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Online Learning in Teacher Education: Enhanced with a Problem-based Learning Approach

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Abstract

This paper describes research undertaken by an academic tutor in a Learning and Teaching Center (LTC) on the design of a module on Online Learning on a Postgraduate Diploma in Third Level Learning and Teaching. The LTC supports academic staff (Faculty) at the Dublin Institute of Technology in learning, teaching and assessment activities, including integrating learning technologies. This work is supplemented by increasing awareness of current national and international research and strategies related to learning and teaching in higher education. The goal of the LTC is to offer resources, consultation, and a forum for discussion to help academic staff provide a valuable learning experience to all students.

This qualification is for lecturers from a range of higher education institutions in the Republic of Ireland. The module is delivered using a problem-based learning (PBL) approach. The lecturers are all currently teaching in a variety of subject disciplines in Higher Education in Ireland and are taking this module on a part-time basis.

The aim of the module is to enable lecturers to become aware of the theories and practicalities of designing, delivering, supporting and evaluating an online course in their own subject discipline. The key to their success is envisaged by using the principles of problem-based learning to share valuable information about online learning with their multidisciplinary peers.

Introduction

The module is one of eight offered on the Postgraduate Diploma in Third Level Learning and Teaching. Attendance for the lecturers on the module is for three hours per week and the module duration is ten weeks. This Postgraduate Diploma is entirely voluntary and only lecturers who are keen to implement novel pedagogical approaches in their own subject disciplines apply for a place on the modules.

The problem-based learning (PBL) approach used involves the lecturers working together typically in a group of six to develop an online module of their own. The beginning point for the PBL group is to work on an authentic problem to justify their decision to deliver a module online rather than by conventional face-to-face methods alone. They then explore the selection of an appropriate structure and mode of supporting the module for a specific target group of students and produce a plan for its design, development and evaluation. Thereafter, they examine how to design appropriate teaching, learning and assessment strategies and develop exemplar online learning materials for delivery within the proposed online module. Finally, developing a cost analysis for the production of the specific online module is included. This latter aspect is important because most colleges and universities feel pressure to do something about online learning and do it soon. But most are finding it very difficult to know what to do or how to do it within their resources and while fulfilling their missions (Sjogren & Fay, 2002).

It is felt strongly by the course team involved in the design of this module, that of equal, if not more so, importance to these group product outcomes, is the development of the PBL group process.

Developing the participants' ability to reflect on their own and their peers' learning through the creation and maintenance of an online reflective journal is a very important aspect of the module.

The Module Design

The module is designed in a blended learning format. The weekly class takes place in a face-to-face learning environment and this is supplemented by online support in order that the participants gain the experience of working and learning of both environments and in a PBL multidisciplinary group. The online learning environment (OLE) used for the support of the learning is WebCT. It provides the PBL group with an opportunity to enhance their group learning.

The aim of the design of the module was for the lecturers to be able to perform various learning activities in an online environment, as a support for their face-to-face sessions. According to Sung (2002), this facilitates the development of web-learning spaces that maximize educational benefits. To ensure that individual and social learning opportunities are complementary, adequate module design is vital.

The transformational use of the computer as a tool for mediation, such as was planned for this module, rather than simply as a mechanism for delivery of content has not been widely implemented (Littlejohn, 2002). This is unsurprising, since many academics have limited experience of ICT for teaching and learning and lack familiarity with current thinking in educational technology. Littlejohn argues that this may lead to severe limitations in course design. He continues by stating that there is a need to offer staff opportunities to gain the skills and knowledge required to incorporate new teaching methods within their course design. Taking all of

this into account, a top-down design is used for the module and icons are developed in the software to reflect this design.

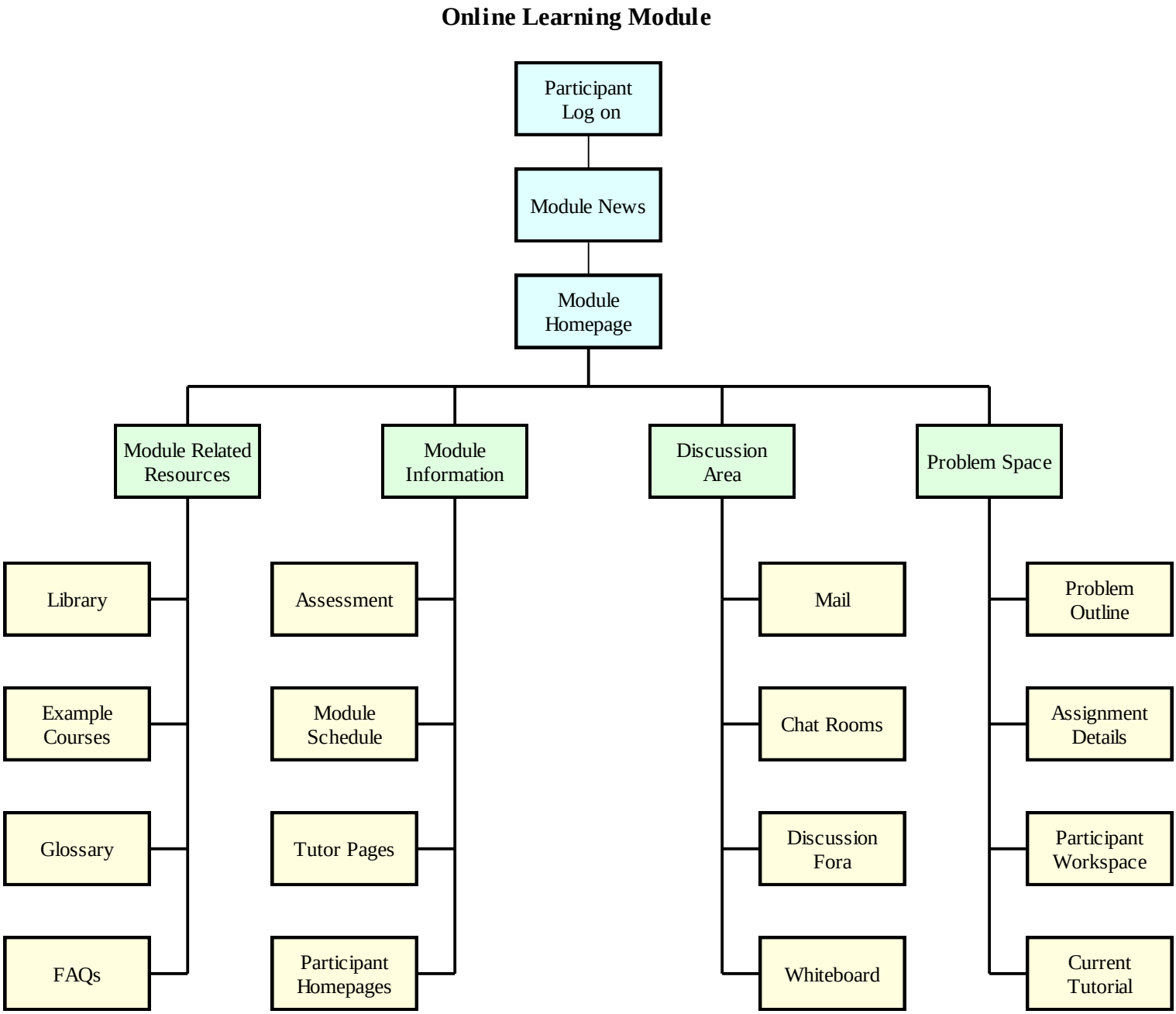

Figure 1 Schema of Online Learning Module

The authentic problem on which the PBL group focus their energies was written to reflect the fact that learning occurs in various ways in the workplace. Often learning occurs as part of a process of endogenous growth (Trentin, 2001), through mechanisms such as trial and error, problem sharing and solving, and informal contacts with peers. Collis & Winnips (2002) advocate that mentoring relationships are important opportunities for learning in the workplace, but generally occur without any reference to a conceptual framework for learning support. They argue that what is often missing is an explicit orientation toward learning from the experiences of the other course participants. An informal peer mentoring system was established within this module to provide such support for those lecturers having problems with the online technology. The mentoring system coupled with the PBL group process itself, was regarded by the module tutor as a vital part of the support to the overall learning process for the lecturers.

Specific communication facilities in the OLE were the main supports for the group process. For the ten weeks duration of the module, the asynchronous discussion (or bulletin) board (or fora) and less frequently, the synchronous chat room, were utilized by the group in the exploration of the authentic problem. Relevant information which individual members of the group unearthed on their various information retrieval jaunts were uploaded to the discussion board for sharing with the whole group. The PBL group then organized a number of synchronous chat sessions, both with and without facilitator support, to discuss pertinent issues about the problem.

The lecturers had all completed a problem-based learning module prior to starting this online learning module. This led the foundations of their knowledge about PBL. They were aware that problem-based learning is centered on a problem which has to engage students' interest, compel

them to take it on as their responsibility, support the development and application of problem-solving and conceptual skills and stimulate self-directed learning into areas of study relevant to the curriculum (Barrows, 1999).

The self-directed learning was an important aspect of the PBL group process. A online library of relevant key articles and reports was initially set up by the module tutor, but this was incrementally developed by the PBL group members themselves as the module progressed, and they discovered further rich resources which deserved sharing with their peers. De Boer & Collis (2002) argue that in higher education learning situations, such submissions become part of the learning resources of others, and is a way to engage students more directly in the learning process as contributors as well as consumers of pre-selected learning materials.

The question can be asked why use an online approach for this module in conjunction with face-to-face teaching sessions, rather than continue allowing the lecturers to work solely in a face-to-face learning environment? Quite simply, the main idea is to provide them with an opportunity to experience online learning as students, and the problem-based learning aspect played an important role in allowing them to experience the benefits of collaboration. The problem-based learning approach used for this module is a motivating way to learn for the lecturers; they are involved in active learning, working with real problems encountered in their everyday teaching.

Prior to the module being designed, an international literature review was conducted on the relationship between online learning and problem-based learning, with the intent to review current research in the two areas individually and in a combined setting. The need to maintain and provide

ubiquitous and individualized teaching and learning support for staff at tertiary level is a growing concern worldwide (Gardner, Sheridan, & White, 2002). Chuang (2002) discussed a teacher-training program that focuses on technology and approaches to learning, amongst others, as a problem-based learning and social-constructivism approach. Similar to this module, participants are involved in small group discussion with some real-world questions that fit with the local context.

The research has also suggested that there are a number of instructional strategies that can be well supported through modern interactive learning environments. Whether it be an individual problem presented on CD-ROM or Web-based collaboration, there are many advocates for problem-based learning as a framework for motivating learners and generating high quality learning outcomes. Problem-based learning is thus particularly suited to assist students towards mastery in a range of generalisable competencies and to support effective adult learning in the cognitive and affective aspects of a course in higher education (Engel in Boud & Feletti, 1991).

The research asserted that technology-mediated learning can play an important role in the problem-solving process (Hedberg, 2000). Although face-to-face collaborative learning techniques have been suggested to enhance the learning experience, it is difficult to incorporate these concepts into courses without requiring students to collaborate outside of class (Ocker & Yaverbaum, 2001). The results of their research indicate that although students preferred to collaborate in the traditional face-to-face manner, they realized the need for and benefit of anytime/anyplace collaboration.

Computer mediated communication including web pages, email and web-based discussion boards have been reported by students using them as assisting in increasing satisfaction with their studies,

decreasing feelings of isolation and providing better support for their learning processes (Geelan & Taylor, 2001). All the findings from this literature review was an important consideration in the design of the module.

Induction to the Online Learning Module

In order to ensure that the lectures enrolled on the module are comfortable with using the necessary technology and are not experiencing access problems, a pre-induction questionnaire is emailed to them to complete. Research has indicated (Grabe & Sigler, 2002) that the potential of online study is diminished depending on the degree of computer skills and student access to computers and the Internet. Liaw (2002) argues that research in the area proposes that in general, the acceptance and use of computers by users appears to be limited due to fear of computers and resistance to new technology.

It is important to establish technology-usage patterns of the lecturers before they start the module. The questionnaire is used to ascertain this in addition to establishing whether they have access to their own PCs at work or at home, in order for technical support issues to be dealt with. The questionnaire also refers to file management requirements. These are established by asking the lecturers if they can create, save and manage files on their PC. Some basic Internet skills are determined by asking them if they know how to attach a file to an email message. All these are pre-requisites for starting the module.

The module begins with an induction week for the lecturers to become familiar with the online learning environment and be introduced to the merits of using a problem-based learning approach

for the module. At the beginning of the induction week, they are provided with a hard copy of an induction pack that provides practical details for logging onto the online learning environment, the online learning environment. They are asked to complete an introductory exercise online, the aim of which is to encourage them to log on and introduce themselves to their peers; they do this by setting up a homepage for themselves. They personalize their profiles online by entering information about their current job, experience to date of using online learning technology, and their other academic interests and research. They are then required to complete an Online Tutorial about using the World Wide Web effectively for research. This is so that they will be in a position to discuss how to search the web for learning resources necessary to explore the authentic problem.

The full induction session then is conducted in a computer laboratory. It is important for the group to physically meet each other in this way to assist with the group bonding process that will be so vital when they will be working together online at a later date. As problem-based learning is the learning that results from a group of people working towards the resolution of a real-life problem, it is important for the group to be fully inducted to the PBL tutorial process. They are given a web site on PBL as a reference to start. The information provided on this web site is then reinforced with a presentation and question and answer session at the face-to-face induction session.

The PBL Group Problem

Throughout these remaining weeks, the lecturers continue to work as a PBL group with the real-life problem dealing with a number of additional issues. The problem asks the participants to submit a written design plan to their head of department, detailing a module they, as a course team within the higher education institution, have identified as suitable for online delivery, with rationale for their choice. This plan is presented to a team of "experts" in online learning for skilled feedback. Taking on board this advice the lecturers work with a web designer to deliver a prototype version of their online module and provide the justification for delivering it is this way.

From the PBL group perspective, the lecturers are encouraged to undertake a range of group roles within both a face-to-face and online discussion boards; developing effective teamwork and self-directed study skills are also important. The face-to-face group discussions are supplemented by a series of online asynchronous discussion board postings and synchronous chat sessions. Two sessions use Desktop Video Conferencing, and two further sessions use "fixed resources". This term is used within the PBL approach on the Postgraduate Diploma to refer to guest speakers. They are invited in by the lecturers in the PBL group to give online and face-to-face guidance on a number of areas relating to the real life problem set. These "experts" were called upon to deliver instruction to the lecturers on design issues for online learning, effective use of video conferencing as a delivery mechanism for teaching and web design.

Problem-based Learning and Assessment of the Module

The assessment for the module is twofold. Firstly, the lecturers are required to make a Group Presentation on their design of a module suitable for delivery online. This is used only for

formative purposes. Byers (2001) promotes the view that interactive assessment is a construct not limited to summative evaluation. It permits important course developments, made in conjunction with the collaboration of the students themselves, while the course is ongoing.

Secondly, the PBL group project is the outcome of working through the problem and this is assessed by the module tutor. The problem is designed to demonstrate the group's higher order thinking and problem-solving skills. Memorizing facts is not sufficient as this module is designed to achieve deeper approach to learning for the participants: they are following the active learning principle of learning by doing. In order to promote the spirit of the group working together to achieve solutions to the problems, they are not allocated grades. They set their own assessment criteria for assessing the group process in the form of self and peer criteria, and a number of Pass/Fail criteria are set by the tutor for assessing the end product, namely the prototype online module designed by the PBL group.

As previously mentioned, the PBL group process is considered to be a central part of the learning in this module. Laurillard (1993) has argued that discussion, interaction, adaptation and reflection are crucial elements in the effective use of technology in education. Where students are given opportunities to discuss and to interact, they can adapt their understandings and reflect upon them. The online reflective journal is an instrument for the lecturers to achieve this over time. Despite caveats about the overwhelming flood of information from the discussion board, there is no doubt that these discussions can be an illuminating place to look for comments of a reflective nature from the module, both from students and tutors (Taylor, Woodman, Summer, & Blake, 2000).

PBL and Collaboration in the Module

(Hicks, Reid, & George, 2001) have outlined the demands on higher education to provide for a larger and more diverse cross-section of the population, to cater for emerging patterns of educational involvement which facilitate lifelong learning and to include technology-based practices in the curriculum. Hall (2002) has discussed the combining of web sites where student support materials such as bulletin boards and course news items co-exist with learning materials, activities and spaces. The hope there, and with this module, is that such web sites will produce a holistic learning experience that promotes co-operation, engagement and involvement for participants.

The issue for those, like ourselves, who are involved in professional development and academic support is how to provide appropriate and timely services that reach the range of students. The role of technology in learning is to provide a flexible learning environment that supports student learning rather than the transmission of ideas for passive use in a highly deterministic educational regime. It is this constructivist approach to teaching and learning which is the critical feature of all successful learning environments.

Interaction is a critical component of constructivist learning environments, whether via the web or in person, because learning occurs in a social context through collaboration, negotiation, debate, and peer review (Grabinger & Dunlap, 2000). This module also follows a constructivist perspective, suggesting that there are three critical components to the online interaction that is taking place in the module. First, an academic (learner-to-content) component occurs when the lecturers access online materials and receive task-oriented feedback from the tutor.

Second, a collaborative (learner-to-learner) component occurs when the lecturers are engaged in discourse, problem-solving, and product-building using the facilities in the online learning environment. This integration component helps them validate their learning experiences, and requires a level of reflective articulation that promotes collective knowledge-building and a deeper personal understanding of what is being studied.

Finally, an interpersonal/social component occurs when the lecturers receive feedback from the tutor or their peers in the form of personal encouragement and motivational assistance. Social interaction can contribute to learner satisfaction and frequency of interaction in an online learning environment. Without the opportunity actively to interact and exchange ideas with each other and the tutor, the lecturer's social as well as cognitive involvement in the learning environment will be diminished.

Conclusion

Several challenges remain in this area despite the substantial promise of web based instruction and other information technologies (Hill, 2002). In addition to the technological challenges such as consistent connections, the pedagogical challenges of dealing with information overload and isolation of learners also exist. It is believed that this module about Online Learning, delivered using a problem-based learning approach, is a move towards creating a community of learners that can "tap levels of energy that otherwise remain dormant" (Manning, Curtis, & McMillen, 1996).

For this module, the exciting features offered by the Online Learning Environment, WebCT, provide a rich supportive environment for learning for the lecturers. It also provides the infrastructure and communication facilities for them to work collaboratively online, as a support to their face-to-face sessions, in a problem-based learning group, giving them a new experience in higher education in this new millennium.

In this era of rapid change, we, as educators increasingly recognize that students must learn how to develop and apply knowledge creatively, not simply remember what they have been told (Wiske, Sick, & Wirsig, 2001). To meet these demands, teachers need professional development opportunities that support them in a transformational process. Online learning and problem-based learning appear to hold promise in overcoming these issues.

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