and by providing the skills students need to engage with these practices she argues educators can produce information literate lifelong learners and global citizens (Bruce, 2002:4). She also argues that the real strength of information literacy is in providing these skills so that graduates can become self directed learners, and equipped to become lifelong learners fit to take up their civic responsibility.
Making information and information technologies available in this world is not enough. Our education systems need to ensure that today’s learners are empowered to learn and to take their place in the learning society (Bruce, 2002:5)

This rhetoric provides an interesting argument but translating this into reality remains a challenge. However, there are some emerging examples in the literature of how this could happen. Bruce discusses the essence of the changes that need to take place within our educational systems to facilitate this. Her argument centres around moving from the current education paradigm into a more real world centred learning paradigm. In particular she focuses on the “pre-packaged” information provided to learners such as “textbooks, lecture notes and even artificially constrained multimedia resources” (Bruce, 2002:5) and instead suggests that the resources learners engage with should become “more real world information resources” (Bruce, 2002:5). She gives examples of enquiry, problem based and action learning as ways to use real world examples and thus to encourage learners to engage with real world information resources in a critical and meaningful way. By bringing the world into the classroom or the classroom into the world she believes learners can be situated with the larger world and become global citizens.

**Blended Learning in higher education**

Our discussion so far has described information literacy as essential for students in higher education, and particularly those at fourth level undertaking research. However, the challenge of teaching information literacy to disparate groups of graduate students in different subject areas, and at different stages of their work, is significant. In designing a module for graduate students at NUI Maynooth, a combination of face-to-face and online methods appeared to offer the potential to meet at least part of this challenge. Our VLE, Moodle, was used within the classroom and as another dimension of the course outside the classroom. This section describes the rationale for using a blended approach for this module.

‘Blended learning’ is a term frequently used to describe a mix of online and face-to-face methods. Learning technologies and teaching online have traditionally often been associated with distance and part-time courses (Oliver & Dempster, 2003). Campus-based universities have tended to adopt VLEs in accordance with their existing teaching practices in the first instance, rather than redesigning courses to exploit the affordances of new technologies (Kirkup & Kirkwood, 2005). In recent years a number of researchers in e-learning have suggested that technology has not lived up to its potential in higher education (Blin & Munro, 2008). While VLEs in particular have proved convenient and practical as content management systems for lecture notes and course materials, many academics are
wary of investing time and energies in further developing their online courses, particularly if their students are still participating in weekly face-to-face teaching events. Perhaps as a consequence, e-learning practitioners have drawn on the concept of ‘blended learning’ to move away from the somewhat polarised view of online versus offline courses: by removing the emphasis from ‘e-learning’ per se, blended learning suggests that a mix of technologies and teaching methods is possible. Blended learning has therefore gained currency as a shorthand that indicates the potential to mix online learning with classroom teaching (Donnelly, 2008). However, its popularity has also given rise to strong critiques of the term for its perceived vagueness and generality. Oliver and Trigwell (2005) explore a number of definitions of blended learning, challenging each one. Ultimately, though, they suggest that the term has potential if (rather than being a shorthand) it designates a comprehensive approach to course design. Those writing about blended learning, similarly, do not simply suggest that it is a convenient label, nor that the ‘blend’ is an arbitrary one:

> Blended learning has come to describe a well thought-out combination of e-learning and other teaching methods. Many people are now coming to see blended learning as something that has always been there: after all, classroom teaching has always been combined with mentoring, role-playing, coaching, and other techniques/strategies. (Donnelly, in press)

Garrison and Kanuka (2004) propose the design of a course such that there is a pedagogical rationale for the medium to be used at each point, and that assessment and learning outcomes are linked as part of the design process.

> The real test of blended learning is the effective integration of the two main components (face-to-face and Internet technology) such that we are not just adding on to the existing approach or method. This holds true whether it be a face-to-face or a fully Internet-based learning experience. (Garrison and Kanuka 2004:97)

This thoughtful approach to blended learning was the basis for developing the role of the Moodle virtual learning environment in this Information Literacy module. The next section describes the overall design of the module, and the design decisions made as part of the blended learning approach.

**Generic Skills Module at NUI Maynooth**

Building on all the above the Information Literacy Module was delivered over a five week period in November-December 2007. There was a six month lead in to plan the Module with three partners:
Over this time six key Learning Outcomes were identified. These outcomes sit on a framework as defined by the Australian and New Zealand Institute for Information Literacy (ANZIIL):

- Recognise the need for information and determine the nature and extent of the information needed
- Find information effectively and efficiently
- Critically evaluate information and the information seeking process
- Manage information collected or generated
- Apply prior and new information to construct new concepts or create new understandings
- Use information while understanding and acknowledging the cultural, ethical, economic, legal and social

Twelve students attended from across the Departments of Engineering, Biology, Geography and Psychology. All except one were in the first year of the PhD programme. The Module was delivered using a Moodle course space combined with five three-hour-face-to-face hands on classroom sessions. The Moodle course space carried course materials and links to the electronic resources which were the subject of the course, but these were used as part of classroom teaching. It became part of classroom teaching, being used dynamically as additional information and resources were added depending on the discussion and examples arising in class. Students simultaneously accessed the Moodle space using their laptops in class. The Moodle ‘Topic’ spaces were also used dynamically, to include a summary of each session, and advice on work to be undertaken outside teaching times. Discussion Forums were used with focused topics for discussion from the module. Sessions were delivered by the Science and Engineering Subject Librarian with input from the Learning Technologist. Learning activities were open and flexible and were tailored to suit individual researchers’ needs. The key activity was an Annotated Bibliography where each participant had to integrate and customise these learning outcomes to their own subject area by searching, finding, evaluating and referencing material for their own literature review and share their findings with the class.

**Findings**

We found that this model was a rigorous one. There was real engagement in both the face to face and online environments. Students used the “Discussion Forums” to ask questions of the teacher but also of one another. On average all of the participants accessed forums approximately 30 times which over a five week period represents daily engagement. Despite the fact that the course was not compulsory
there was consistent attendance and students commented on how they valued the social aspect of the classes as they did not usually get an opportunity to engage with other PhD students. This may also have contributed to the consistent attendance. The Module was Faculty Specific i.e. aimed at the Faculty of Science & Engineering and the students who attended were from a wide range of disciplines within this Faculty. One student from the Faculty of Social Science attended some of the classes and this was welcomed. As the Module was Faculty specific with small class sizes learning outcomes and activities could be very tailored and focused. Initial discussion with all class members informed how the learning outcomes would be reached via the learning activities. Throughout the classes regular checks were made to ensure that the learning outcomes were being met and also new learning activities were added when appropriate. Many class members thought that further exposure to information literacy at undergraduate level would have been helpful. By closely linking information literacy to discipline specific issues i.e. finding discipline specific information or the value of impact factors and citation reports within a discipline the value of information literacy was more obvious. Also by working closely with teaching staff the Library could ensure the Module’s content was targeted, focused and relevant.

**Student Feedback**

At each session feedback was gathered from students on the session’s learning activities and learning outcomes. At the end of the Module formal feedback was gathered and students which was used to assess the Module and plan for the future. Some quotes from students include:

“I feel that if I’d taken this course at the start of my PhD it would have saved me a lot of time in terms of literature searches and reviews”

“Very useful to help me to find and manage information for the research”

“I went into the course thinking “I am already literate in finding info”. But I was surprised at how much I have gained”

Overall the student experience of the course was very positive and information literacy will continue to remain on the generic skills agenda for the future.
Figure 1: the Information Literacy Module homepage in Moodle

Figure 2: example topic spaces from the Information Literacy Module in Moodle
**Future plans**

In May 2008 the Library was invited to submit a Tender to the Faculty of Science & Engineering for continued inclusion in the provision of Generic Skills. Expressions of interest specified (a) the specific module tendered for; (b) the names of the lecturing staff nominated to develop and deliver the modules; (c) a brief summary of how the module would be delivered. A Committee assessed the tenders and Information Literacy was nominated to continue in the academic year 2008-2009. A new Module titled *Communication Skills* will be delivered in a blended learning environment and will cover information literacy, science communication and writing skills. The Library will be involved in the planning and delivery of the Module, specifically leading on the information literacy element which comprises of six hours face to face teaching. The Module will target PhD students in their second semester and will run twice a year over two semesters.

The Faculty of Social Science and The Faculty of Arts and Humanities are also reviewing the potential of generic skills for their students and the Library is also committed to involvement in their generic skills programmes. Some elements of this model will be useful.

Beyond the next academic year, we would seek to explore the possibilities for developing similar provision for Information Literacy at undergraduate level. This would reflect the other core themes of our *Teaching and Learning Strategy* (NUIM, 2007b), as well as developing the use of blended learning as part of students’ experience at NUI Maynooth. We argue that a twofold benefit would arise from such work, since students would gain information literacy skills but also a richer experience of the VLE.
References

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