

Biomedical Online Learning: The route to success

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Abstract: The potential of the World Wide Web for rapid global communication is driving the creation of specifically tailored courses for employees, yet few practitioners have the necessary experience in on-line teaching methods, or in preparing documents for the web. Experience gained in developing six online training modules for the biotechnology and pharmaceutical industry sectors is informing the development by a partnership of academics and practitioners of seven online modules that will meet requirements for continuing professional development in the health sector. This paper highlights lessons for success.

Keywords: Biomedical Online learning; experience; solutions; training

1. Introduction

In the UK, the enormous potential of the World Wide Web for rapid global communication is driving the creation of electronically delivered courses by both commercial and educational organisations alike. Some of the perceived opportunities are highlighted in table 1.

In the early stages of this climate change in education using the Internet, a group of academics from the University of Greenwich teamed up with representatives from the biotechnology and pharmaceutical industry sector. Their goal was to up-skill employees in the industry sector using web-based methods and they obtained £500,000 from the South East Development Agency (SEEDA) for this purpose. Six on-line training modules were created in the BioPharm Skills Project and these are now marketed through the Royal Society of Chemistry (www.gre.ac.uk/biopharm) for CPD. Experience gained from this project led to the initiation of the Biomedical Online Learning

Project (BioMed). Funded by a consortium of six different Workforce Development Confederations, its objective is to develop and deliver six flexible training modules to meet the CPD requirements of Healthcare Scientists within the NHS. Workforce Development Confederations were established on 1 April 2001 following consultation on A Health Service of all the Talents [3]. They bring together local NHS and non-NHS employers to plan and develop the whole healthcare workforce.

This paper examines the lessons learned from the delivery of these two projects and highlights those aspects considered to merit particular attention for the successful creation and delivery of an online course.

Table 1: Perceived opportunities from the creation of online learning courses

International recruitment and income generation.	The global market for higher education is estimated to stand at £300 billion per year. David Blunkett the former Minister for Education, urged that we “use the competitive advantage we have been given by the English language and the international reputation of our higher education system to make major strides in (international recruitment) markets” [1].
Compliance with Government policy.	The policy document Higher Education for the 21st Century states that “Higher education has a major contribution to make to lifelong learning, but access must be widened to include those who have traditionally been under-represented in our colleges and universities” [2]. Education delivered under the umbrella of “any time, any place” using the Web may reach these groups.
Student retention.	Increasingly, students expect to learn in a technology rich environment and have high expectations for using technology in their studies. At another level, there are also more students than ever before looking for part-time jobs to support their education. For them, the flexibility afforded by taking an online course is highly advantageous.
Continuing Professional Development (CPD)	The Lifelong Learning Framework for the NHS in England, ‘Learning Together-Working Together’ (http://www.doh.gov.uk/lifelonglearning/index.htm) has led to major demand for CPD throughout the NHS. However, financial and workforce constraints make it difficult to release employees from regular duties, and shift work hampers regular attendance at the location of CPD course providers.
Specifically-tailored courses	For commercial organisations, use of the Web offers the opportunity to provide specifically-tailored training for employees on a global scale.

2. Scope of the problem

The development of a successful online course is not a trivial task –it requires significant inputs in both cost and time. Several logistical

component parts need to be addressed, and this may require contributions from a variety of different experts at different stages during evolution, as illustrated in Figure.1.

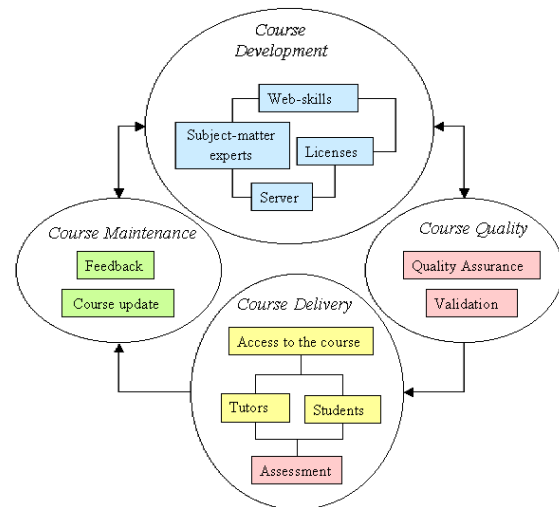


Figure 1: The steps required in creating and delivering an online course, and the interrelationship between each.

Since materials will be published on the Internet, licences and copyright clearance may be required. The courses need to be evaluated to ensure they meet quality assurance and accreditation standards. Arrangements need to be made to ensure that both students and tutors can access the course materials. The courses need to be regularly maintained and updated, particularly if they include links to other web-sites over which course designers may have no control.

We decided that our courses were to have the following characteristics:

- They required content to be organised, and developed where necessary, by subject matter experts who in turn needed to be able to identify and make use of the best of the different teaching resources available i.e. texts; e-journals; image databases; stand-alone CDs.
- They needed to elicit interaction between tutor and students as well as between students via the Internet
- They needed to meet quality assurance criteria of the university and were to be accredited by professional bodies.

3. Lessons learned for the successful creation and delivery of an online course

3.1 Establish a Partnership

Our first priority was to pitch the choice of course where there was a clear need. We found that the best way to do this was through creation of a partnership between those able to create courses and those with a need for courses.

The BioMed project started life as a partnership between academic practitioners skilled in delivering high quality training using web-based e-learning methods, and specialists and practitioners from the health sector with a firm grasp of the needs and skills gap in hospital and public health laboratories. These laboratories are responsible for investigating samples of tissue and body fluids to diagnose disease and monitor the treatment of patients, and to advance research into the causes and cures of disease [4].

When funding became available, a Steering Committee was created, made up of representatives from the University, Laboratory Managers from 16 NHS Hospital Trusts, the Public Health Laboratory Service (PHLS) and the 6 Workforce Development Confederations funding the project. Representation as observers was invited from the professional and regulatory bodies (the Institute of Biomedical Science (IBMS) and Health Professions Council, HPC) as well as the NHS University.

The BioPharm Skills project, on the other hand, developed a partnership between academics and industry representatives from the biotechnology and pharmaceutical industry sectors once funding had been obtained.

Partnership has afforded a number of advantages:

- Funding. In the case of the Biomed Project, the bid for funding was developed by the partnership over several months and resulted in a proposal that was difficult to ignore.
- Appropriate choice of course to meet the needs of the end-user.
- Guaranteed students for trials
- Shared responsibility. With few precedents in place for developing an online course, we needed to gather information and experiment with ideas. Working together in partnership meant that problems were

shared and the responsibility for the outcomes has been a joint one.

3.2 Engage institutional support before commencing

At all stages of online course creation and delivery there are numerous issues to be resolved, such as:

- A web server on which the course will be located
- A webmaster to manage the chosen Information Communication (IC) platform
- Support from web page designers
- Computer/Internet support for the distant student
- Licensing arrangements for electronic resources
- Registry support to enrol students
- Legal advice on course ownership and copyright of materials

The best way to resolve these varied issues is to engage support for the goals before commencing course creation. This way, terms of reference can be established and contracts drawn up to ensure clarity and support. This is particularly important in managing the inevitable technology failures that occur, so that students do not lose confidence in using the technology whilst receiving online training.

3.3 Establish the objectives of the course

The partnerships for both the BioPharm Skills and Biomed projects reached the same conclusion that CPD courses were required for employees, but, as illustrated below, course popularity has differed markedly, reflecting the need at any one time for this type of training.

In the case of the BioPharm Skills partnership, a need to up-skill employees and improve their written and spoken communication skills was identified at the time of starting course creation. Six specifically tailored training modules were developed (Table 2), and each was accredited through EDEXCEL [5] for a Certificate of Achievement leading to the award of an EDEXCEL Professional Development Certificate in BioPharmaceutical Sciences. During trials, employees found the technology relevant and highly motivating, and the standard of their learning output was high. Despite their obvious popularity, however, the number of paying students registered on these

courses is low. The major stumbling blocks seem to be

- a reluctance on behalf of employers to pay for this type of training in the present economic climate and
- a concern amongst employees that personal investment in these courses will not lead to career advancement.

In the case of the Biomed project, however, a timely decision was made to create modules specifically aimed at providing CPD for state registered personnel; supplementary training required for registration for those holding non-approved degrees, and academic accreditation towards Masters level qualifications in biomedical sciences. The decision was reached after realisation by the partnership that

- Biomedical laboratories, and pathology services in particular, were the subject of major modernisation proposals and that training programmes needed to be more strongly aligned with NHS service requirements and the provision of care around the patient [6-8];
- there was a real need to attract and retain laboratory scientists to the profession. One way of achieving this would be to offer flexible learning programmes for CPD, which would also develop top class staff.

Shortly afterwards, the lifelong learning framework for the NHS in England, 'Learning Together-Working Together' [9] was published, which made evidence of CPD compulsory throughout the NHS.

Seven modules for meeting CPD requirements in the NHS are now being created, for demonstration purposes (Table 2).

Each module will be subjected to a trial using six employees from biomedical laboratories. The trials will be designed to

- test the quantity and suitability of course material;
- evaluate the appropriateness of this approach to training for employees,
- ascertain the reaction to this type of training from employees in the sector, and
- determine if additional modules should be developed.

Table 2: Courses chosen for online development and delivery

	CPD Courses	Market
BioPharm Skills	Bioinformatics Pharmaceutical Analysis Drug Design and Delivery Regulatory Issues Enzymes Microbial Growth	Employees in biotechnology and pharmaceutical industry
BioMed Online	Hospital Acquired Infection Point of Care Testing Laboratory Skills Management Biology of Disease: Respiratory Biology of Disease: Renal Breast Cancer Genetics	Healthcare scientists within the NHS

3.4 Provide appropriate support to course content creators for course construction

Academics, in the main, were employed to create the BioPharm Skills modules, and for the Biomed modules, practitioners from the workplace were used. However, for both cohorts of content creators, the same problems needed to be surmounted. Course authors demonstrated

1. knowledge of the subject and enthusiasm for the concept, but they had little or no time available during the working day to commit to course construction;
2. experience in face-to-face teaching but no experience in on-line teaching;
3. some experience in using the Web, but little or no experience in preparing documents for the Web.

Most of the authors were attracted to the project because they wanted to learn how to use the teaching method, all were surprised how long it took to become expert in the software. They had varying degrees of IT expertise and educational backgrounds and this also added to the complexity of project management.

In the case of the Biomed project, all authors found the stressful life of today's health service to be less than an ideal backdrop to finding quality time to engage in this work. Interestingly one module had a retired member of staff with a little more time than her collaborators. Her various documents were worked on interactively with the module leader

and helped the others in agreeing style, layout and content.

There were also geographical problems with organising the course in that authors were based in many different parts of London and the South-East of England. Face to face discussions were on occasion needed.

In an attempt to solve the problem of time, authors for both projects were paid to either prepare the materials in their own time or to buy out their time from the workplace.

To tackle the problem of the lack of online course design experience, a compulsory training programme was created for authors on the Biomed project, comprised of two components:

1. Face-to-face practical training to equip authors with the practical tools necessary to publish course materials on the Internet; and
2. On-line training (approximately 40hours training conducted over eight weeks) designed to
 - provide experience of being a student on an online course;
 - provide a forum for discussion;
 - facilitate course planning and development;
 - provide tips, support and guidance on how to make the online training modules interactive and motivating;
 - provide insight into what constitutes good online teaching;

Authors were required to enrol on the programme before commencing construction of the course materials, so that they would be empowered to

- design for the on line medium, conscious of all the facilities on offer (asynchronous and synchronous communication tools; image databases; quizzes and so on);
- appreciate problems of computer access as a student;
- recognise the level of frustration that is experienced when web-links don't work;
- experience the power of interaction between students and with a tutor;
- appreciate the problem of meeting course deadlines in the face of limited time within the working environment.

Participation by the authors on the on-line training programme provided insight into problems that we had not envisaged. For example,

- The Internet delivery systems and computer access within the NHS could be tested in advance of the delivery of CPD modules to students. As a result, a number of problems for online course delivery within the NHS were identified. In particular, we have encountered serious problems associated with firewalls associated with NHS.net that have affected course access using synchronous communication tools;
- Internet skills amongst authors were more limited than anticipated.

The biggest problem we encountered, however, was the limited amount of time that course authors were able to commit to their participation on the online course, according to the recommended timetable. Consequently remedial action in the form of engaging additional support to prepare html documents was necessary in order to meet the project timelines. Course authors were nevertheless, keen to learn the necessary skills required for publishing materials on the Internet. Therefore the course timetable was significantly modified to provide them with support in course design early in the programme. Support in creating and designing web pages was in turn timetabled for when their own online courses were completed. This way, authors were still equipped with the necessary tools to update the courses at a later stage, as required.

3.5 Provide guidelines for Quality Assurance to course authors

Subject matter specialists were hired by the Steering Committee from a field of peers recommended by the course designers, to review the modules and report on the following matters:

- Integrity of content matter
- Academic standard
- Consistency and continuity of materials
- Typographic and grammatical errors

In addition, they were required to report on the extent to which the modules met quality assurance criteria for an online course, which needed to be defined. In turn, authors were supplied with accreditation criteria of the University and of the professional bodies and checklists of the sort shown below (Table 3).

Table 3: Checklist for authors for quality assurance of an online course.

	Yes	No
Clear guidelines for interactions with students?		
Well-designed discussion assignments?		
Challenges for students e.g. opportunities to choose and present course projects or sample cases?		
Opportunities for tutors to provide feedback: information feedback and acknowledgment feedback?		
Presence of course assignment deadlines?		
Assignments that minimise the risk of plagiarism from students?		

3.6 Implement a plan to maintain the courses

Online courses afford the opportunity to publish rapidly and respond to new developments in the field. They may also make extensive use of web-links to remote Internet sites, which frequently become out of date or are no longer active.

To solve the problem of course maintenance, tutors who were hired to deliver the courses were required as part of their contract, to upgrade and maintain the course web pages each time the course was offered. By publishing the date that the page was last upgraded, they also enlisted confidence of the student in meeting their CPD requirements.

4. Biomedical Online Learning

The Biomed project has thus far highlighted strong commitment by all partners to develop online courses for meeting CPD requirements in the health sector, and has been driven by a clear need to supply training in an environment characterised by staff shortages. It has also identified considerable enthusiasm amongst practitioners to participate in course development, not least because of the opportunities afforded to them to provide specifically tailored training to meet an acknowledged skills deficit. However, work in progress has also identified that

- the level of IT skills amongst course designers is much more variable than

originally envisaged; and all have little or no experience of how to create an online course;

- the presence of firewalls associated with security considerations within the NHS will seriously hamper course delivery and online tutor support;
- in the short term, limited availability of online workplace computers may constitute a limitation to the ready participation of students on the courses 'any time, any place'.

5. Conclusions

Online Course design and delivery is not for the faint-hearted, but with institutional support and a carefully constructed partnership willing to work together to achieve a common goal, many of the problems that will inevitably be encountered, will be solved.

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