LTDI
Case Studies

Learning Technology Dissemination Initiative

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with the help of other members of the LTDI team

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Preface

The questions most often asked by academics contemplating implementing the use of learning technology are "Does it work?" and "How do you do it?" .

One very effective way of answering these questions is by reference to the evidence of case studies of appropriate implementations. The study of successful implementations can help us understand what works and why.

The case studies presented here have all been implemented with support from the Scottish Higher Education Funding Council's Learning Technology Dissemination Initiative, which exists to provide staff in Scottish HEIs with information and support in this area. This document complements the LTDI publications "Implementing Learning Technology" and the LTDI Information Directory. Over a hundred implementations have been supported by LTDI and the 8 case studies selected give a range of different uses of technology in learning and yield ideas that are applicable outside their own subject areas.

I hope that these examples will provide a useful addition to our knowledge and understanding of how learning technology can support learning and teaching and that they may prove to be the starting point for further successful implementations.

Dr Roger Rist
LTDI Director

LTDI Case Studies: Contents

Introduction

Sue Hewer, LTDI

The purpose of this booklet is to provide insights into the kind of issues which arise during the practical implementation of learning technology into a module or course. In the main, the kind of implementation discussed here relates to the use of existing packages. The development of packages through the use of authoring tools such as ToolBook and HyperCard was not part of the LTDI brief. Each of the case studies involved an LTDI consultant and one or more colleagues from Scottish higher education institutions.

In providing implementation support, LTDI works within a loose framework on instructional design but one which necessarily varies with each situation. Implementation support could often be described as a succession of tasks and decisions, usually forming an iterative process, but at worst resembling a jigsaw puzzle. Fortunately, even with the worst case scenario, no one so far has lost the picture!

Rationale

There have been almost as many reasons for embarking on the introduction of learning technology as there have been implementation projects undertaken by LTDI. However, the underlying rationale tends to concern the desire to improve the learning experience for students either by replacing one medium by another, or by offering an alternative medium. The perceived need for the introduction of learning technology has resulted from such things as:

- changes in staff-student ratios (more students, no more staff);
- changes in student profiles (students requiring flexible delivery);
- changes in student roles (encouraging independent learning);
- the arrival of software directed to meet the needs of higher education;
- communications media to enable students to learn at a distance or asynchronously;
- the availability of tools which can take over mechanical tasks and free up time for students to develop higher level skills (eg statistics packages which encourage the development of problem-solving skills whilst removing the tedium of calculation).

Aims and Objectives

Once a need has been identified, it is important to be clear about the purposes of the learning technology and what it is anticipated that the students will know, understand and/or be able to do as a result of using the proposed package. Once this is clear, it is possible to define objectives, the achievement of which will indicate progress on the part of the students.

Packages designed as tutorials will probably have their own in-built objectives. However, the profitable use by students of more open packages such as tools and databases will require staff to formulate objectives.

Assessment and Evaluation

Having defined the objectives, and having also considered what the students will bring with them to the package, the next stage is to establish the relationship between the learning technology and the other delivery media in use, to sequence the learning and decide on an appropriate form of assessment.

It is helpful during the planning stage to think ahead and to plan evaluation strategies which take into account the stated objectives. In any educational innovation it is important to monitor what happens as it happens and to evaluate the processes and the outcomes. As learning technology is still a comparatively new medium, for which few evaluative studies are available, it is even more so. Evaluation data will influence future implementations, both of the chosen package, and of additional packages adopted to meet new needs.

Institutional constraints

The processes summarised sound straightforward enough. However, they are inevitably complicated by the institutional constraints within which we all work. It is one thing to settle on an appropriate package and to find the necessary funding to buy it. It is

another to get it set up and maintained on your university network, to secure the use of an adequate number of appropriate machines at times which suit your students, and to get together the documentation to help students to get started.

Course considerations can also be a constraint. Changes in the form of delivery and in the assessment pattern cannot always be made without additional course documentation. Students might need support in the early stages of self-access activities, but there might not be enough financial resources available to provide support staff to meet this need.

Perhaps the single most important thread running through the processes involved in implementing learning technology is that of collaboration with departmental colleagues and fellow members of course teams. It might be possible to be a one-person learning technology band on a course which attracts few students. However, this is an unlikely situation for anyone to find themselves in today. It is much more likely that the introduction of learning technology will be a policy decision, involving several staff, some of whom will be all for it, the majority of whom will need to be convinced, and a small minority who will want to turn away. It is vital to get as many people as possible on board. There is great strength to be gained from a united approach and, in terms of the student learning experience, the implementation is likely to be seen as rather more than a 'take it or leave it' course component, to be taken seriously, and to have the desired outcomes.

Overview of the case studies

The eight case studies presented here have been selected because they each illustrate different types of implementation of learning technology. The first six case studies each describe integrating pieces of software into a course. Of these, case studies 1, 2 and 6 might be described as fairly typical examples of implementations of learning technology. Case study 4 presents an example of the important role that students can play in formative evaluation of software, and case study 5 emphasises the role for non-academic staff in disseminating information about learning technology. Although all the case studies have benefited from departmental support, 3 and 7 show two different departmental approaches to the introduction of learning technology across the department. Case study 8 does not draw upon the integration of a particular package into teaching, but demonstrates how technology can be used to promote cross-institutional co-operation and collaboration.

1. The sweet smell of Aromatic Substitution

Nora Mogey, LTDI

Course : 2nd year Chemistry
Software : TLTP Chemistry Courseware Consortium (C^3)

This case study describes how one department made its initial venture into the use of learning technology. Key points leading to its success were:

- **Planning was spread over several months.**
- **The software selected was challenging and directly relevant to other course materials.**
- **Student reactions were very positive.**
- **Network problems did not lead to insurmountable difficulties.**

Aims and Objectives

Glasgow Caledonian University supports an internal programme of developments in teaching and learning, to which all staff or departments may apply for funding. Innovation in teaching is, therefore, positively encouraged within the institution. The university also has a record of excellence in the creation of software to enhance teaching. In common with other departments, Physical Sciences are constantly monitoring good practice in teaching and learning, and seeking innovative ways to improve the learning opportunities offered to students.

It was in this climate that the department decided to investigate the opportunity for using computer based materials within some chemistry courses. Conscious that much has been invested nationally in the development of resources to support teaching and learning, the original hope from the two members of staff running this project was to develop a resource centre containing a wide range of materials that students could use on an open access basis. LTDI were contacted for advice and guidance in establishing these resources.

Initially a few meetings were held where LTDI and departmental staff discussed the variety of courses being delivered, and those specific areas where students were identified as having greatest difficulty. Technology was perceived as being one possible tool to enhance the students' understanding of chemistry. It became clear that more benefit might be expected from integrating technology more closely with other resources and delivery methods, rather than providing courseware as a supplementary tool which might then be regarded by students as rather detached from the core of any one course. There are a number of possible difficulties associated with an open access resource centre, most of which revolve round student motivation, and a perception that such materials do not play an important part in the course, and consequently do not merit much time or concentration from the individual student. Until students are familiar with the role of computer based learning materials their use is often more successful if they are firmly embedded within the main delivery strategy of the course.

The plan to develop a resource centre as a first step towards using technology evolved, therefore, into a plan to integrate computer based materials with one aspect of one course. It was decided that one of those areas earlier identified as being more challenging for the students should become the focus for this integration, hence the next stage was to search for software which might be suitable.

Overview of the Project

Over about six months, through contacts with the CTI centre for Chemistry and LTDI, a number of packages were identified as potentially of interest. Actually obtaining materials for evaluation purposes was not always straightforward, particularly in terms of pressure on staff time, and difficulties in installing materials. In some cases printed publicity was all that was available upon which to base a judgement. One package (Aromatic Substitution, from the TLTP Chemistry Courseware Consortium, C^3) was identified as

closely matching the content of part of the second year CITI (chemistry, information technology and instrumentation) course.

Staff were confident that the students had good levels of competence in general computer use, and given the institutional record in the development of courseware, it was expected that some students would have had prior experience of using computer based learning materials. One large computer lab was booked for the appropriate session, and arrangements were made for the software to be loaded onto the machines.

The computer based session was planned to replace a standard tutorial, and was supported in this case by two institutional staff, with backup support available from a technician. The Aromatic Substitution package is an MS Windows™ tutorial package, divided into three units, with questions and activities throughout. All the material in the first unit had already been delivered to students through a series of lectures, and developed in tutorials, but was also felt to be of critical importance to the students' overall success in the course.

With the support of LTDI, the institutional staff worked in detail through the package, identifying a number of stages where some guidance might be needed, particularly where differences in notation occurred. It was felt that there was no need to set the students tasks other than those already contained within the package, and that the content matched the lecture course so closely that students would not have any difficulty in identifying the important nature of the material. A sheet of information was prepared to indicate which units (one and part of three, but none of two) should be attempted, and to explain some of the notational differences. The students were not told in advance that this tutorial was to be held in the computer lab.

It was decided to evaluate the implementation by observation and through a questionnaire. A brief questionnaire was drawn up, to be completed in stages through the tutorial. It requested responses about how the students felt about computers generally, and then sought information about the package in question.
Up to this point things had gone smoothly, if perhaps a little slowly. On the morning of the tutorial, the network was down and one of the members of staff was needed to cover for a colleague who was ill. Students were given some reading materials and asked to return in one hour, in the hope that the network would then be restored. In an hour, about six machines were working, with some of the others slowly being reset. It was decided to proceed, and to ask the students to try out Aromatic Substitution. The difficulty with the network did however mean that not all students could start the exercise together, and that they were being asked to work in groups of four, rather than in pairs, and were rather squashed in that half of the lab which was up and running. This staggered start, together with the reduced time now available, meant that not as long was spent highlighting the few possible problems with the package as had originally been planned. Perhaps this was not a recipe for a great learning environment, however....

Evaluation
It was evident almost immediately that all the students were involved and interested. There was an excellent atmosphere with the students keen to work through the package. The use of questions throughout the package promoted a great deal of student interest, and soon all groups were deep in discussions, with students pointing to the screen to explain to a peer why a particular substitution occurred, and with others jotting down notes or diagrams to supplement their lecture notes. No student had navigation problems within the package, although it was noticeably slower in operation than when it had been tested by the staff. On the whole students ignored the prepared information sheets and attempted to work through the whole package, including those topics in unit two not included in their syllabus. The teaching staff were able to circulate amongst the students, posing or answering questions to reinforce the learning that was taking place.

The evaluation forms were very positive: students found the package easy to use and enjoyable; it helped them to understand the subject and made it more interesting; they felt that it fitted in well with the rest of the course, and the content was challenging, all despite the lack of time and the cramped conditions. Initially the students were overwhelmingly confident or reasonably confident using computers, and MS Windows™ in particular, although about a third would not use computers unless they were forced to. Twenty-three out of twenty-five students responding

indicated that they would like more computer based learning materials to be used in their course. The comments made by students indicated that they had been thinking :

- "Challenging, but good revision"
- "Good revision questions, and if it (the student's response) was wrong it (the package) explained how in the chapter"
- "The package was easy to understand"
- "Good questions, taxing to the brain".

Conclusions

This was the first time these lecturers had used computer based materials with students. Despite the network problems it was a hugely positive experience, largely because time and trouble had been taken to identify a package that was appropriate for the rest of the course. Because the materials matched the course content so closely little was required in the way of tailoring or preparation of supplementary materials.

Staff felt that students were more actively involved in learning than in some more traditional situations, encouraging a deeper level of understanding. The computer based materials were being used to supplement other teaching techniques, creating a richer overall learning environment. The design of the package, with frequent and challenging questions, also promoted a good atmosphere within which learning could take place, and was crucial to the success of this implementation.

With the experience gained the staff now plan to introduce another computer based session into another course. Thence the intention is to build up, one at a time, a bank of resources that the students will be introduced to within contact hours, but which can also be accessed for self study or revision purposes.

2. Economics and planning for irrigation management using Mahakali

Rupert Loader, Department of Agricultural Economics,
The University of Reading

Course : MSc Agriculture
Software : Mahakali (produced by the World Bank)

The key characteristics of this case study were:

- **Successful educational adoption of a package which was designed for specialist commercial training.**
- **Students were expected to take responsibility for using and exploring the software.**
- **The module assessment could only be tackled fully if students had used the package.**

Introduction

Mahakali has been used successfully in the Department of Resource Engineering at the University of Edinburgh. It was used initially with a combined group of 10 students studying for degrees in either MSc Agricultural Extension/Rural Development, or BSc Agriculture/Crop Science. One optional module is offered in 'Irrigation Systems and Water Use', and the module represents approximately one sixth of a student's time during the term concerned.

The package was originally commissioned and designed by staff at the World Bank as a training aid. It offers a complete simulation environment in which users can explore and test their understanding of production and management decisions in an irrigation scheme. It is based around a case-study of the Mahakali irrigation project in Western Nepal.

Aims and Objectives

The general aim of including this package in the module was to support the technical lecture material with an environment in which scenarios could be tested and ideas explored in the context of a realistic system.

Specifically, the objectives of the use of the package were to allow students to simulate real situations and to explore particular issues, namely production decisions relating to agricultural planning and production decision-making, and operational decisions regarding the effects of different water management policies on the economics and operation of the irrigation system.

Overview of the Project

LTDI was involved in preparing for the implementation of this module in the summer of 1995. Following initial consultations and a review of the content of the Mahakali package, the main activity of the Implementation Support Consultant was to prepare documentation on the use of the package and its integration into the module concerned, in consultation with the lecturer concerned, and his existing lecture notes.

Mahakali is a self-contained package and it comprises all the information required to perform a fairly complete analysis of the agricultural production and irrigation management situations for a realistic project. There is a wide variety of information contained in the case-study, arranged in a menu format, with the user required, and encouraged, to follow through the various sequential activities. Usually some note-taking or printing out of such information is required in order that students keep full account of their progress through the module.

The module tutor used the package at the *start* of the module. Students were given an initial briefing session by a colleague from the Civil Engineering department, which was then followed by three computer laboratory sessions in labs of 12-14 machines where students were encouraged to explore the various scenarios and produce results for themselves. There was relatively limited supervision of this process, but the main objective was to enable students to frame the

content of the subsequent lecture sessions of the course. This was thought to be particularly important for Masters level students with prior experience of the practice of irrigation management, with the objective of giving relevance to the technical material which followed.

Evaluation

Although no formal evaluation was conducted, apart from informal discussions with individuals, students were asked to evaluate the package in the course of their normal module evaluations, following the implementation of the package in the spring term of 1996. General student reactions were very positive, and although there had been minor system problems at certain times (Mahakali is very memory intensive in the MS Windows™ environment), students were keen to re-try the scenarios and to work out optimum management scenarios for themselves. They appreciated the variety the software brought to their courses, and the extent to which it enabled them to link together various parts of the overall degree programme, relating to agricultural production decision-making as well as irrigation decisions. Such reactions and the relative success of the exercise mean that it was decided that in following years its use within the course would be retained, but with a greater degree of integration and documentation. The experiment in allowing students access to the software as a precursor to the main lecture material was deemed successful and will also be repeated, with the stated objective remaining - to allow students to 'brief themselves' on the content of the course, and to set the main material in context.

Students were themselves assessed on the basis of their use of the package. An examination exercise was set which involved students criticising a paper relating to government involvement in farmer managed irrigation schemes. They were then asked to comment on the extent that a software package could be used to aid in such planning activities.

Conclusions

Mahakali was designed as a training package for irrigation management specialists, and provides detailed simulations of the design and analysis of such systems. It is somewhat lacking in documentation, and was not designed specifically to integrate with University courses. However, the use of Mahakali in the example above has been successful. The comprehensive nature of the package enabled students to experiment with all the main issues relevant to the course, and allowed the lecturer to refer, in the classroom teaching environment, to such issues in a recognised context. The use of Mahakali will continue, with recognition by the teaching staff involved that there needs to be more refined integration with rest of the module, more comprehensive documentation and preparation for the use of the package, and guidelines on which parts of the package are the most relevant - given the fact that a large amount of technical detail is contained within the package, not all of which is covered in the module.

3. University of St Andrews CALL Project

Sue Hewer, LTDI

Course : Various Modern Languages
Software : TLTP Tell Consortium
Gapmaster (WIDA)
Storyboard (WIDA)
LUISA (Leeds University)

This case study describes how a Modern Languages department, having decided to use learning technology, effected its implementations in a range of different courses. The key factors contributing to the success of this Implementation were:

- **the support of the heads of department and the head of school**
- **adequate time was found for software selection, staff development, materials development, testing, booking of hardware and the setting up of software;**
- **throughout the planning, implementation and evaluation phases, dates were agreed on and kept;**
- **the computer activities were completely integrated with the course content;**
- **attendance was a compulsory part of the course;**
- **the students were assessed on the content of the sessions.**

Introduction

At the beginning of the 1994-95 session, the School of Modern Languages (SML) set up a Computer Assisted Language Learning (CALL) Committee to investigate the potential of CALL in the various courses taught within the School. The committee was set up by the Head of School with the full backing of the heads of all the language departments. The project reported here was initiated and supported by this committee and financed by the Head of School.

The formation of the committee enabled departments to share existing expertise, of which the Spanish Department had the lion's share, to explore common problems, and to agree cross-departmental plans which were both cost-effective and which would ensure continuing collaboration in CALL.

The LTDI Implementation Support Consultant for Modern Languages was invited to join the Committee and to work with departmental representatives in the planning, implementation and evaluation stages of the project which emerged from the initial deliberations.

Project aims and objectives

The broad aims of the project were

(I) to enable staff in the School of Modern Languages to explore alternative teaching strategies

(II) to enable staff to develop their knowledge of, and expertise in the use of CALL to enrich the student learning environment and to improve the efficiency of student learning.

The Committee decided to focus on CALL provision for first year French, German, Italian, Russian and Spanish courses for specialist linguists as each department felt that these students needed additional opportunities to develop their knowledge and use of the grammar of the target language taught in lectures and tutorials. It was felt that timetabled, computer-based activities were most likely to meet the defined need.

Software selection

It was agreed that the software chosen should be as simple to implement as possible, given the constraints on availability of staff time and programming resources.

The availability of the GRAMEX and GRAMDEF software from the TELL consortium, in French, German, Italian and Spanish for the 1996-97 session was noted and plans were discussed for the linking of the content of that software to the grammar courses.

After a software sampling workshop, it was decided that the initial implementations in the 1995-6 session should be closely targeted, limited in scope, fully financed and formally

evaluated. Two well-tried authoring packages were selected (GAPMASTER and STORYBOARD, WIDA 1983) which, whilst being easy to set up and use for both staff and students, were in keeping with the learning outcomes envisaged by the staff of the three departments (French, German and Italian) which planned to use them. The software was available in Mac and PC versions which facilitated the timetabling of student access to hardware. Integration with existing materials and course content was ensured in that the lecturers with responsibility for the delivery of the grammar course controlled the content of the software.

GAPMASTER is a very flexible program in which the user fills in blanks in passages of text. It can be used in 'tutorial' and 'test' mode. STORYBOARD is a text reconstruction program which promotes the use of a wide range of language learning strategies recognised as being characteristic of successful language learners.

In addition to the two authoring tools, the Italian department decided also to make use of LUISA, a dedicated grammar package developed at the University of Leeds for use by *ab initio* students in need of intensive grammar practice.

The Russian department planned the introduction of WinCalis units and software developed to support a new course book which they intended to adopt. The department is also involved independently in the development of a Russian Alphabet tutor for beginners.

The Spanish department opted to continue to use its existing STANCALL software which has proved popular with several generations of students, whilst pressing on with the development of a CD ROM to support an existing course.

Practical considerations

At the beginning of the project, the CALL Committee enlisted the support of one of the university's computing officers who had a personal interest in language learning and a brief to support the integration of computer-based learning materials into existing courses. This was an important move which did much to ensure that staff development workshops ran smoothly and that the implementations themselves were comparatively free from technical problems.

The LTDI Implementation Support Consultant liaised regularly with the Computing Officer and, between them, they were able to make the practical arrangements necessary to implement the plans of the committee, such as the setting up of workshops, thereby freeing hard-pressed lecturers to concentrate on other tasks within the project which only they could undertake.

Project overview

Once the initial decision had been taken about which software to use, staff identified the exact grammar points which they wanted to support with computer-based activities. Licences for the two authoring packages were purchased and a series of workshops was arranged which examined the software from the point of view of the learning outcomes that it could deliver, the kind of support needed by students to use the packages, and the practical issues concerned with the authoring itself.

Towards the end of the 1994-95 session part-time research assistants were engaged to input the texts which had been developed by the lecturers involved in giving the related lectures and classes. The involvement of lecturers outwith the CALL committee helped to spread awareness of the project and ownership of it. A workshop was run for them which gave an overview of the student program, but which was mainly concerned with the technicalities of authoring. The texts were input and tested during the vacation prior to use with students during the first semester of the 1995-96 session.

Before the end of the 1994-95 session an evaluation workshop was held at which evaluation strategies were discussed, plans drawn up and a timetable agreed.

Bookings for the computer labs were also made before the end of the session and as were arrangements to mount the software and relevant files in good time for the first classes. The number of students involved (300+) made heavy demands on hardware resources and the help of the Computing Officer was crucial in securing the hardware and installing the software.

Post-graduate students were recruited to supervise the timetabled lab sessions and to

introduce the software to the students who also had handbooks prepared by individual departments.

The implementations took place during the first semester of the 1995-96 session and evaluation reports were presented to the CALL committee at their meeting in January 1996.

Staff concerns

It was clear from the early stages of the project that there was some resistance to CALL in most of the departments of the School. Nevertheless, some of those with misgivings agreed to become involved and attitudes changed during the course of the project. This was in part due to the efficient management of the committee and the active dissemination through departmental meetings of the decisions of the committee and of the progress of the project.

Another important factor in the change of attitudes and in the growing confidence of those actively involved in the project were the workshop sessions. These were fixed well in advance on a date and at a time convenient to all concerned. They were held in the Computing Centre, well away from office telephones and alternative corridor meetings. Refreshments were provided. The workshops were financed through the university's staff development scheme. They were clearly structured, and set up well in advance by the Computing Officer in collaboration with the LTDI Implementation Support Consultant.

Implementation and Evaluation

The French Department

The French department stated in their student handbook that the aim of the core CALL course was 'to reinforce and consolidate the learning of the grammar which is covered in lectures and language classes'. All first year post-highers students were required to attend 5 fortnightly classes using the STORYBOARD and GAPMASTER software, and were also offered self-access materials associated with their course book, *Le Français en Faculté*, and a translation package, *Bon Accord*, developed at Aberdeen University by Brian Farrington.

At the end of the final compulsory CALL session, students were invited to complete and hand in evaluation questionnaires. The response rate was disappointingly low at 20%. However, it was felt that this was due in part to the comparatively informal request for returns, made by the post-graduate students who monitored the sessions, rather than by the tutors.

Of the questionnaires returned, 80% of the replies indicated a positive response to the exercises in terms of their usefulness and in terms of helping them to reinforce their knowledge of the grammar points in question. The students appreciated the help of the post-graduate students in connection with the running of the software and with grammar points. In practice, there had been few difficulties with running the software, due to the clear instructions in the student handbook, which received a positive response from 90% of the students who returned a questionnaire.

Only 18% of students claimed to have used the self-access software which fulfilled the lecturers' expectations that attendance would be poor if it was voluntary.

The German Department

As with the French students, the German *ab initio* students were required to attend a fortnightly CALL class. This class was designed to replace a class taught by a lecturer. The exercises on offer followed the course book studied by the first year *ab initio* students and were intended to provide grammar revision and consolidation. Each grammar topic was offered at two levels, to meet the needs of quick workers.

The department undertook an open evaluation of the classes in terms of student attitude by requesting students to record their comments at the end of each class. The post-graduate supervisor also recorded her comments. The department also required students to record which exercises they had completed.

Some problems were experienced early in the semester concerned with the conversion of files from Mac to PC format, and student unwillingness to read instructions! Overall, the students' comments were favourable and they offered constructive ideas for future CALL work. The staff involved concluded that they felt that this is a line of teaching worth pursuing. They plan to investigate more sophisticated software and also to look into the possibility of computer-based marking of objective tests.

The Italian Department

The department embarked on an ambitious plan to use the LUISA package, GAPMASTER and STORYBOARD as integrated units of work within the 'grammar', 'video' and 'practical' components of the Level 1 *ab initio* course. LUISA was used for grammar practice after the relevant structure had been introduced in the grammar class. It was also used for vocabulary building.

GAPMASTER and STORYBOARD were used to provide written practice in the use of vocabulary and structures presented to students on audio or video tape during the 'video' and 'practical' classes.

The department was clear in its objectives for the introduction of CALL. They wanted to reduce the time spent by tutors on grammar practice and reading comprehension, thereby freeing time to concentrate on more interactive aspects of language teaching. They also wanted to reduce the time spent on marking grammar exercises by using LUISA's in-built assessment tool.

From the students' point of view, they wanted to give them opportunities for grammar practice where they could work at their own pace, to some extent in their own time, and with immediate feedback. In addition to the LUISA assessments, all other work done in the CALL sessions was assessed, in written or oral assignments away from the computer. Attendance levels at the pre-booked sessions were unsatisfactory. However, this did not indicate that students were not doing the work, simply that they were doing it when it suited them.

Student response to all the activities was evaluated by questionnaire. It appeared that the LUISA grammar exercises were seen as helpful. The vocabulary exercises in LUISA and the STORYBOARD and GAPMASTER activities were seen as less helpful. Students did not feel that the connection between the exercises and the rest of the course was always clear. They also found the exercises quite challenging and complained that the amount of work set was too much. Despite the students' reservations, staff noted that the CALL activities had made a positive contribution in the three areas identified earlier and considered that the CALL classes had had a positive effect on student motivation.

As students had experienced difficulty in getting access to hardware, even when sessions had been booked, the department suggested that the possibility of a CALL computing lab for the exclusive use of language students should be investigated. They also felt that staff supervising CALL classes should receive basic training in the use of PCs, trouble shooting and running induction sessions. They were also keen to see access to the software from computers based in the halls of residence.

The department plans to purchase software dealing with more basic grammar for level 1 students. They intend to use LUISA with level 2 students and to continue to develop GAPMASTER and STORYBOARD activities for both levels. They also plan to use GAPMASTER to replace pen and paper assignments in the second semester to cut down further on tutor's marking time.

Follow-up

As a follow-up to the work described above, the computing officer set up a one day CALL seminar for the staff of the School at the beginning of the second semester of the 1995-96 session. June Thompson, manager of the CTI Centre for Modern Languages at the University of Hull spoke about integration issues and made available a wide range of software for evaluation by staff, including the products of the TELL consortium. Nina Garrett, on a visit to Scotland from the Wesleyan University in Connecticut, was also invited to talk to staff about her research into foreign language acquisition theory, advanced technologies and foreign language pedagogy. Some 25 members of the School of Modern Languages took part, interest in the software on offer was high and several members of staff discussed possible research topics.

Future plans

The School has formed a partnership with the University of Abertay Dundee and the University of Dundee in a SHEFC funded project designed to develop shared language learning resources to be distributed through the FAT MAN (Fife and Tayside Metropolitan Area Network). Materials will be produced in French, German and Spanish for use in all three of the universities. In order to facilitate the use of the materials at St Andrews, a CALL computer lab is to be provided with funding coming in part from the SHEFC project and in part from the university.

4. Mathwise in use

Neil Pitcher, Department of Mathematics & Statistics, University of Paisley

Course : 1st year Mathematics
Software : TLTP Mathwise

This case study describes an implementation where students were involved in formative evaluation of software, in addition to it being part of their course. The main lessons from this implementation were:

- **the effectiveness of computer based packages can be enhanced by the inclusion of self assessment questions.**
- **the computer can be used to go beyond what is feasible in traditional approaches to teaching.**
- **there is a need for research to maximise the effectiveness of computer based materials.**

Aims and Objectives

Mathwise is a set of modules covering first and second year university level mathematics, produced by the UK Mathematics Courseware Consortium, within the TLTP. The aim of the consortium was to produce computer-based materials which could be used on a student-centred basis. A set of more than 30 such modules has been written.

At the University of Paisley one of these modules, "Complex Numbers", has been used on two courses on an experimental basis. It was anticipated that this could result in improved efficiency of course delivery and enhanced quality of learning experience for students, compared with that attainable using traditional teaching methods.

Overview of the Project

Delivery in both the courses in which Mathwise has been used is partly traditional, using lectures, and partly computer-based, using sessions in the Mathematical Sciences Laboratory. It was felt that there was a danger of students clicking aimlessly through pages, so that some guidance was necessary. Paper-based worksheets were produced in-house to accompany the Mathwise software. These worksheets gave introductory instructions on navigation and some advice on which parts of the module to cover in each one hour session.

Integration was not found to be a significant problem, as Mathematical Sciences Laboratory classes had been in operation at Paisley for many years, so that the department was well set up to take the new Mathwise software on board. Staff in the department have gained considerable experience in small group work with students over many years, so that they have developed the necessary inter-personal skills for the more interactive computer-based approach to work successfully.

The Mathwise software was found to be sufficiently user-friendly that students could use it quite easily without any additional training, particularly when it was supported by the accompanying worksheets. The main thing which needed emphasis was that students should work their way slowly but thoroughly through a small section, rather than try to cover too much material too superficially.

However, there were implications for the provision of hardware, as the department's existing 386 machines ran the software somewhat slowly. The necessary upgrading has subsequently been undertaken.

Evaluation

During the initial phase of evaluation, in the 1994-95 session, student assessment was carried out by means of a traditional paper-based test. The results of this indicated that the introduction of Mathwise had been successful in enabling the students to learn about complex numbers.

The principal shortcoming identified during formative evaluation was the lack of short tests on screen. This tended to result in students clicking quickly through pages without ensuring that they had understood the content. As a result of comments received this deficiency was rectified, so that the final version contains appropriate on-screen tests at

strategic points within the software. The latest version of the module contains both formative and summative assessment facilities on-screen.

It was found that students tended to work much more effectively when a worksheet was provided containing brief operating instructions and guidance. They found it very helpful to be advised on which pages and exercises they should concentrate during any one session.

It is anticipated that the results of the full evaluation will be published separately.

Outcomes

As well as being an effective tool in course delivery, it has been found that Mathwise is of particular value for review and revision. The University of Paisley has a Mathematics Support Unit in which the Complex Numbers module has been used effectively in this way. A network facility is being purchased which will enable the department to make all the Mathwise modules available in the future.

A real virtue of the computer as a delivery vehicle for mathematics is its interactive capability in terms of moving graphics and visualisation. These are the kind of features that students tend to find particularly helpful, as they involve a use of technology which genuinely goes beyond what is feasible in traditional approaches.

The department is aware that what has been done to date is merely the beginning of an ongoing exercise in developing teaching and learning strategies for what is still very new technology. Much work remains to be done, both in terms of further development of learning programmes to maximise their potential, and in terms of research to determine their effectiveness. It is suggested that such work would best be carried out on a collaborative basis involving a number of institutions.

Conclusion

To use a system like Mathwise successfully, it is not necessary to abolish all that went before. Given appropriate hardware and sympathetic staff, it sits well alongside a traditional lecture course as an added resource. Some new demands are made on staff, but colleagues are generally able to acquire the new skills fairly painlessly, provided that appropriate support is provided.

The “lecture+computer laboratory” model for a mathematics course provides a good vehicle within which to pilot the use of Mathwise. It may, of course, be possible to use it in ways more radical than this, but at Paisley, we are satisfied that it can at least be used successfully alongside a traditional approach. Mathwise can be used effectively for formative assessment, whereby students test themselves while learning. As for formal examination purposes, we leave it to others to investigate its possibilities.

5. Utilising support agencies when integrating technology into teaching and learning

Kathy Buckner, Department of Communication and Information Studies
Queen Margaret College

Course : Physiotherapy
Software :TLTP Mathwise
TLTP Life SciencesConsortium

This case study is about a bottom up approach to introducing technology into teaching and learning and demonstrates how an effective support mechanism can influence a change in attitude across departments towards using technology in teaching.

In particular it highlights the important role that can be played by support staff in disseminating information about learning technology.

Background

The Department of Physiotherapy at Queen Margaret College, Edinburgh has been using technology in teaching for several years. Students are required to undertake first year modules in Principles of Investigation in which they are introduced to electronic mail, databases and spreadsheets. The assessment for the module requires the students to use technology and must be submitted in word processed form. Students also use computers for real-time data gathering within other modules on the course. Computers are not generally used for assessment purposes as the numbers on the course are relatively small. However, software packages are used where appropriate to support learning and teaching in some modules eg biomechanics and physiology.

Software selection and installation

LTDI became involved with the Department during 1995 when the TLTP Mathwise software was demonstrated to the lecturer in biomechanics. This was installed in a centrally managed workshop to provide background material and study support for those students who required additional help with basic maths and physics or who found conventional texts on these subjects difficult to understand. During 1995/6 software became available from TLTP project 32 (Life Sciences Consortium) which was specifically developed for teaching biomechanics and which is of direct relevance to core areas of the curriculum. Relevant commercial CDs also became available and after demonstrations by LTDI several items of software were purchased for implementation and used in teaching during the first semester of 1996/7. Initially some software was installed by the IT central support staff and some was managed by the library staff. Looking to the future, the Department aims to integrate references to relevant parts of these packages within the course material and to provide the students with direct access to them via a departmental LAN and server, thus integrating the materials fully into the teaching programme in biomechanics.

At about the same time, the lecturer in physiology, who had been successfully using some DOS based software in his teaching, attended an LTDI workshop and identified several pieces of TLTP software appropriate for his subject area. These were subsequently purchased by the Department and integrated into the curriculum.

Because of the relatively high level of computer literacy and high motivation of students on this particular course the use of additional computer software was not a particular problem.

Support staff as catalysts for change

Whilst this type of implementation of learning technology within a department is not exceptional what seems to be happening as a result is worthy of mention as an example of good practice. At this particular institution the Department of Physiotherapy has the use of a technician to support staff in their use of all forms of technology including computers. The technician became involved in the use of the teaching materials when he was asked to purchase software and liaise with the IT Centre staff and librarians regarding installation. Once he became aware of the availability of subject

based material at a modest cost through the TLTP projects he was able to identify additional materials which could be of benefit to other staff in the institution. As well as supporting the Department of Physiotherapy, this particular technician also supports the Department of Podiatry and Radiography and the subject areas of Human Performance and Physiology, some of which is taught from within other departments in the institution. As a result of this cross-fertilisation, changes in teaching practice which were initiated in one department are filtering through into other departments. From the technician's viewpoint he has become proactive in identifying software, purchasing software and disseminating information to the academic staff. Whilst this is extremely beneficial for the busy academic ultimately it is the academic who is responsible for implementation of the software within a teaching programme.

Lessons to be learned:

- Effective support staff can be of great value in implementing learning technologies into teaching. Liaising with other support services eg library, information technology centre and identifying software within the subject domain are valuable activities. For this liason to be effective, good relations between academics and support staff must exist.
- Cross-department/cross-subject fertilisation of teaching practices can occur as described above but could be further encouraged by the setting up of focus groups or other for a at which both academics and support staff could meet for the exchange of ideas.

Conclusion

This case study deals primarily with local technical support issues and interdepartmental co-operation. Other support services which may be needed to achieve effective implementations include the librarians (if support materials are to be stored/referenced in the library or if information retrieval support is required); the IT centre (if installation of support materials is on a central rather than local server); learning and teaching centre if they are involved in either storing materials or advising on issues of pedagogy and integration of materials; and staff development teams for support of staff in the use of technology for teaching. To provide an effective support infrastructure for learning technologies it could be argued that all these functions should be managed from a single co-ordinated point. However, as indicated above local technical support is vital because of the local knowledge of subject areas and teaching practices.

6. Learning Technology in the Institute of Biomedical and Life Sciences at the University of Glasgow

Erica McAteer, Paul Skett and Helen Watt, University of Glasgow

Course : 3rd year Pharmacology
Software : TLTP PharmaCALogy

This study describes a trial implementation of one module of a computer assisted learning package on drug metabolism. The key points to emerge from it are :

- **Students found that using the package promoted their understanding of the subject matter.**
- **Students were introduced to software during a lecture, thereafter use of the computer package was timetabled.**
- **Lectures have now been replaced by a mixture of practical labs and student directed learning sessions.**

Background

The Level three Drug Metabolism course had been slowly eroded over the years between 1978 and 1994 from a full three week unit of lectures and practical labs to a short five-lecture course. This was in part due to the increasingly negative reaction of students to the high chemistry content of the course. Financial pressures had also limited the practical lab resources to the point where they could not provide the equipment and task demands which would best enable the students to attain the learning objectives set.

Supported by TLTP Phase 2 funding for the PharmaCALogy consortium, with the University of Glasgow as a leading site, the course teacher authored a CAL package to present the lecture material, supplemented by a diet of practical tasks, over a series of student directed learning (SDL) sessions.

The CAL package

The courseware is a highly interactive, graphics-supported package which introduces the basic concepts of drug metabolism. It uses animations to show what happens when a drug is metabolised by the liver, allowing each stage to be examined in greater depth in terms of the actual chemical reaction, the enzyme involved and the cofactors needed. Following each section there is a short quiz with the option of more extensive questions, before the student exits the package. There is also a glossary of drugs and a map function to facilitate navigation round the learning units.

Trial implementation

The CAL material was under development during the 1994-95 academic year, with an introductory section developed sufficiently to run as a trial with the student class. It was decided that, with the developed unit and with the enhanced materials available, though not in digitised format, the course could expand to seven SDL sessions, four lectures and one review session. The original five lectures were covered in two of the SDL sessions, freeing up lecture time to allow a more discursive treatment of drug metabolism and drug toxicity. The thrust of the change at this point was not, therefore, to reduce student contact time, but to enhance the course content and hopefully, for both students and staff, the enjoyment of the course.

The software was introduced to the students during a lecture period and thereafter timetabled into lab sessions, to be worked through by pair groups of students.

Evaluation

It was agreed that the evaluation capability which was being developed within the University's institutional TLTP project, Teaching with Independent Learning Technologies (TILT) should be utilised for this trial of the CAL materials in student use.

A questionnaire was administered to the students at the end of the course, containing open questions about the course in general. The responses showed that several aspects of the course content were particularly well regarded by the students, and increased their interest in biological science as a subject. "...specific drug pathways - helps

understanding of their mechanisms." "...I just find all the mechanisms at work in the body fascinating, also how we can manipulate these mechanisms." "...makes it seem like you're doing some real pharmacology work."

Students liked working in pairs through the tutorial software, pointing out that this was familiar practice from physical laboratory sessions. They felt it was more useful to be able to discuss and test a hypothesis within the software than simply to watch a demonstration. As one student said, "It puts theory into practice without the hassle and unpredictability of labs".

However, few students clearly felt that physical labs should be entirely replaced by simulations, as the acquisition of skills in experimental procedures was seen as valuable. Against this has to be set the expense of practicals in this area, the ethical questions raised by the use of animals in experiments and the use of radiolabelled compounds.

A tailored version of the TILT resource questionnaire was also administered to gain some insight into how the students used the different resources available to support their learning during the course, and whether the amount of time available to study this course was sufficient to allow them to make full use of the materials. This was given to the current course and, with the CAL component removed from the options, retrospectively to the group of students who had completed the course the previous year, without the CAL.

The current year's students rated lectures and class notes as more useful than did the previous cohort - possibly reflecting a greater engagement with the content as a result of using the software, which they uniformly rated as a highly useful resource. It should be noted here that the comparison was not simply between the course with the CAL and without it, as the previous year's course had been shorter, lacking the extra content brought in as extension and presenting the CAL based material in lecture form. All in all, where common items were rated, the current student responses were more positive. Most of the students felt that the pace of the course was fine, with the right number of SDL sessions timetabled to cover the material.

No precise comparison of assessment grades between the two years was feasible as, effectively, there were two different courses, though covering the same content. However, there was no marked difference between overall grades between the two years which, given the trial level of the software and the extension of the course material, should perhaps be considered a positive effect. The issue of revising assessment procedures in line with changes in learning resources was not, in this piloting year, addressed.

Outcomes

A full implementation of the CAL package was possible during 1995-96, evaluated under the Consortium procedures with supplementary focus group sessions with students at the Glasgow site. This was successful, and it was decided to run the class in the future as a mixture of SDL sessions and practical labs, dropping the lecture component altogether.

7. Descepticising some sceptics

Greg Stoner, University of Glasgow
LTDI Implementation Support Consultant, Accounting & Finance, 1995-96

This case study documents an intervention at policy level within a department.

It is concerned with aspects of staff awareness and of the political aspects of the introduction of learning technology.

Aims & Objectives

The aims and objectives of this implementation were not clear-cut as different participants appeared to have different underlying objectives. The head of Department was keen to establish a Departmental IT Strategy before a key member of the academic staff left the department. That key academic saw my possible intervention as an opportunity to further the integration of Learning Technology (LT) into the Department's teaching - a long term campaign. Another member of staff was keen to obtain further information on the learning technology possibilities for their courses. Similarly the motivation to increase the use of learning technology was not homogeneous. Teaching quality was high in the mind of the Department and this case spanned the period of Quality Assurance Ratings within Accounting & Finance. Effective use of resources also appeared to be a motivation.

Following initial contacts, I went to the Department aiming to increase staff awareness of the materials available in the subject discipline and to introduce some of the more sceptical members of the academic staff to the benefits of integrating learning technology into their teaching. I hoped that those new to learning technology would start to introduce appropriate applications into their own teaching and be more responsive to others' use of learning technology.

The foci of the implementation were:

- Departmental policy
- staff attitudes
- knowledge of the LT materials available
- how LT resources might be used.

Though specific course implementations were considered this was not the prime focus in this case.

Overview

Like many Departments the academic staff included a small number of IT/LT enthusiasts. The majority of the remainder of the staff were sceptical, with some undertones of actual hostility to the use of IT/LT.

At the time of the LTDI intervention the Department was in the process of determining a Departmental IT strategy. The Department's most enthusiastic user of learning technology in the curriculum was in process of drafting this policy, which was to be discussed by the Department before they left to take up a post in another institution. This individual was one of my prime contacts in the department, the other being a relatively new lecturer in the department. It may be relevant that the academic community of Accounting & Finance in Scotland is relatively small and I have known a large proportion of the academics in this department for several years.

The principal intervention was a 1 day visit, involving detailed interviews with four of the academics identified as the most sceptical of the benefits of learning technology in the curriculum, the presentation of a seminar on the integration of learning technology into teaching and a demonstration of some of the learning technology materials available. Additionally I had several informal meetings and other communications with my two prime contacts in the Department, both before and after the visit.

The main implementation issues addressed in this case where:

- Why use LT in your teaching?,
- The importance of integration;
- The role of computers in assessment;
- Identification of potential LT materials for individuals' courses.

Outcomes

The visit took place towards the end of the 1995/96 session. At the time of writing (July '96) there has not been much time for action, and no teaching has yet been affected. However, enquires indicate that there have been outcomes.

- Over half the Department have indicated an increased willingness to use LT in their own teaching.

- The department has adopted an IT strategy including substantive agreement on the role of computer based assessment within the department's curriculum.

- Several LT packages and/or resources have been identified for inclusion in courses, resulting in several bids for inclusion in the Department's LT grant application to the University. The widening of the debate about which items should be given priority in this funding application is indicative of an increased interest in using LT.

- There has been increased use of the WWW to provide course / learning resources for students.

- There have been instances of new uses of spreadsheets as a learning tool.

- There is interest in using LT materials to reduce the Department's reliance on other departments to teach elements of the degree curricula.

- Consideration is being given to using some of the identified LT materials to supplant some of the extant service teaching in the longer term.

- In the short term LT materials will be made available to supplement the teaching of statistics and economics.

- There is an improved awareness of the potential role of LT in the teaching of the department and its effects on student learning and motivation.

It is of course too early to see an outcome in the terms of changes in courses and teaching - but the commitment to and interest in change is heartening.

Conclusion

It is of course impossible to disentangle the effect of the LTDI intervention from all of the other pressures and flows within and upon the department. The outcomes noted above are evidence of an increased awareness and interest in learning technology within the department, but there appear to be additional, more general observations that can be made.

One of the lessons is that demonstrations of what can be done with learning technology together with a realistic approach to the problems and advantages of using learning technology can "win over" even some of the most sceptical. Learning technology will not solve all of our teaching problems but it does present us with innovative teaching opportunities and our students with different forms of learning experiences. Some of the interviewees within the Department were NOT willing subjects, having been cudgelled into talking to me about learning technology. A position made worse at a personal level because of my existing relationships with them in other roles. Despite this initial reluctance, all of these individuals have shown an interest in increasing their use of learning technology. Of course time may show some of this interest to be tactical - because of the head of department's support. We can however hope that even if this is the case their use of learning technology will foster and enhance their interest in this area.

Within this case I believe that an important element in the turning of sceptics may have arisen from the emphasis on learning rather than advocating learning technology as being "more efficient". The integration of learning technology may increase the efficiency /effectiveness of teaching in the long term but the reasons for change can have more to do with improving the quality of student learning and increasing our interest in our own teaching methods and style. Further, we need, perhaps, to empathise more with our students, thereby enhancing their motivation to learn. Our reactions to "gimmicks" may well be very different from that of our students!

Finally, for me, some of the outcomes were surprising. I did not expect to "descepticise" the sceptics, though I did hope to. Only time will tell of the "real" impact but the signs are encouraging - so far!

8. Life Sciences Assessment Group

Jen Harvey, LTDI

This case study describes the formation and activities of a cross-institutional group, who meet in person and also electronically to discuss ideas and issues of common interest - in this case assessment within the life sciences.

Key points are that the network:

- **Promotes cross-institutional collaboration.**
- **Provides a supportive environment for sharing common problems and experiences.**
- **Has benefited from a central administrator, willing to stimulate discussion.**

Aims and objectives

One of the common requests for implementation support has been from biology departments who have been wishing to develop computer based assessments, primarily of an objective type, in multiple choice format. This has been, in part, initiated by ever increasing student numbers and the desire of academic staff to provide feedback to students through formative assessment methods. The use of learning technology has a number of additional advantages in enabling student responses to be both marked and analysed with relative ease and speed.

Multiple choice questions have been used already as a method of summatively assessing principally first and second year students for many years. However, the translation of questions from paper to computer based exercises has seemingly elicited a much higher level of scrutiny of objective questions and consideration of student responses. This could have been as a result of the Teaching Quality Assessment Exercise which was then about to be carried out within biology departments, but it also grew in part from the increased range of facilities available from computer software which encouraged an in depth analysis of test items. For example, the time consuming calculations of discrimination indices and facility values of hundreds of questions from examination papers has now become almost immediately available by selecting an option from a menu bar.

Focusing in on computer based assessments

Over the last two years, LTDI has been supporting academic staff wishing to develop computer based assessments in a number of ways. Two national conferences concerned with Learning Technology in assessment were held in 1994 and 1995. A range of relevant and available software was presented which could be used to assess students and in addition, speakers addressed the different ways in which these had been used within academic departments. Subsequently, several workshops were organised for staff within departments and implementation support was provided to individuals working to develop their own test items. These involved advising staff on the construction of objective tests, outlining the implications of different software presentation formats on student learning and discussing issues of software security, question validity, reliability and the ability of test items to discriminate between different groups of students.

Life Sciences Assessment Group

To complement these existing activities but from a subject based perspective, a Scottish Life Sciences Assessment Group was set up by LTDI in January 1996. This was primarily established to enable academic staff from several different institutions to collaborate, exchange ideas and to share their experiences in developing computer based assessments. This type of group has a number of advantages, in that its members :

- already know each other;
- are working within the same subject discipline;
- are active in developing computer based assessments;

and

- share an interest in quality issues such as question validity.

Setting up the group
Although the majority of members had already met each other prior to the establishment of the assessment group, an inaugural meeting was set up to help formalise the group's main aims and objectives and the level at which it might function over the following months. As an original interest in collaboration had been expressed by individuals from Aberdeen, Glasgow and Edinburgh, it was decided to hold the first meeting approximately midway between these; in Dundee.

Rather than solely having a business type format, it was felt that the initial meeting might be more productive if a speaker was invited to give a presentation relating to their work in developing computer based assessments in order to trigger discussion within the group. In addition, a pre-release copy of Question Mark Designer Version 3 for the PC (Question Mark Computing) was made available by the software company for the group to evaluate during the that session.

The proposed structure and function of the group
It was decided, during this first meeting, that the Life Sciences assessment group could function most usefully in two different ways :

A. Email discussion group
An email discussion group would be set up which would be based at Heriot-Watt University. This would function as a group mailing system which would enable individuals to send mail to the collective group and also to see any ongoing discussions between group members. At present, this email group comprises 24 members from 14 different Scottish HE institutions, in addition to the CTI Biology, with each member acting almost as a representative for their department. Discussions have included the use of negative marking in objective tests, scaling multiple choice questions and the possibilities of setting up biology question banks.

B. Group meetings
There were 2 further meetings of the group during the 1995-96 session.

The second meeting focused on the use of Optical Mark Readers to analyse student responses and a demonstration of a reader by a commercial company was given. Ways in which students' responses might be analysed were outlined. These initial discussions were followed up via the email group.

The third meeting focused on alternative ways of assessing students using Learning Technology, for example, concept mapping systems, Modified Essay Questions and student constructed portfolios. In addition, ways in which group based activities might be assessed were outlined which could be used if, for example, students were set a group task using a computer based laboratory simulation.

The future
Another meeting is planned to air a number of issues raised within the email discussion group. This is to be in the form of an informal debate. In addition, a 'SWAP Shop' forum is to be used to exchange ideas between group members and to share personal experiences in developing and using a range of different computer based modes of assessment.

Conclusions
This group has worked well for what seem to be two reasons : firstly, there has been a central administrator willing to set up meetings and help initiate discussions and secondly, the members have been readily willing to contribute to the group. The level and quality of the contributions towards the group's activities have been impressively high with several people being prepared to share their experiences and knowledge in the field of assessment by, for example, citing useful references and outlining their own particular successes and failures.

In addition, a combination of meetings and email discussion group has worked well. Face to face meetings are useful, for example, for demonstrations of software and re-establishing contacts with those from other institutions. However, having too many meetings can prove problematic within the constraints of academic timetables. Providing a complementary email group also allows discussion to continue and those not able to attend the meetings can keep in touch with the group's activities.

The Life Sciences Assessment Group members were originally selected for either their existing or future planned activity in developing computer based assessments for biology students. They might be considered, therefore, to have an interest in mutually supporting each other. Although one or two

individuals might take on the responsibility of setting up a group, even at an institutional level, a group's power is ultimately in its members and their enthusiasm to maintain the group.

Thoughts for the future

Sue Hewer, LTDI

The case studies described in this book all include elements of collaboration. For the most part, the collaboration is within a single institution. As we all know from personal experience, it is not always easy to work with other people, even colleagues in the same department, especially if our views on content, methodology and/or assessment do not coincide. It can be especially difficult to use materials produced by other people.

The Teaching and Learning Technology Programme (TLTP) made available over £30 million for the development of software by and for higher education institutions (HEIs) with the express intention that the software should not simply be used by the development site, but by HEIs throughout the UK. As the TLTP deliverables find their way into institutions, an important part of the evaluation process is to ascertain just how widespread is their use, what kind of difficulties and delights lecturers experience as they introduce the materials into courses, and the extent to which the 'not invented here' syndrome prejudices their implementation.

The setting up of the Metropolitan Area Networks (MANs) in Scotland has been done at a cost of £11 million. The MANs initiative has taken the notion of shared resources one stage further. Whilst one likely outcome was to facilitate communication among the research community by means of video conferencing and the high speed transfer of various data types, it was also envisaged that the networks would provide the infrastructure to enable HEIs to share learning technology applications electronically. The Use of MANs Initiative (UMI) supports this through a programme for the development of applications which make use of the MANs' infrastructure.

Collaboration is an important word in the vocabulary of the future of learning technology. It is a challenging word, in an environment in which diversity of provision is valued. No one is going to pretend that it will be easy to collaborate in the development of new learning technology resources, or to implement the shared products. One of the most important challenges for the future, therefore, will be to identify areas in courses across institutions where there is a consensus about the benefits that learning technology can bring, both by improving the quality of the learning environment for the student and also by freeing up staff time to engage in the vital tutor/student dialogue which is an essential component of higher education, and which, itself, is increasingly likely to take place on-line.

Further reading

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