

Using Interactive Elements Between Disciplines

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Abstract:

A range of web based activities developed for individual and specific learning contexts are described. These learning resources reuse Flash programs which create the interaction and are, essentially, free of subject content.. Working closely with academic staff across the institution, each development is highly specific and contextualised within discipline. The rationale for individual projects and process of specification, design, development and evaluation is described along with examples.

Keywords: multimedia, learning objects.

Interactive Demonstration:

Demonstration of the sample reusable learning objects accompanies this article as a website linked from within the article, also available as a downloadable .zip file (8.07Mb). You will need a web browser with the Macromedia Shockwave plug-in to view these.

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1. Introduction

Multimedia learning technologies can provide a rich interactive learning environment that can be used in scheduled classes, for independent study or distance learning. Multimedia resources are, however, expensive to produce leading to an interest in the development of reusable learning objects (RLOs). Controversy exists over how an RLO may be defined. Koper (2001) provides a review of definitions applied to learning objects, the minimal being "any object that is used to enhance teaching". To be useful a more complex definition is needed which is where controversy develops. Developments within learning technologies follow and are influenced by evolution in the IT industry where component based architecture is increasingly used in programming as there is no point reinventing the wheel. Similarly, within learning technology there is a move away from individual computer aided learning (CAL) packages for isolated use towards the creation and repurposing of simpler learning objects that can be embedded into the curriculum.

Current constructivist models of education acknowledge that learning involves more than the acquisition of knowledge, facts and technical skills. Learners need to use information to construct their own understanding (Palincsar, 1998) to integrate it with their current understanding. Jonassen (2002) identifies a number of educational objectives that should be met to fulfill the requirements of a constructivist learning environment. The environment should provide opportunities for active, constructive, collaborative, intentional, complex, contextual, conversational, and reflective learning. The objects described in this study are specific, they have been developed for a specific reason: to address a particular difficulty arising from current teaching practices or in response to changing student needs as a result of the widening participation and lifelong learning agendas. Each object is embedded and contextualised within the subject and the curriculum, including assessment, modified appropriately to produce a coherent learning experience. However, the templates themselves are the multimedia web instructions, usually with Flash animations, describing the interaction with no subject content, effectively empty boxes. These templates are intended to be simple, attract students and have a strong games influence to motivate students from non-traditional backgrounds to interact with the subject content. All the templates use web technology and are remotely accessible either from websites or a virtual learning environment (VLE) Web-CT in addition to use during timetabled lectures and workshops.

The projects described here represent collaborations between subject specialists, learning technologists and education developers in a range of disciplines across the

university. The development cycle begins through dialogue with academic staff with the aim of identifying specific areas of difficulty in their current teaching. Each development has been designed to address a specific issue: limited contact with teachers due to distance or part-time study, poor motivation, difficulties understanding basic concepts, or the need to reinforce rote learning. Once the problem has been identified, alternative technological solutions are proposed and prototypes built rapidly. Separate evaluations are carried out on the prototype to establish both student and staff reactions to the materials. In some instances, there have been significant discrepancies between the two. For example, at early stages in the specification of a development for community nurses on day release, staff voiced concerns that the students might have low IT skills and have limited access to PCs. Discussions with the students, however, showed that they all had access to a PC and the Internet from home and were confident users with relatively developed IT skills. Once these evaluations have been carried out the materials are revised and re-evaluated in terms of technical performance, student attitude and learning outcomes. A variety of evaluation methods have been used, each appropriate to the development. An iterative process of development and evaluation continues throughout the life-cycle of an object.

London Metropolitan University (LMU) is located in north east London, the majority of students are drawn from the local racially and culturally diverse populations, many are non-native English speakers. Only 12% of students in the business school were standard A-level entrants (QAA Subject Review 2002) and only 25% come from families with previous experience of HE. Many failed during their school education, are overcoming painful experiences and have little self-confidence (Sinfield, Burns and Holley, 2003). These students have to combine study with paid employment, working an average of 15 hours a week in addition to their studies and family commitments. Only 50% have access to a computer outside the institution. The challenge with new technology is to balance the paradigm identified by Mick and Fournier (cited in Rudestam and Schoenholtz-Read, 2002), where successful operation of new technology can lead to a greater sense of intelligence and efficacy, but failure can evoke feelings of stupidity and ineptitude in both staff and students.

Each of the case studies described below was developed in response to a specific need, identified during course evaluation to address a problem recognized during course delivery or, in for new courses to address a potential problem. Brief rationale for these developments demonstrated here are given along with the web-based examples. As each development was developed specifically to address an individual teaching situation their specific aims, structure and use were different. Although each project

had a separate inception a marked commonality was observed in student response to these developments and in how the staff used them in their teaching. In several cases, the academic staff involved in these developments were studying for Postgraduate Certificates in Teaching and Learning in HE or the Applying Learning Technologies masters module themselves.

Although these developments cover a range of subjects and disciplines they were all carried out at LMU North Campus with its own mission statement and student body. Some of the problems they were intended to overcome; poor performance, limited attendance, the need for distance study are common to most courses. Where an approach was successful and well received by students, it was demonstrated to academic staff and used as an example to inform future developments. Some interactions were developed specifically to address a particular problem, for example the pairs game was designed to provide reinforcement of essentially rote learning whilst inserting text was developed to allow text entry without typing (to prevent students with poor keyboard skills from being disadvantaged) both interactions were easy to demonstrate and reuse in a different contexts.

Evaluation was built into the development cycle, where possible students used early prototypes and their feedback was used to inform modifications and further development. Both the developers and teaching staff observe students as they use the materials and verbal feedback is collected during classes. In some cases evaluation questionnaires were used during the development process and questions on the LT were included in routine module monitoring. Since each of these resources was developed for a specific course the opportunity for evaluation was constrained by the teaching requirements and timescale of the course. For example, evaluation of the distance course using "Talking Heads" was constrained by the teaching being in Hong Kong. In this instance student comments were reported by staff on their return. Detailed evaluations were carried out on one of the text insertion exercises (Java programming) in terms of performance and learning outcomes which showed a measurable 15% increase in mean module mark

2. Case Study One: Talking Heads

This website was developed following concerns of staff teaching community nursing. These mature students are geographically dispersed, meet only during weekly classes and work at health centres. In response to changes in their role, community nurses can now prescribe medication directly to patients. The aims of this intervention were, to introduce the teaching staff to students, to create a set of resources to help

nurses develop both the skills and confidence to prescribe and to provide a means of communication between the students themselves and other practitioners.

<http://www-jime.open.ac.uk/2004/16/demo/nurses/aboutus.htm>

The need for staff to introduce themselves to students is increased on courses with a high proportion of virtual delivery and e-learning. During the development of a distance learning, part-time MBA the talking heads template was used to introduce teaching staff to their students.

http://www-jime.open.ac.uk/2004/16/demo/bridget_saunders/saunders_heads.htm

The talking heads template used again for a franchised computing degree delivered in Hong Kong by London based staff. The majority of teaching was via the VLE with lectures from visiting UK staff. Given that Talking Heads had produced positive student feedback in two previous incarnations, it was used to introduce UK teaching staff prior to their arrival in Hong Kong. Unfortunately, we had not understood local culture and offended many of the students, probably by breaking the taboo of photographing people. The teachers reported an unexpected hostile reaction from their students, who were also unwilling to cause offence by talking about the pictures but were pleased when they were removed. Demonstrating that cultural differences can have strong influences in responses to e-learning materials.

3. Case Study Two: Pairs Game

The pairs game, based on the children's card game Happy Families, aims to provide reinforcement for rote learning. The interaction requires selecting two cards from a display on the screen and until a pair with relevant content are identified. This template was used on the nurses prescribing course described above to help students learn the meanings for the acronyms that appear on prescribed medicines and on prescriptions. In this case the player wins when both the term and its acronym are exposed, for example Prescription Only Medicine and POM.

<http://www-jime.open.ac.uk/2004/16/demo/nurses/pairs.htm>

This template was originally created for a series of introductory foreign language courses aimed at novices. Here the game is to match the word with a picture of the object, for example picture of an orange with l'orange with the intention of increasing the students vocabulary. Clearly changing the words needed from one

language to another is simple, Epacks have been created for a number of European languages including French and Spanish.

http://www-jime.open.ac.uk/2004/16/demo/ePacks/pairs/epacks_pairs.htm

4. Case Study Three: Inserting Text

During the development of materials for the modern language courses the need for another template was identified. Interaction is an important aspect of e-learning and the opportunity for students to insert a text response to a question is valuable. However, feedback must be predetermined and included in the programme routine. It is easy to elicit a single word or simple phrase as a response and identify the correct answer. However, this will not accommodate poor typing or spelling mistakes and an essentially correct answer will be rejected. Templates were developed that gave the user text set in boxes that they were asked to arrange in the correct order, overcoming the need for text entries. This provides an interactive exercise that allowed students to develop their understanding of syntax and grammar without the complication of typing.

http://www-jime.open.ac.uk/2004/16/demo/ePacks/test_insert/text_insert.html

The text insertion interaction has been reused a number of times during a major development to teach Java programming to first year undergraduates. Prior to the redesign of this course there was a 40% pass rate. The module was restructured, team teaching introduced and a weekly series of scheduled multimedia classes introduced. Multimedia classes were held in an IT teaching room with staff present. Each individual session included a virtual demonstration of key principles, access to lecture materials and a series of interactive exercises. Syntax is an important aspect of any programming, again we wished to overcome problems resulting from typing and spelling mistakes or to disadvantage students with low IT skills. The text insertion template described above was reused on a number of occasions.

http://www-jime.open.ac.uk/2004/16/demo/java/lm_jav1_softob_t.htm

Redesigning an entire first year module involved collaboration between the academic staff responsible for the module, curriculum specialists, learning technologists and multimedia developers. The effect of these innovations has been extensively evaluated. Comparing exam performance of the previous cohort of students, with conventional face to face teaching, 200-2 with that of students taught with the

revised delivery, team teaching and multimedia activities there was a measurable 15% increase in mean mark (Boyle, Bradley and Haynes, 2003).

5. Case Study Four: Animations

5.1 Incoterms : Inco Dive for International Purchasing and Supply Module

This series of interactions was developed for an advanced level course in International Purchasing. Two distinct types of participants take this course; mature students working in industry studying for a professional qualification by day release and a group of young full-time students. Research indicated that both groups had difficulties learning the series of terms (Incoterms) describing the stages and documentation necessary to move goods from one country to another. The Incoterms Challenge was designed with the intention that students would learn the terms through interacting with the materials and playing the games, the challenge itself to motivate students to work through the materials. Users can only enter the challenge once they have completed all sections of the material and this game allowed students to compete against one another as a reward. Animated swimmers were incorporated into the game to act as a memory aid and as a stimulant to encourage users to engage with the game.

<http://www-jime.open.ac.uk/2004/16/demo/Incoterms/index.htm>

Student feedback was positive and exam performance appears to have improved. Early student evaluations showed that initial concern that the mature cohort of students might find this games approach trivial or patronizing were found unproven. There was a marked contrast between the professional students who were confident of their IT skills and the undergraduates of whom about 25% had difficulties logging onto the network, opening a browser running and accessing the site and could only access the site with assistance. (Holley & Haynes 2003).

5.2 Basic Probability

Students on science courses often have limited understanding of numbers, probability and experience difficulties understanding the basic concepts of statistics and data analysis as a result. A range of interactive e-activities were developed for a compulsory second year research methods module for sports scientists (N=30) with the intention of overcoming this barrier. Many people say they are "afraid" or "no

good at maths". These feelings often arise from poor learning experiences during previous education, students have failed to grasp a basic understanding of numbers. The intention of the materials described here was to initially present a basic concept, ratios and probabilities, in a simple context using a games approach. In this example different coloured swimmers were used and the student invited to play with the model. Further activities provide subject-based context for the concept. Because this activity is simple and decontextualized these materials can be used for a variety of classes and levels of student and are now used for year 0 (400 HiTec students) and first year undergraduates across the science faculty in scheduled IT classes.

http://www-jime.open.ac.uk/2004/16/demo/sports_science/index.htm

6. Discussion

The paradigm underpinning these developments was to provide a rich interactive student-centred learning experience placing the user in control of their environment within a constructivist framework. Engagement with the e-learning materials was intended to stimulate deep learning (Ramsden, 1992; Biggs 1999) although in some cases, for example Epacks and Incoterms, the learning involved was essentially by rote. Littlejohn (2003) discusses seven issues relating to the reuse of learning objects. A number of which were demonstrated during the present study. The developments described here resulted from collaboration between learning technologies and academic subjects specialists, some developments involved larger collaborations, becoming part of a larger change involving team teaching and complete restructuring of the curriculum. The LO was no longer an added extra to enhance teaching but an integral and integrated part of the curriculum. Interventions are designed individually and are specific to the needs of the situation, indeed projects are approached from the problems that need solving not the technology. Given a collection of content-free templates where it is technically easy to add content and repurpose creating bespoke resources for different disciplines is relatively simple. The templates themselves are small and may be used and reused in alone or combined to create a series of events. An unforeseen effect was the number of different ways a single academic would find to use an object. These materials can be used with a data projector and staff frequently used them for demonstrations during face-to-face lectures in addition to scheduled CAL classes and distance learning tools via the VLE and the web. Some groups of students accessed the materials extensively from open access PCs on campus, effectively working as distance learners whilst on site. This preference did not appear to result from limited external access to PCs but from the opportunity for informal collaboration with colleagues. Extensive use of the materials was noted during revision periods.

These RLOs have a number of advantages over bespoke CAL in that there are clear economies of scale, once a routine has been created, content can be added easily and the object repurposed. The development cycle itself involves repeated evaluations, once a resource has proven itself technically robust, further evaluations become relatively minor. An understanding of the interactions develops each time an object is used in a different context and student evaluations compared. There would appear to be considerable commonality in response. For example, initial concerns over the reaction of the two different cohorts of students studying international marketing and supply to Incoterms proved unfounded as the mature cohort did not report finding the games approach patronizing or facile. The objects are popular with students and are themselves reused by students and staff.

Each of these resources was developed with the intention of using them in specific teaching situations. "Incoterms" for example was designed for use in a scheduled class in an IT laboratory run by academic staff but to remain available via the web and for distance learning by resit candidates. Early evaluations indicated that students made extensive use of the resource for private study at a distance. The resources generally remain available via the web until the end of a module. An unforeseen advantage of these developments was the variety of ways staff used them: during scheduled IT classes, smaller components included in PowerPoint presentations for large group lectures, as demonstrations at the start of practical classes and to initiate group discussion.

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