Blessed are those who have not seen and yet have believed

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Abstract

This paper was delivered as the plenary lecture at 'Variety in Chemistry Teaching 2002' held at the University of Keele, 9th-10th September 2002. It provides a 'retrospective' on the 10th anniversary of the start of the Universities Funding Council/Higher Education Funding Council for England (UFC/HEFCE) 'Teaching and Learning Technology Programme' and is illustrated by the work of the Chemistry Video Consortium project for 1992-2002.

A set of *PowerPoint* slides from the lecture is available from the web site http://www.soton.ac.uk/~ecchemed/conference.htm.

Introduction

In 1991/92 the Universities Funding Council (UFC), the precursor to HEFCE, decided that the universities should use more *new technology* in the delivery of learning and teaching. It recognised that for this to happen resources would have to be provided and over the next five years some £50 million was set aside to fund the Teaching and Learning Technology Programme (TLTP). No such initiative has been embarked upon by any other nation.

Project teams were invited to submit bids and three teams were successful in getting bids accepted for Chemistry (see Figure 1), two to start in September 1992[1,2] and the other[3] to start in September 1993. The 'Variety' Conference, therefore, coincided with the 10th anniversary of the start of two TLTP projects and it seemed appropriate to look back at what had been achieved.

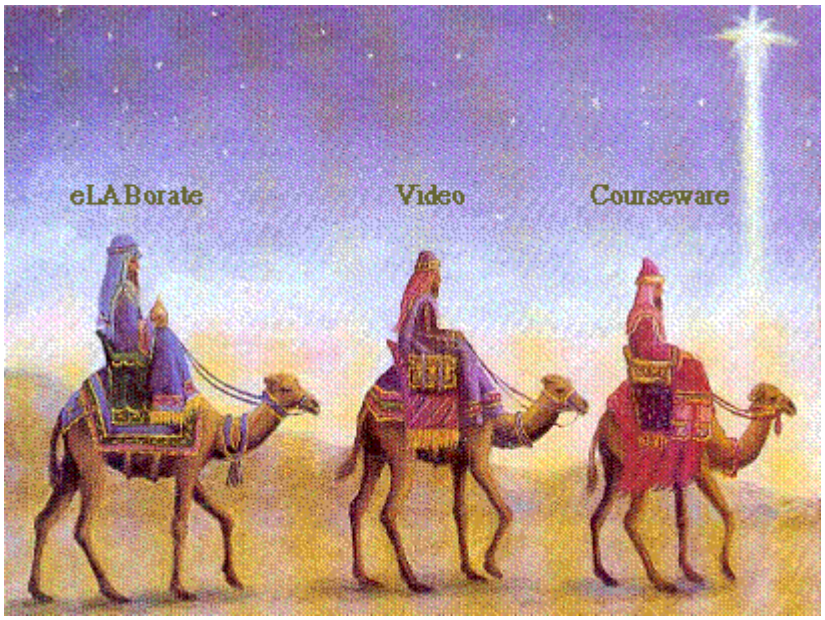

Figure 1. Three chemistry teams were successful in bidding for TLTP funds

The strategies adopted by the three Chemistry projects were broadly similar so I will concentrate on the aims, objectives and achievements of the Chemistry Video Consortium project (CVC).

The Chemistry Video Consortium project had the following aims and objectives:

a. to deliver high quality images and resources compatible with 21st century technology - this was an aim common to all TLTP projects;
b. to support learning, teaching and training in the practical aspects of Chemistry; and
c. to provide images and resources for lectures, tutorials seminars and self-paced learning situations.

As a result of market research, it was decided to concentrate on providing video clips for (b) because of the high investment of time in practical laboratories and the perceived commonality of techniques and experiments across the UK and the world. To fulfil the general needs for images, i.e. item (c), a database of films, videos, laser discs and CD-ROMs was created in collaboration with the Royal Society of Chemistry (RSC) and launched on the RSC web site[4]. This database is regularly updated and a section for pre-16 students has been added to meet the needs of GCSE teachers and students.

Tips from the Chemistry Video Consortium project

Quality

It was recognised at the outset that the video material would probably be transferred to other platforms and, therefore, the quality of production would be crucial. It was also recognised that students are used to seeing high quality video in wildlife films and documentaries so that to offer low quality video would turn students off rather than turn them on.

To ensure that the videos and resulting products would be of high quality the following steps were taken:

1. videos were filmed at high specification (broadcast quality; Digital D2; Betacam SP) and actors were used for the commentaries;
2. professional directing (OU/BBC director), editing and post-production staff were used;
3. products were designed and made professionally;
4. there was a wide range of authors operating under strict peer review (OU course team model) to ensure generic scripts;
5. detailed preparations were made prior to filming, e.g. storyboards and briefings; and
6. it was essential to have good continuity, e.g. a filming location, a bank of clean equipment, a bank of chemicals.

Products

It was recognised that any products must be user-friendly. In 1992/93 the quality of the video images on CD-ROM discs was very poor and so it was decided to use laser video discs to deliver the images in 1995/96[5]. These have the advantage that they deliver high quality video and they can be used with bar codes which provide quick and simple access to clips and parts of clips so that students can troubleshoot problems occurring during laboratory sessions. The response to the laser discs was excellent with more that 60 departments installing laser disc players and using the sets of discs. The key to getting such a high acceptance was 'road show' visits in 1993 and again in 1995/96. The former were to clusters of about five university chemistry departments over the period of two weeks. The latter involved visiting each department individually over a five month period when the opportunity to meet a 'critical mass' of staff led to incorporation of the laser disc videos into practical classes.

It was discovered that one of the problems with the use of CD-ROMs in the early 1990s was that images had been over compressed in order to put more video onto a particular disc. With better digitisation software and more sympathetic compression a picture quality close to SVHS was achieved in the set of CD-ROMs which was produced in 1999[6].

An obvious platform for the CVC resources is the Web. However, the high quality video entailed long downloading times for Internet users, complex commercial arrangements and conflicts between management software and user software. Therefore, the currently preferred platform is the stand alone CD-ROM (or DVD). Nevertheless, Intranet access from a dedicated server within an institution's Firewall is possible and this low cost option produces high quality streaming video[7]. There are, however, problems of conflicting software such that only the videos will stream and the glossaries and the quizzes will not.

Once the images have been digitised and delivered as CD-ROMs there is considerable scope for customising them into new applications (see below) but copyright issues must be settled. Some reasons for customising are:

a. few external resources ever exactly meet the desired need for a particular course;

b. images are costly to produce so customisation affords cost savings by recycling images and this minimises re-inventing wheels;
c. enormous pedagogical benefits arise from building in the types of interactivity achieved via computers;
d. different levels of explanation and adaptation for different user groups may be required, e.g. sets of students, distance learning, and students with disabilities; and
e. technology is readily available in institutions and home for using interactive materials and there is considerable scope for exchanging technical experience, skills and resources with partners overseas.

The technology for customising is moving forward very quickly. Once customisation involved writing complicated computer code but many PCs now come with software packages which will digitise, compress, and edit images and mix these with text and graphics using course management software, e.g. *Director* and *Flash*. The way is open, therefore, for individuals to customise images to meet their own needs. Workshops to demonstrate how to customise materials were organised by the CVC in 1998 at the University of Oxford and the University of Central Lancashire and at 'Variety in Chemistry Teaching' in 2001.

CVC resources

To date

The initial product was a series of 19 laser video discs, entitled 'Basic Laboratory Chemistry' which was supplied with bar coded booklets[5]. These were converted into CD-ROM format in 1999[6] and re-titled 'Practical Laboratory Chemistry' (19 CD-ROMs).

Once the video images had been converted into CD-ROM format, a series for 'A' level entitled 'Practical Chemistry for Schools and Colleges' (2 CD-ROMs) was produced in 2000[8] and a series on 'Physical Chemistry Experiments' (4 CD-ROMs) was produced in 2001[9].

A collaboration with the Centre Developpement Informatique Enseignment Chimie (CDIEC; University of Nice) has led to the production of a dual language set of CD-ROMs entitled 'Le bon geste pratique en Chimie/ Practical Laboratory Chemistry' in 2002[10]. These CD-ROMs were produced using *Flash* which is more flexible than *ToolBook* which was used for previous packages. A bonus with the *Flash* software is that more than one language can be inserted into the software shell and non-Romanesque fonts can be accommodated. This opens up possibilities for a wide variety of packages, e.g. Spanish/English/French, Chinese/English/French. A demonstration CD-ROM covering English, French, Italian, Spanish, American, Brazilian and Russian was produced in September 2002[11] to show the multiple language capability and to encourage project teams to get involved with producing packages for their own countries.

In addition to finished products, the CVC team has produced several pilot CD-ROMs. The most interesting is probably one for disabled students which incorporated regular video, scrolling text, subtitles and text with variable font and colour options, quizzes, key stroke operation mode, print out for Braille[12].

Future activities

The development of the multiple language option indicates that in the future it will be possible not only to export materials with English as one of the multiple languages but also to take packages in other languages and customise them into English, thus avoiding re-inventing wheels.

Given the necessary funding, it will be possible to do the research and development work: to deliver materials in DVD and maybe Internet format, to extend the 'Chemistry Images' database, develop resources for disadvantaged students and students with disabilities and to produce new video materials, e.g. 'Advanced Practical Laboratory Chemistry'. Many of the storyboards for the latter are already written but filming will require about £250,000.

General needs

Although it is becoming easier to customise resources, the pressures of time are such that there is actually less time to engage in such activities because of the pressures to do research. Additionally, it is a fact of life that promotion depends on research and not teaching.

How can we deliver the kind of teaching that the TLTP was intended for? The answer is that we must make much better use of the Learning and Teaching Support Network Centre at Hull and the experiences of colleagues across Europe[13], e.g. the European Chemistry Thematic Network[14].

Another fact of life is that, while the Engineering and Physical Sciences Research Council (EPSRC) provides grants of hundreds of thousands of pounds for research projects, the funding available for teaching is a small fraction of these amounts. If the decline in the numbers of Chemistry students at universities is to be arrested then government agencies, the RSC and multinational companies need to invest imaginatively in innovative teaching projects and in promoting new materials within schools, colleges and universities. Otherwise splendid initiatives like the TLTP will wither away.

Acknowledgements

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The leap from laser discs to CD-ROMs and then customising new products was carried out by Don Brattan and Oliver Jevons and the development of multiple language CD-ROMs was initiated by Daniel Cabrol-Bass and Jean-Pierre Rabine at the University of Nice.

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