Effective use of virtual learning environments (VLEs)

This infoKit was first published in 2004 and is currently being updated.

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Each section of the 2004 infoKit can be download as a PDF

- Introduction to VLEs
- Evaluating your practice
- Managing for Sustainability
- Designing for Sustainability
- Computer-Mediated Conferencing
- e-Assessment

Back in 2004 when we wrote this infoKit, we defined a VLE as – ‘A Virtual Learning Environment is a collection of integrated tools enabling the management of online learning, providing a delivery mechanism, student tracking, assessment and access to resources’. These integrated tools may be one product (eg BlackBoard, Moodle) or an integrated set of individual, perhaps open-source, tools.

This definition still holds true with most education providers using a 'product' for example Blackboard or Moodle with Web2.0 tools being used to supplement the functionality offered by these systems, but these are often not truly integrated.

Although written a few years ago, most of the advice and guidance remains sound. Of course the screenshots are out of date! There are many excellent current examples of elearning and etutoring and it is anticipated that these will be used to update this resource in the near future.

The infoKit aims to enable tutors to make informed decisions, based on sound educational principles, about the use of technology in their teaching and their students' learning when using a VLE. After having used the materials we hope that tutors will be able to:

- Demonstrate a working understanding of strategies of use for e-learning for meeting a range of pedagogical, practical and social needs within courses of study
- Work comfortably with the e-learning resources available within their own institutions including an institutional VLE
- Identify opportunities and recognise limitations for the use of VLEs for teaching and the support of learning
- Feel sufficiently confident to provide and support virtual learning activities within their course programmes
- Reflect upon and develop their own professional practice through the use of e-learning resources.

The infoKit has been written as a series of sections comprising in-depth resources and case studies drawn from both further and higher education which emphasise the underpinning pedagogy in the use of e-learning. There are extensive links between the sections and to other infoKits on the JISC infoNet website. We have sought to synthesise key readings and research and to present this in a practical and easy to navigate format with links to additional sources for further exploration.

Throughout the Kit there are references to different VLEs which were available at the time of writing through the tertiary sectors in the UK. However, the aim of the infoKit is to go beyond a simple demonstration of hardware and software, and the basics of how to operate these, but to focus on why use VLEs and in what circumstances.
Presenting such information in the abstract makes it harder both to absorb and recall, and also means that it is less likely to be brought to mind at the point of need. Therefore throughout we provide links to a range of case studies and examples of good practice to help tutors engage in the whole process of using a VLE to provide a more effective learning environment.
Effective Use of VLEs: Introduction to VLEs

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Introduction to VLEs

This introductory section provides an overview of virtual learning environments (VLEs) focusing on how they can be used to improve the learning experience for both the learner and the tutor. The potential uses of VLEs for learning and teaching and models of learning are discussed and specific examples of where VLEs may be used to resolve current learning and teaching issues are provided. By the end of the section you should be ready to start thinking about course design.

The section is divided into five parts and throughout there are links to additional materials, readings, case studies and websites as well as a resources section.

As well as a general overview, this section looks at:

- What tools are typically available for tutors in a VLE?
- What are the advantages for you, the tutor, in using a VLE?
- What problems can a VLE solve for you?

By the end of this section you should have a general overview of what a VLE is and some of the issues involved when deploying a course with a VLE.

Some practical considerations

Prior to working through this section, you might like to consider some of the following issues, for you, the tutor:

1. Your access to a 'modernish' computer with Internet connection. You will need time to design and develop a course using a VLE and then time to maintain it. If you do not have easy access to a relatively modern computer with Internet access then this is going to have a severe impact on how quickly and efficiently you work and develop your course.
2. Your skills at using information technology. VLEs are becoming easier to use but you will need to be comfortable with organising documents in folders, using the Web and email. If at all possible, you might also consider getting some introductory knowledge about developing webpages. If you are worried about your skills you might consider getting some training through your institution or taking the European Computer Driving Licence (further information about this is available at: http://www.ecdl.ie/LatestNews/index.asp). This will help you when you are starting to use your institution's VLE and reduce the amount of time that you need to spend improving your skills.
Bristol University has developed a quick online guide for tutors to check their understanding of learning technology – [http://www.ltss.bris.ac.uk/interact/22/in22p13.html](http://www.ltss.bris.ac.uk/interact/22/in22p13.html)

3. Your current commitments.

1. Is it the right time for you?
2. Do you have the time to design a course using a VLE?
3. Do you have the time to deploy a course in a VLE?

Designing and deploying a course in a VLE for the first time will require your time and this will probably be a significant amount of time if it is going to be really effective. You will need to plan both the use of the VLE and the subsequent changes to the overall delivery of your course. After the first and subsequent iterations updating will be quicker and you will only need to set aside time for refinements. However, if you are in the middle of a programme review, an inspection, a course validation, finishing your Master’s or PhD or writing up a research bid, it may be better to wait for a few months before starting to use your institution’s VLE. It is, of course, all too easy to find reasons why we should postpone change and hopefully this infoKit will encourage you to try something new sooner rather than later.

**Resources**

The Higher Education Academy's website at [http://www.heacademy.ac.uk/](http://www.heacademy.ac.uk/). The Higher Education Academy works with higher education in the UK and focuses on the student learning experience. It has an extensive number of e–learning resources and subject centres which provide useful information and case studies about e–learning;

The JISC e–learning programme – [http://www.jisc.ac.uk/elearning](http://www.jisc.ac.uk/elearning)

The FERL (Further Education Resources for Learning) website at [http://www.ferl.becta.org.uk/](http://www.ferl.becta.org.uk/). FERL aims to provide advice and guidance to ensure effective use of ILT within the Post Compulsory Education sector. It has a number of e–learning resources and case studies;

The SFEU (Scottish Further Education Unit) – [http://www.sfeu.ac.uk](http://www.sfeu.ac.uk) – seeks to raise standards of practice in Scottish further education. We reference some of its materials; access to these is by subscription which your institution may already have.

Alternatively the subject specific Higher Education Academy centres have sections on e–learning on their websites and also in their journals. For example, the subject centre for Hospitality, Tourism, Leisure and Sport provides an overview of the use of VLEs in their subject area at: [http://www.hlst.heacademy.ac.uk/projects/haven_report.pdf](http://www.hlst.heacademy.ac.uk/projects/haven_report.pdf)

**Virtual Learning Environments**

This section provides a general introduction to VLEs and describes the functionality that is usually available in a VLE to you, the tutor, and your students. The advantages of the integrated online tools in a VLE from the tutor perspective are discussed and a number of scenarios are provided where VLEs may help to solve some issues that you may have as a tutor or a member of a teaching team. Case studies and voices of tutors who have used a VLE are available.

Although many institutions claim to have a VLE, it is perhaps worth checking what is meant by a VLE. As with real learning environments (eg. classrooms, laboratories), a VLE is designed to support and enhance student learning. According to the JISC:

'A VLE refers to the components in which learners and tutors participate in 'online' interactions of various kinds, including online learning.'
However, not all interactions have to be online since a VLE can act as a focus for students' learning activities. Hence, Mark Stiles states:

'a 'Virtual Learning Environment' (VLE) or 'Learning Management System' [is] designed to act as a focus for students' learning activities and their management and facilitation, along with the provision of content and resources required to help make the activities successful.' (Stiles – http://www.staffs.ac.uk/cital/poznan.html)

These systems allow students and tutors to interact locally or remotely. They can collaboratively share and generate knowledge in the virtual environment without having to travel out of their local setting (Britain and Liber, 1999; Milligan, 1999).

VLE software is currently being used across most UK institutions to support a variety of different types of learning: for example, collaborative and co-operative, blended and distance learning. A study undertaken in 2005 for the JISC indicates a high take-up of VLE in all types of institutions surveyed (including FE and HE). 86% of FE colleges, 97% of pre–1992 universities and 90% of post–1992 universities report using at least one type of VLE. However, there is a wide variation in subject area usage of a VLE from 16% in Medicine, Dentistry &Veterinary Medicine through to 82% in Business Management, Accountancy, Economics and Law. In other countries, such as the United States, Australia and some European nations, VLEs are more commonly referred to as 'Course Management Systems' or 'Learning Management Systems' (LMS).

Many commercial VLEs (e.g. Blackboard, WebCT etc) consist of a variety of different tools bundled together into a package. There are also a number of open source software packages available (e.g. Moodle, Bodington, COSE). The JISC e−Learning Frameworks (ELF) projects is producing a range of open source e−learning tools that can be used separately, linked together or used to complement existing software packages.

Often a VLE is linked to other information systems within an institution, eg. library, student records, finance, Intranet. This is often referred to as a Managed Learning Environment (MLE). Students are able to log in once to the system (using one password) and then move seamlessly between one system to another without having to log in again.

There has been considerable confusion regarding VLEs and MLEs. To clarify, a VLE focuses on learning and teaching and is usually a specific piece of software. MLE is a conceptual term for a whole range of different software, systems and processes that interrelate, share data and contribute to the management of the learner experience. By its very nature there is no one definition of an MLE – the tools, processes and services bundled together depend on the institution's vision.

For more information about MLEs, visit our Creating an MLE infoKit. To view the results of a Think Tank on MLE issues see the When Worlds Collide Publication. The FERL website also contains useful resources in this area.
Tools in a Virtual learning Environment

A Virtual Learning Environment is a collection of integrated tools enabling the management of online learning, providing a delivery mechanism, student tracking, assessment and access to resources.

Typically VLEs integrate the following tools:

These tools can support student learning in a number of ways.

Communication

Firstly, they support communication between students and tutors, between students and students or across student groups through synchronous (or real–time) chat and asynchronous online discussions tools. Students can use these facilities to build upon their existing knowledge and create new ideas through online debate and discussion. Some discussion areas can be linked to course material and online quizzes and self–tests. Further information about online communication is available in this infoKit.

Other communication tools include online calendars, diaries or timetables. These can provide an overview of key events during courses and might include submission dates for assessments, reminders about TV/radio programmes to watch/listen to and additional meetings (online or face–to–face). The calendar can also be linked to other areas within the VLE, such as course content.

Some VLEs may have email facilities which can be used for communicating on a one–to–one or one–to–many basis. Using an email system within the VLE has the advantage of keeping messages about the course separate from other email communications. However, usually students log on to a number of other email systems, including their institutional account. Therefore students may not wish to access the VLE email account and learn to use yet another system. To overcome this problem, some institutions have linked the VLE email with institutional email, so that students and tutors only have to check one account.
Assessment

Secondly, VLEs have tools for formative and summative assessment. Self−tests can be used by students for quick concept−checking and 'formative' feedback. Quizzes can provide guidance for both the tutor and the students; the results can highlight key areas that have not been fully understood by the student and which the tutor or teaching team can then cover in later sessions, online or face−to−face. Tutor feedback provided in these assessment tools is a key element in helping students develop an understanding of a subject; it is essential that tutors provide comprehensive feedback and not just indicate whether a question is 'right' or 'wrong' (Juwah, MacFarlane, Matthew, Ross, Nichol & Smith 2004).

Students can submit assignments within a particular area of the VLE. This can be set up to indicate the time and date of submission. Assessment marks can be released to students (individually) online. Further information about using online assessment is available elsewhere in this infoKit. This is particularly relevant for distance learning students. An example of the use of the dropbox is provided in the FERL case study by Pat McCann.

Collaboration

Thirdly, there are tools that can support collaboration within and across student groups. For example, the file upload facilities in a VLE allow tutors and students to share resources by moving learning materials (for example articles, notes, images, PowerPoint files, etc) into the VLE. This can be achieved by dragging−and−dropping the file into a designated area within the VLE.

Whiteboard software is a useful way of 'visualising' ideas and concepts. This software allows students to draw images collaboratively or, alternatively, to upload images and discuss them using chat facilities (text or audio communication) while simultaneously viewing the image. This software is particularly useful in design education, eg. the visual arts, architecture and engineering.

Other facilities

Other facilities which may be available in a VLE include student tracking which will provide tutors with information about when a student first accessed a course, how frequently they have accessed it and which areas they have accessed. It is essential that students know that you have access to this tool and you may also want to check with your IT department regarding their security and intervention policies.

VLEs can be linked (either directly or via a web link) to other online learning tools, which are not part of the VLE, for example concept mapping. These may provide further functionality, eg: WriteNote which is a referencing tool for students. This software is housed on the WriteNote server but can be linked to course materials and online discussions. Turnitin is a tool for checking accurate citing and helping to prevent plagiarism. For generic advice and guidance on all aspects of plagiarism prevention and detection, including Turnitin, visit the JISC Plagiarism Advisory Service.

Also, VLEs can link directly to your institution's Library or Learning Centre. This may be to your Library's catalogue, to resources that your librarians/learning centre teams have developed or to digital libraries.

Further information about the tools within a VLE is available on the FERL website.

Different Virtual Learning Environments

The tools and functionality available to the student and tutor vary from VLE to VLE, for example, you may find the tools in the VLE that you are using are more or less extensive than those
mentioned in the previous section. Some VLEs have been produced by commercial companies, others by universities. In the UK, Blackboard, Learnwise, Teknical's Virtual Campus and WebCT are the most commonly used commercial products. Bodington, COSE and Merlin developed by UK universities, have also been adopted in the sector. Moodle (Modular Object–Oriented Dynamic Learning Environment) is an open–source VLE that has many similarities to the commercial products and is being used by some institutions in the sector. SAKAI is an open source VLE developed in the USA.

OSS Watch, a JISC funded service, gives advice and guidance on open source software. Support Models for Open Source Deployment, the second OSS Watch conference has a number articles relevant to OS VLEs and Top Tips for Selecting Open Source Software provides tips and further resources links.

FERL has further information in its paper 'VLEs: Beyond the Fringe and Into the Mainstream' about purchasing an open–source or commercial product. Whilst making your choice of VLE, you should remember that staff engagement with technology depends on reliable systems with familiar layout and symbology (Glenaffric Ltd, JISC funded report 'Case Studies of Managed Learning Environments in Further Education').

JISC infoNet provides advice and guidance on System Selection.

Britain and Liber provide an overview of VLE usage between 2001 and 2003 which shows the growth of VLE–usage and the different VLEs that are being used (diagram updated to include data from 2005):

![Diagram produced by courtesy of Britain and Liber and the Landscape Study](image)

When considering the above table, the following differences in the data sets should be borne in mind when making a comparison: The 2001 survey only included HE institutions, but the 2003 survey results were obtained across HE and FE institutions. Thus, for example, First Class still has a higher level of use in HE institutions than in FE, but the combined data from both types of institution would indicate a drop in use. Learnwise is much more commonly used in the FE sector and so the apparent rise in the level of use of this system is skewed by inclusion of FE institution data only in 2003.

Two websites provide a wide range of comparative information about VLEs. These focus on the functionality of VLEs:

**Chest** has developed a comparative grid of five VLE products (BlackBoard, FD Learning, LearnWise, Virtual Campus, WebCT and Wizlearn). This offers information on the products, type of licence, requirements, costs and maintenance issues.

**EDUTECH** has further comparative information about VLE products. The website is supported by the Federal Office of Education and Science, the Swiss University Conference and the University of Fribourg.

Although these websites are updated on a regular basis, it is always worth checking that they have the current version of the VLE that is being described.

**Britain and Liber (2004)** have also produced a framework for pedagogical evaluation of e–learning environments. They provide us with a ‘rich picture of current tools, systems and architectures designed to support e–learning.’ Each system is described from the course, learner and programme/institution perspective.

In addition, **FERL** has produced a model to evaluate learning platforms.

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Advantages of Virtual Learning Environments for Tutors

The advantages for tutors using a VLE centre on improving the learning experience and using the tools within a VLE to help with the management and administration of the course.

Administrative Tools

Tutors can benefit from the 'administrative tools' within a VLE. Many VLEs provide information to staff about how often and when students have accessed a VLE through the tracking tool. They may also provide information about when and what they have read in the online discussion area.

For distance learning students, tutors can track if students are engaging with the online communication and associated materials. The assessment dropbox allows students to submit assessments virtually. These are collated and time-stamped by the VLE ready for collection in one area by the tutor. After marking, feedback can rapidly be distributed to the students individually, through the VLE. However, a drawback is that many VLEs do not allow submission which supports anonymous marking.

Collaboration and Communication

A VLE also offers tutors tools to encourage collaboration and communication. For instance, a VLE can provide a virtual space where students, staff and other learning support specialists can discuss, interact, share learning, ideas and materials. For example, Continuing Professional Development students may work together on a specific case study before loading their summary into an online discussion. This summary can be compared with other summaries posted. The feedback will draw upon a wide range of working experiences which can then be related to the specific area of discussion. This draws on the experience of the whole group which is particularly useful in multi-disciplinary courses.

Active Engagement

It is often difficult to find time or a way to ensure students actively participate in face-to-face sessions. Through online discussions it is possible to help students engage more actively with a
course and with the learning process at a time and place that is convenient for both tutor and student – see LEAP Case Study 12 which shows that discussion can motivate students to learn in new ways and encourage students to join in. Part–time students often find difficulty in working in groups with full–time students studying on the same course especially when this requires face–to–face meetings at the institution. A VLE provides an area to work together without the necessity of physically meeting.

Community of learners

The result of this collaboration and communication may be to develop a unique space which the student cohort builds into its own identity and community: a community of learners. Case studies have shown that VLEs are particularly good at bringing people together and creating what Wenger (1998) would refer to as a community of practice. Regardless of physical location and time zones, VLEs will allow you, the tutor/s, to create an area where your students can develop an area to listen and debate key areas for their studies at a place and time convenient for them as indicated in LEAP Case Study 9 (which shows that distance learning students can greatly benefit from using asynchronous online discussions to deepen their knowledge and create a community of practice) and LEAP Case Study 11 (which showed that a community of practice can develop between distance and campus–based students).

Signposting

Through careful course design, tutors can support the communication and collaboration in a VLE with specific signposting and access to a vast array of up–to–date, multimedia, interactive online materials for students. This can be material that is developed by the tutor, for example, lecture notes, diagrams and images. It could include links to web resources, the institution's online library resources, web resources developed by publishers for core texts, online articles, graphics or searchable online databases. These resources will need to be linked to the online activities in the VLE, may offer a focus for students who need additional support, provide a gateway for those who will be studying at an intensive level or encourage those who wish to study at a higher level. It is also extremely helpful for students to have all their course information including timetable, regulations, past exam papers and administrative information in one place and from one authoritative source.

Saving Time

There is much debate as to whether VLEs save time for students and tutors. In the case of lectures, a VLE can help you to change the focus of your time since much time is lost through students copying complicated diagrams and references and general administration; these can be transferred to the VLE. It will also reduce time required for photocopying.

However, as you will see from the course design section, designing a course to use a VLE requires planning time. Nevertheless, once you have created your materials online, you can easily update them with a few mouse clicks. Adding a new online resource, a clearer colour image, a new relevant case study can take a few minutes. It does not require you typing up the material, photocopying and then distributing to students. If you are careful in your planning, you can use and re–use the materials in your VLE in many and different ways as indicated in the section ‘Designing for Sustainability’.

Advantages from the student perspective are discussed further on in this section.

Using a Virtual Learning Environment

So far we have discussed the integrated online tools (focussing on collaboration, communication and assessment) that are available within a VLE and the advantages they provide for tutors. This
section provides some specific examples of how a VLE may help you, as a tutor or a group of tutors, to overcome problems that you may encounter in your day–to–day teaching environments. We provide a number of vignettes and outline how a VLE may assist student learning.

**Scenario 1: reducing face–to–face contact time with students**

Your institution has decided that all teaching staff must reduce the overall amount of contact time that they spend with students. This means that the teaching team will see the students about 70% of the time that they do currently in face–to–face sessions. You are extremely worried about the impact this will have on the student learning experience:

- How will you cover all the curriculum in the appropriate depth?
- How will you know if your students have understood the ideas in sufficient detail?
- How will you have time for the students to work through case studies and provide sufficient feedback?
- How will you ensure that problem areas are quickly identified and resolved?

In these circumstances, through careful course design, you can use the VLE as the centre of the learning activities for the students.

Initially, you will need to develop a number of online activities. For example, online discussions can be used to prompt students with questions before or after the face–to–face sessions. The online sessions can lead to debate and provide opportunities for feedback. You can also ask groups of students to summarise lectures, take responsibility for leading discussions and to ask a ‘question of the week’. All members of the teaching team including learning centre staff or librarians will be able to provide support for students through the online discussion.

Online quizzes and self–tests can be used for concept–checking and probing of students’ level of understanding. These activities will provide you with vital information about areas and concepts that the students find difficult and which you will need to cover in more depth in the face–to–face sessions. The assessment dropbox could be used for formative feedback. For example, groups of students could provide an outline of how they would solve a specific case study problem.

A large amount of materials especially complicated diagrams, formulae, case studies, past exam papers (with model answers) and related theories could be held within the VLE. You may also wish to develop a narrated PowerPoint with other members of the teaching team or experts from the field. The students could access these materials independently and especially in preparation for your face–to–face sessions. The reduced face–to–face sessions can be used to present key themes, guide the students through the activities and the materials in the VLE and work through case studies.

This is an example of how a VLE can be used for blended learning. The course design impacts on the face–to–face sessions as well as online delivery. **LEAP Case Study 2** provides an example of using the online medium to deliver content and activities which are closely linked to practice and clinical activity. This blended approach has had benefits for students as well as staff. To quote from a 2001 QAA institution audit report, "The students...believed that the provision of VLEs was an important supplementary feature of their learning.". The QAA commended this University on its Learning and Teaching Strategy.

**Scenario 2: students won’t discuss**

It is extremely difficult to ensure that all students contribute in face–to–face sessions. However, some students may find discussing online more comfortable – it gives them more time to think about their response and allows them more anonymity than the face–to–face environment.
It is possible to use online facilities to encourage discussion, for example, by setting up a role play. In this case you may ask students to take specific roles around a scenario, for example, the difficulties of writing an essay. Students would then work in pairs and take a defined role, for example, the tutor, the study skills support tutor, the student, the friend, the student from the previous course. The debate continues online over a specific time period. Your role, as the tutor, is to facilitate the debate and ensure that all pairs become involved. You may also want to call upon the student support at your institution to respond to the debate.

This ensures that everyone contributes and that there is a record for reflection after the event. It is also possible to continue the online role play in a face-to-face seminar or vice versa. A case study which uses cmc in law for student debate prior to a face-to-face role play is described in ‘www-based negotiation exercises’ from Warwick University. Further information about online discussions can be found elsewhere in this infoKit.

**Scenario 3: additional readings and materials**

Students come from increasingly diverse backgrounds and you, as the tutor, may feel that they do not have the appropriate grounding in the subject area that you are covering. You may use the VLE to provide formative quizzes or links to areas where students can ensure that they have a solid background. In this way, students do not have to admit that they do not know the core concepts and ideas of a course; as the tutor you can monitor those using the quizzes and identify those who may need further assistance.

**Scenario 4: students complain they are not marked on their efforts in group work**

One thorny problem that recurs with group work is the perceived fairness of marks; students often feel that they have worked harder than others in their group but they all receive the same mark. One way for students to show how much work they have contributed is by using the online discussions in a VLE and creating a student presentation area. Here students communicate with each other about their group work and show their contributions in the student presentation area. You will have access to all these areas and will be able to use their postings to help inform your marking.

**Scenario 5: decreased library/learning centre budgets result in less access to paper-based materials**

Students (especially part-time) often complain that it is impossible to access text-based materials on loan in the learning centre or library. No matter how many books and articles exist and how many of them are on short loan, the grumbles continue. With mounting debts students are also reluctant to buy anything but the most essential texts. Unfortunately libraries' overall budgets are often not being increased. In this case, you may want to provide a wide range of electronic materials as links from your VLE. It is worthwhile talking to your librarian and finding out how you can use the online journals and databases available. This will also improve access since many students have very limited (if any) time to visit the library.

You might also consider using HERON if it is available at your institution. (HERON offers a national service to the UK academic community for copyright clearance, digitisation and delivery of book extracts and journal articles. In addition, HERON has also developed a resource bank of digitised materials for rapid re-use (subject to copyright permissions). Therefore, HERON will allow you to hold a digital copy of an article in your VLE course. However, pricing depends on the article, length of time required for access and numbers of students. Don't forget that many textbooks now have associated web pages with quizzes and extra materials. Sometimes a textbook may have a CD-ROM associated with it. It is worth checking with the publisher if you could hold this material in your VLE. Your librarian may also be able to help with this.
Some of the VLE producers such as WebCT and Blackboard are producing learning and teaching materials (often referred to as e−packs). For example, WebCT has a learning zone which holds material that can quickly be imported into a course in WebCT. Sometimes there is a small fee in using these materials.

The National Learning Network (NLN) is a national partnership programme designed to increase the uptake of Information Learning Technology (ILT) across the learning and skills sector in England. Supported by the LSC and other sector bodies, the NLN provides ILT materials for teaching and learning.

Scenario 6: encouraging reflection in work−based learning

Many students (full and part−time) undertake a period of work−based learning, for example, placements. These may be short or long−term and can have a profound positive or negative impact on students.

A VLE may be used to prepare students prior to undertaking a VLE with FAQs, short video clips of students talking about their work−based learning experiences or employers discussing their expectations. VLEs can also hold students' CVs and provide an information repository for forms required during the placement.

During the placement, the online discussions can be used for specific reflective exercises. These may assist students in making the time to think about their work−based experiences and linking this with their studies within the institution. For example, students may be asked to compare their knowledge of health and safety with its application in the work experience. (The LTSN has encouraged exploration of the role of VLEs in placements.)

Scenario 7: students don't read enough and in enough depth

One of the constant concerns for tutors is that students do not read enough during the course and do not read in enough depth. You can use the VLE to provide signposting to high quality resources, subjects gateways and research papers. To encourage active reading, you can ask students to work in pairs/groups and allocate them some specific readings. This can be summarised in the online discussions or loaded into the collaborative area. You can then allocate another pair/group to respond to the summary. Other students may respond to these messages. To encourage participation, formative or summative assessment may be used. You do not need to respond to each message but provide a summary of the messages, focussing on the key issues. You can also ask students to start a tutorial/seminar with a summary of their postings.

Examples of tutors using VLEs

Three tutors who have used a VLE discussing the issues in using learning technologies explain about their use of a VLE to support their students. They emphasise how they use a VLE for their particular teaching environment and the benefits for them and their students. Follow the links below to read their thoughts:

Tutor 1
Tutor 2
Tutor 3
Virtual Learning Environments Summary

A VLE:

- Is web-based and accessible to both students and tutors through a web browser on any computer connected to the Internet anywhere, any time;
- Organises students into virtual classes, with individual, secure, logins;
- Comprises a range of integrated online tools that aims to support collaborative and co-operative student learning;
- Provides a focus for student learning activities;
- May support on-campus delivery (typically referred to as blended learning) or off-campus delivery (distance learning);
- Has a wide range of benefits for tutors including improving the learning experience (through using the collaborative, communication and assessment tools) and assisting in course management and administration;
- Has the flexibility to support a range of learning scenarios but needs careful and thoughtful course design to ensure that the VLE is used to its fullest.

Further information about VLEs is available on the FERL website in the technology for e-learning section.

Tutor 1: Clinical Effectiveness for Continuing Professional Development

What's so good about a VLE for Clinical Effectiveness?

I like using WebCT because it helps me to support learning at a distance. The flexibility in both delivery of materials and support for students makes it particularly suitable for adult professional learners – adult workers want to dip in and out of learning whenever and wherever is convenient to them. The flexibility of the online environment also means I can reach a wider selection of learners.

There are real benefits for students – they can communicate across disciplines, and across LEA and NHS regional boundaries. Also the students can access as and when they please, giving them more control over their learning.

Which tools are being used?

The Introduction – home page: I wanted a clean and uncluttered design of the homepage which means easy navigation and avoids complication for the students. Everything is visible and yet neatly organised with icons that are instantly recognisable. This page is important to help the students orientate themselves. Essentially they can see everything that they need on this page. I don't like using time release of materials because I like them to see everything at the beginning of the programme to let them organise their own learning.

Content: the content icon links directly to the first page of the materials, providing an impetus for the students to begin studying. The table of contents is still accessible, however, allowing the student to re-enter where they left off.

Discussions: this is the central part of the module, with much of the synthesis of learning taking place as the students discuss the problems set by the tutor. For me the discussion area is essential for online learning and is what sets a VLE apart from learning on a website.
**Quizzes:** I use the quiz tool summatively. The final assessment is delivered online and marked automatically. Formative assessment is a combination of the quiz tool, self-test embedded in the content, and feedback in the discussion area.

There is also a link to a feedback survey, which the majority of students have filled out.

**What feedback have you received?**

Of the 31 students that have completed the course, 29 have submitted feedback. Only one of those was negative in that the student found working with IT very difficult and would not wish to study in this manner again. The rest were very happy to continue with this type of learning and most found the environment easy to use.

The main advantages for the students were that the module raised their perceptions of the other professions represented. They found they shared problems and methods of working across professional boundaries. They also found it increased their IT awareness and abilities. They were all amazed at the ease of use.

**How has it changed you?**

Working with WebCT has changed the way I work. Specifically it has changed the way I manage messages in the discussion area. Now I read all the new messages in a block and take notes on a pad as I do so. This allows me to summarise and recap in a single posting. This saves me a great deal of time and avoids me repeating myself. It also helps me to encourage my students by publicly recognising those that have made valuable contributions to the discussions.

At the beginning of the session, I have a welcome message and then I ask the students to do a specific task by a specific time. This is also set out in the calendar.

**What hints and tips could you give us?**

Planning – The main thing I advise is to define what it is you are trying to do before beginning the planning process, and to hold this in mind throughout.

Planning, timeframe and materials all need to be considered before WebCT can be used, and it requires a lot of pre-thought. It is not possible to improvise online as it is in class. Everything must be planned beforehand, meaning there is much less flexibility for the tutor but that you are more organised and more considered.

**What else would you do?**

For the future, I am planning to change the formative and summative assessments to make them more investigative and challenging. I am probably going to remove a pre-test which was set up to give learners a trial run before they sat the final assessment. I can in fact now build trial runs into the final assessment.

**Tutor 2: using a Virtual Learning Environment in Psychology**
What's so good about using WebCT for Evolutionary Psychology?

There are 2 main reasons. The first is that I hate printing and photocopying lecture notes and WebCT allows me to upload them as I go. The students can then print them out if they want to. Secondly the use of the Group Presentation tool helps to avoid problems that have arisen in the past, such as ‘So—and–so’ is not contributing to the group work. I had wanted the students to use it as more of a group meeting point, making it easier for me to track contributions, but in the end it was used more for administration level discussions, rather than to discuss academic matters.

Being able to track students allowed me to deal better with failure to participate. I was able to remove students from groups, forcing them to re–engage with others in order to meet the module assessment criteria. This did, of course, depend on each circumstance.

Another benefit is that the materials uploaded by the students are accessible by me, allowing me to re–use web links, articles and such–like.

The students were split between those that found it useful and those that thought it was a bit pointless. However, those groups that used it more than others tended to be the groups with students from different courses and modules who wouldn't normally get the opportunity to meet during the week.

The site is also a resource for students to be able to review their work when preparing their essays at the beginning of semester 2.

What Tools have you used and why?

Group Folders were a good way for the students to access and collaborate online while allowing me to track their involvement.

Discussion tool was part of the process and although I wanted it used for more academic discussion, the students found it useful to administer their group work.

Content Module: I only lecture for the first 5–6 weeks, and then the students work in their groups. The content module allows me to upload material as we go and include other resources as I find them. Because Evolutionary Psychology is a relatively new discipline, much of the available materials are on the web and informal. It also means there are many interesting resources such as video and radio broadcasts which can be uploaded onto WebCT.

How has it changed the way you teach?

Practically it has allowed me to do things in real time. I tell the students to check WebCT twice a week and that allows me to convey information to them and know they are getting it. I don't have to rely on them checking a notice board, and I can check they are accessing WebCT through the tracking tools. This allows me to correct misunderstandings quicker and to identify knowledge gaps and make adjustments as I am going.

As we move to a more learning focus, I think of it as a much better resource. It allows students to study independently, and I don't have to spend time photocopying resources.

Also it helps with my confidence, because you do doubt yourself sometimes. You wonder 'Did I really tell them that?' or 'have I done the OHP’s for week 2?' WebCT allows me to check my own performance and keep a track of what I'm doing.
What hints or tips could you give us?

Staff have unreal expectations of how much time is required to develop a module for WebCT, and of how much students will engage with it. The reality is that some students still do not have computers at home, and as a resource for on-campus modules there is a limit to how much the students need to use it. There has to be an incentive, on top of that for class attendance, for the students to enter WebCT.

What else would you do?

If I had the time I would like to use more innovative technologies, such as creating interactive tutorials with RoboDemo and RoboPresenter, but in reality these are not made a priority.

I could put all my lectures on WebCT as the module is not lecture driven. The information I give out in the lectures could be delivered online and would save me repeating myself. It would also allow me to use more interesting media such as video and audio.

Tutor 3: Using a VLE in Radiography

What do you use WebCT for?

Delivering support material for modules, e.g., module contents; lecture notes; lecture presentations; glossary of terms to assist with the understanding and spelling of a new vocabulary; hyperlinked list of approved online resources related to each section of the module; recommended reading list; list of relevant journals and hyperlinked electronic journals; notes on the correct construction and citation of references; reiteration of assignment requirements and submission deadlines.

Allowing student self-assessment, e.g., multiple choice questionnaires that can be marked electronically and accessed as often as required.

Providing discussion areas for student groups.

Delivering distance courses.

What do you think has been the driving factor in your continued development of new WebCT modules?

The fact that these facilities are available to the students at all times, even on clinical placement where hard copy hand-outs are often lost or not available when a student is in a position to study.

Once the information is uploaded, the lecturer hands the responsibility for learning over to the student.

Directed study can be focussed, reducing the student/staff contact hours required.

WebCT provides an additional learning environment which can only enrich the student experience and be of benefit to students with different learning styles.

WebCT is useful for students with special needs, i.e., the visually impaired, hearing impaired, dyslexic, and those whose first language is not English. The flexibility of the system allows the release of lecture notes and overheads to these students in advance of each lecture, allowing them to assimilate the information in their own time.
How has using WebCT changed the way you teach?

Less time is spent reinforcing concepts in class as the students are encouraged to use the WebCT resources in their individual learning.

Students are expected to be better prepared for class as learning objectives are listed for the following week of the module.

Hard copy handouts are not used as students can print out from WebCT if required.

Less formative assessment needs to be marked as the self-assessment is self-marking.

Self-assessment attempts can be monitored to highlight any areas of general misunderstanding that can be pursued with tutorials.

Each of your modules is different, and you use a variety of WebCT tools and materials. Which are your favourite and why?

The glossary tool is wonderful for helping students become familiar with new vocabularies in particular modules, e.g., radiation protection, research methodologies, anatomy and physiology.

The use of self-assessment tools means that the students can test themselves as and when they are ready rather than all at the same time as in other formative testing. This is an advantage for both the more able and the less confident students. The former can move on at their own pace whilst the latter can spend as long as required and make as many attempts as required. In addition, the module coordinator can view the history of attempts to monitor progress and plan future lectures/tutorials.

Continuity of thought is improved by the use of hyperlinks to suggested online resources. This provides immediate access to other sources of information related to the topic under investigation. The alternative, providing a student with a list of websites on a handout, would require the student to stop what they are reading, find a computer and type in all the URLs in turn.

What hints or tips would you give someone who was thinking of using WebCT for the first time?

The initial effort of designing and uploading material is well worth the time as the resource is then available to be updated and uploaded year after year.

It is worth starting with a basic WebCT module as it can be expanded as the students get more used to accessing it and the designer develops more skills.

If you had the necessary time, how would you develop your existing modules?

The students who are used to seeing WebCT modules expect to have this resource for all modules. A more integrated approach to electronic delivery of information in Radiography would be desirable. As more staff are becoming trained in WebCT and have access to Front Page on the new staff desktop, this may be achieved.

The use of WebCT to collect student module evaluations would be of great benefit, especially if the analysis can also be done online.
What have been the main advantages and disadvantages of WebCT?

Advantages

- Continuous accessibility of resources for students.
- Ability to update and add material without having to print and photocopy for handouts.
- Archival record of material delivered and student use.

Disadvantages

- Some students do not enjoy using electronic resources and do not contribute to group discussions, disadvantaging themselves and the group.
- Any downtime on the server.

What feedback have you received?

The use of a WebCT module can be monitored to determine the number of students, frequency of access and most popular pages of the resource.

Student module evaluation asks about electronic resources and the feedback has been favourable for the WebCT modules.

Approaches to course design with technology

Traditionally models of learning adopted by tutors have tended to focus on what the tutor does rather than on what the student will do in order to learn. These models portray face−to−face meetings in which the tutor is seen to ‘pour’ information into the students' heads by talking about important concepts, ideas and facts. Unfortunately, this allows few, if any, opportunities for the students to ask questions and start to formulate ideas. Early forms of computer−assisted teaching mirrored this model of teaching, with the tutor being substituted by a computer. This often led to online courses that concentrated on materials and content rather than what the student was doing. The result was that students were not fully engaged with the online learning process and perceived webpages and areas developed in VLEs as an 'add on' or an adjunct to their learning but not essential.
More recently, models about the use of online learning including VLEs have focussed more on the students than the tutor.

In this section the work of some of the most influential thinkers in the field of learning with technology is discussed.

As you are working through this section on course design, it is essential to be reflecting on:

- The reasons you intend to use a VLE especially the intended benefits for you, the tutor, and for your students;
- The different ways in which the VLE will assist your students achieve the learning outcomes of the course;
- The student activities you are going to use in the VLE;
- The content you will need to support these activities;
- Gathering student feedback.

You may also wish to work through materials produced at Cranfield University as a background to this unit and the online book, 'Theory and Practice of Online Learning'.

**Theories of learning and teaching**

In the past, many early adopters of VLEs explored the possibilities of the technology at a basic level. For example, they frequently used the VLE to allow students to access and download supplementary learning materials – similar to an electronic filing cabinet. Although this may have some benefits for your students, it is not harnessing the full potential of the VLE.

Sigala (2002) in her overview of the evolution of Internet pedagogy describes this as the first stage in the use of e–learning; at this stage many tutors use e–learning including VLEs to provide a web version of their classroom activities. In other words, tutors 'webify' their face–to–face sessions. Unfortunately, the impact of this transfer of the didactic, transmission approach to learning and teaching from face–to–face to web–based instruction is very limited. What's more, an ad hoc approach to course development within a VLE is inefficient: you may spend a lot of time on developing materials for your course in a VLE for little reward. To get the best out of your VLE, it is worthwhile thinking about the underlying theory of your approaches to learning and teaching and
how they can best be exploited for you in the VLE.

One of the best places to start is the Seven Principles of Good Practice in Undergraduate Education developed by Chickering and Gamson in 1987. They point to the following characteristics of teaching–learning as being especially valuable for improving learning outcomes:

1. Encourage student−staff contact;
2. Encourage co−operation among students;
3. Encourage active learning;
4. Give prompt feedback;
5. Emphasise time on task;
6. Communicate high expectations;
7. Respect diverse talents and ways of learning.

Steve Ehrmann and Arthur Chickering later wrote an article about how technology can be used to advance each of these principles. The following outlines how the collaboration, communication and assessment tools in a VLE can support you in each of the Seven Principles of Good Practice.

Using a VLE to support the Seven Principles of Good Practice

<table>
<thead>
<tr>
<th>Principle</th>
<th>Support from VLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encourage student−staff contact</td>
<td>A VLE can help contact between tutors and their students through the communication tools in a VLE. Students can post messages at a time and place convenient for them. For example, tutors can set up a QA area in the discussion board (in some VLEs this could be anonymous) which tutors read and respond to on a regular basis.</td>
</tr>
<tr>
<td>Encourage co−operation among students</td>
<td>The discussion tools can be used to encourage student co−operation in small or large groups, face−to−face or online. Areas can also be created in a VLE for students to share work. For example, groups of students can have a private area where they develop their group presentation. They may choose to work together face−to−face and then load their work into the VLE for others, including the tutor, to review.</td>
</tr>
<tr>
<td>Encourage active learning</td>
<td>Through careful course design, focusing on student activities, you can encourage active learning. For example, before loading materials into the VLE, think about what you want the students to do and how these activities will help fulfil the learning outcomes. For example, if you want them to review a poem from World War 1, you would divide the class into groups and ask them to review the poem from different perspectives: from the reader, the poet, the narrator, the friend. These could all be housed in the VLE with groups commenting on each other’s work.</td>
</tr>
<tr>
<td>Give prompt feedback</td>
<td>The assessment tools including quizzes and the assessment dropbox assist timely feedback. Quizzes can provide a wealth of feedback for students. Not only can they inform students if the answers are correct but they can provide pointers to further study, hints and tips and links to additional readings.</td>
</tr>
<tr>
<td>Emphasise time on task</td>
<td>By using a VLE, to link to Library resources and online resources, students can spend time working through activities that you have developed rather than searching through shelves and surfing the web. This means they focus on the task rather than getting the materials for the task.</td>
</tr>
<tr>
<td>Communicate high expectations</td>
<td>As the tutor, you can use a VLE to show what you expect of your students. With agreement from students, you can use examples of previous students' work to show the level of work that you expect and why.</td>
</tr>
</tbody>
</table>
Respect diverse talents and ways of learning

The online discussion area can be used to build a community of learners which shows how the diverse talents of its learners can all contribute to everyone's learning. For example, a distance learning programme in marketing can call upon its students from all over the world to provide examples of how they would market a product.

There are a number of current models of learning dealing specifically with the use of learning technologies in learning and teaching. Many of these are based on the early work by Vygotsky (1962). In his theory of the Zone of Proximal Development (ZPD), Vygotsky observed that children learned skills more effectively when they were working in collaboration with an adult. This was not always due to the adult teaching them how to perform the task but the process of engagement with the adult which enabled children to refine their thinking or their performance to make it more effective. These observations formed the basis for constructivist theory in which these ideas have been expanded and can inform adult learning.

In his essay on constructivism, Doolittle (1999) maintains that constructivist learning can lead to a set of pedagogical principles:

- Learning should take place in authentic and real-world environments;
- Learning should involve social negotiation and mediation;
- Content and skills should be made relevant to the learner;
- Content and skills should be understood within the framework of the learner's prior knowledge;
- Students should be assessed formatively, serving to inform future learning experiences;
- Students should be encouraged to become self-regulatory, self-mediated, and self-aware;
- Tutors serve primarily as guides and facilitators of learning, not instructors;
- Tutors should provide for and encourage multiple perspectives and representations of content.

These principles are reflected in the models of learning and teaching with technology in the next section.

Linked to constructivism, is the idea of 'scaffolding'; this is a term used to describe the ways in which we help students build their understanding of a concept (hence use of the term 'scaffold'). A common example is when the tutor helps a student to work his or her way through a problem by asking questions. The tutor is, in effect, building a scaffold to support the student's learning. Scaffolding can exist at different levels of cognition. These include:

- Conceptual – at this level, we guide the learner in understanding concepts by providing explicit hints and examples. Examples include helping the student think through a problem by asking him/her questions.
- Metacognition – at this level, we may guide the learner in how to approach a problem. Examples include supporting the student in constructing a strategy for tackling a problem (e.g., the student is asked to plan a scientific experiment that will address a particular problem).
- Procedural – at this level, we guide the learner on how to use information. Examples include guidelines and tutoring (e.g., the student is guided in how to use a map).
- Strategic – these guide the learner in analysing and approaching the problem with a strategy.

Models of learning and teaching

Two models of learning that have been developed specifically for learning and teaching with technology are Mayes Conceptualisation Cycle and Laurillard's Conversational Model. A third model proposed by Salmon focusses on computer-mediated communication. Finally we consider
Mayes: The Conceptualisation Cycle

Mayes states that learning with technology involves a cycle of conceptualisation, construction and dialogue. In an article written by Mayes & Fowler, Mayes examines how different learning activities support students' understanding of new concepts and the revision of erroneous concepts. This is achieved in three stages, known as the Conceptualisation Cycle.

- At the conceptualisation stage, students are exposed to other people's ideas or concepts (for example in traditional face–to–face sessions or accessing content on the WWW).
- At the construction stage students apply these new concepts in the performance of meaningful tasks.
- However, it is only at the dialogue stage, in the performance of tasks in which these new concepts are tested during conversation with tutors and peers, that learning takes place. The feedback provided enables students' erroneous conceptions to be resolved.

Mayes suggests that each of the three levels of learning activity can be supported by three different classifications of courseware, or online material intended to promote students learning, into three categories:

Primary courseware is used to support, for example, online lecture notes, reading lists etc, which are a good way of giving students information. For example, look in the classroom or library sections of the Health Education Cyberschool. Also, if you have access, take a look at the SFEU module on copyright.

Secondary courseware supports students in performing a task. For example, computer assisted assessments in which the student is asked to answer questions. Examples of this include computer–aided assessments or online tests. For example, look at the quiz from the SFEU on copyright.

It is only at the level of Tertiary Courseware where there is two–way dialogue that learning can occur. Examples include online discussions, videoconferencing and shared workspaces where feedback is extrinsic and online simulations. For example look at the Virtual Microscope at the Open University

It is useful to begin developing online materials at the primary level. However, Mayes stresses that focusing too much on primary courseware will not provide sufficient support for learning. In order to ensure that learners are supported at all three levels of the conceptualisation cycle, a variety of teaching methods need to be within the course design. High level learning will not take place until there is two–way dialogue (either tutor to students, peer student dialogue, or the sort of internal dialogue which may go on within a student's head). This can only take place at the tertiary level – either using courseware or face–to–face methods of learning which are integrated with technology enhanced teaching.

Although it is useful to begin by developing primary courseware, it is important for tutors not to stop at this stage but to continue development to the level at which student learning can occur.

Laurillard's Conversational Model

Professor Diana Laurillard, Chair of Learning with Digital Technologies at The Institute of Education, University of London, and formally of the Open University in the UK, is one of the leading researchers in the application of technology to learning and teaching. Laurillard developed a conversational model, based on earlier theories of Vygotsky, in which dialogue between tutor and student is seen as central to learning. Laurillard stresses that, for higher level learning, dialogue
must take place at both a theoretical and practical level. This not only enables students to link theory with practice (which is sometimes difficult to achieve in many subjects), but also allows the tutor to evaluate whether or not he or she has set appropriate tasks for the student.

One of the major characteristics of this model is the way in which the student and tutor interacts. In face-to-face teaching, many of these interactions are so spontaneous and intuitive that they can be overlooked in the design of technology supported teaching. Therefore Laurillard made these interactions explicit. Technology can support these interactions in the following ways. It can be:

- narrative – this involves the telling or imparting of knowledge to the learner;
- interactive – this is based on the outcome of the learning. The tutor provides feedback to students based on the outcomes of tasks students undertake in order to help consolidate learning and improve performance;
- In addition, the tutor uses this information to revise what learning has occurred and, if necessary, change the focus of dialogue (adaptive);
- Communicative/discursive – the tutor supports processes where students discuss and reflect upon their learning.
- The tutor and student agree learning goals and task goals, which can be achieved using 'productive' media, such as online presentations.

A full account of this theory, Laurillard’s Conversational Framework, is in her book, ‘Rethinking University Teaching’. These ideas were reflected on in a keynote presentation at the Association for Learning Technology conference in September 2000.

Gilly Salmon: 5−stage model and e−Moderating

For computer−mediated communication (CMC), Salmon has proposed a highly practical five−stage model based on her own research (see table below). The first two stages of Salmon's model focus on acclimatising the learner to the online environment and developing a supportive social environment. The third stage 'information exchange' is characterised by learners interacting with course materials and activities online and providing each other with further resources. In the fourth stage, 'knowledge construction', we see learners working collaboratively sharing ideas, posing problems and challenging each other in a spirit of enquiry. The final stage leads participants to take responsibility for and reflect on their own learning. The role of the tutor – the moderator – is essential to the design and implementation – supporting, encouraging, focusing to ensure all learners meet the intended outcomes.

<table>
<thead>
<tr>
<th>Stage One: Access and Motivation</th>
<th>For this first stage, it is critical that the tutor ensures that the learner can easily and quickly access the online conference, often in a VLE. Usually this will be to ensure there are no technical problems, for example, with passwords. Technical support is critical at this stage as the learner can easily become frustrated. Simultaneously the tutor needs to ensure that the learners understand the need to put time and effort into the online activity. All the learners will need to know why they are accessing the online conference and what they can receive from it.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage Two: Online Socialisation</td>
<td>During this stage, learners need to become comfortable in the online environment and to socialise with each other. There are a number of barriers which may inhibit this:</td>
</tr>
<tr>
<td></td>
<td>• the embarrassment of making a mistake in front of other participants;</td>
</tr>
<tr>
<td></td>
<td>• the text−based nature of CMC can be daunting;</td>
</tr>
<tr>
<td></td>
<td>• it is a new and strange environment for many;</td>
</tr>
</tbody>
</table>
Salmon in 'e−tivities' provides a number of online activities that can help new learners in the online environment become comfortable and ready to talk and collaborate online. It is essential to create an environment where learners feel respected and show respect to each other. Salmon states that this stage is over when learners have started to share a little about themselves online.

### Stage 3: Information Exchange

Usually this stage of the conference is characterised by the fast and furious exchange of messages. The learner will interact with the resources in the VLE such as weblinks, databases, case studies and fellow learners. One of the issues at this stage is information overload and some learners complain about the messiness of the conference. The role of the tutor is to give some structure and to keep things organised. It is critical that the tutor does not respond to all messages at this stage but summarises and focuses the online discussions. Some learners at this stage may move away from the 'social' stage but it is essential that it remains for some, for example, through an online student cafe area where students can discuss without the tutor.

### Stage 4: Knowledge Construction

The main focus is building an online community focusing on learning, at this juncture. The tutor will be relating messages back to concepts and theories and encouraging other learners to respond. The tutor will be summarising but also moving the group along to new subjects and topics when appropriate. At this stage, the tutor may also be sharing the leadership with learners.

### Stage 5: Development

It is at this stage where we clearly see Salmon's link to constructivism. The online learners are taking responsibility for their own learning and becoming more confident and critical thinkers. The focus is on high−level learning with the tutor encouraging the learners to discuss concepts and ideas at a deeper level.

Further information about Salmon and her 'Five stage model' can be found on her website.

**What can we gain from these models?**

The educational models described in the previous section provide a framework to help guide your thinking while designing courses using a VLE. Each of these models provides just one way of viewing how you could design a course using a VLE – so your design will be based around a single model.

**Example 1 − using Mayes' model**

For example, if you were to design a course based around Mayes' Conceptualisation Cycle you may start off by considering how your course fits with his view of primary, secondary and tertiary courseware. It may be useful to outline this in a table. For example, a short course in which students are asked to read articles on Mayes' theory and discuss their ideas could be outlined as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Activities for students</th>
<th>Feedback/dialogue</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Students can access course readings</td>
<td>No explicit feedback</td>
<td>Article1.doc and Article2.doc Can be downloaded from the VLE</td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further information about Salmon and her ‘Five stage model’ can be found on her website.
Students asked to read articles 1 and 2 and discuss (in groups) the importance of vicarious learning

Feedback from peers through the online discussion and from the tutor who is moderating the discussion

Discussion forum (within the VLE)

Students asked to create a short course which will allow for vicarious learning. They present their ideas on how vicarious learning will occur in class by creating a PowerPoint slide show within the VLE. The students then discuss ideas online with peers and the tutor using audio-conferencing or a discussion board.

Feedback from peers and the tutor during discussions

Slide shows uploaded to coursework area within the VLE Discussion forum (within the VLE) or audioconferencing

Tertiary

Example 2 – using Salmon’s model

The same course could be planned using Salmon’s model. In this case, you would focus on each of the five steps and may map out your course as follows:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Activities for students</th>
<th>Feedback/dialogue</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1 Access and motivation</td>
<td>Students asked to logon to the VLE</td>
<td>Tutor ensures students can logon and access all areas of the VLE</td>
<td></td>
</tr>
<tr>
<td>Stage 2 Online socialisation</td>
<td>Students asked to introduce themselves and respond to at least two others</td>
<td>Welcome message from tutor and from other students</td>
<td>Discussion forum within VLE</td>
</tr>
<tr>
<td>Stage 3 Information exchange</td>
<td>Students asked to post the URL of their favourite course website and say why they have singled it out. They then respond to at least two others.</td>
<td>Responses from tutor and from other students</td>
<td>Discussion forum within VLE</td>
</tr>
<tr>
<td>Stage 4 Knowledge construction</td>
<td>Students asked to read articles 1 and 2 and discuss (in groups) the importance of vicarious learning</td>
<td>Feedback from peers through the online discussion and from the tutor who is moderating the discussion</td>
<td>Article1.doc and Article2.doc Discussion forum (within the VLE)</td>
</tr>
<tr>
<td>Stage 5 Development</td>
<td>Students asked to create a short course which will allow for vicarious learning. They present their ideas on how vicarious learning will occur in class by creating a PowerPoint slide show within the VLE. Students discuss ideas online with peers and the tutor using audio-conferencing or a discussion board.</td>
<td>Feedback from peers and the tutor during discussions.</td>
<td>Slide shows uploaded to coursework area within the VLE Discussion forum (within the VLE) or audioconferencing</td>
</tr>
</tbody>
</table>

Note that the Salmon model focuses on ensuring your students build the skills necessary to interact online, whereas the Mayes’ model focuses on interaction and dialogue. It is important that you as the tutor consider which model is the most appropriate for your course and for your students.
Constructive alignment: John Biggs

John Biggs’ idea of constructive alignment (Biggs, 1999) has been one of the most significant in learning and teaching in tertiary education. This approach asks:

‘What do we (as the tutor/s) want students to be able to do as result of learning?’

The basis of this concept is that learners construct their own learning through appropriate activities. Therefore the role of the tutor is to develop a learning environment which can support the activities that assist the learners to meet the desired outcomes. In other words:

‘How can we as the tutor/s align the planned learning activities with the learning outcomes?’

Success is dependent on the alignment of:

- the curriculum;
- intended learning outcomes;
- teaching methods used;
- assessment tasks.

The alignment process involves:

- defining the intended outcomes
- selecting teaching/learning activities likely to help and encourage students to attain these outcomes
- Engaging students in these learning activities through the teaching process
- Assessing students’ learning outcomes using appropriate assessment methods

(The Higher Education Academy, 2002)

There are a number of resources on Biggs’ work on the website of the Higher Education Academy. These can be found by searching the resource database. The Higher Education Academy’s subject centre for Engineering also has a very pragmatic introduction at: http://www.engsc.ac.uk/er/theory/constructive_alignment.asp.

It is therefore essential when you are developing your course in a VLE to focus not only on developing materials but on the learning activities that will help assist your students’ learning and meeting the learning outcomes of the course.

The impact of VLEs on the roles of tutor and students

When applying these theories to the design of your course in a VLE, it will certainly have an impact on you, the tutor, and the style of your teaching. Using a VLE will provide you with an opportunity to think about how you teach and how you facilitate your students to learn. You will probably find that you will become more of a guide for students as they become more independent learners. Since you are providing activities and materials for students to use online, the students will usually take more charge of their learning at a time and place convenient for them but simultaneously will look to you for advice and guidance especially in the early stages of the course. You will also find yourself working more in a team with support staff from the Library, IT and other tutors. This can be very exciting but it can also be rather challenging to let go of the comfortable and the familiar.

Goodyear (2002) has developed a number of indicators that show how the tutor and student roles might be expected to change when moving into an online environment, for example, a VLE. These roles include:
Changing tutor roles

• From oracle and lecturer [tutor] to consultant, guide and resource provider;
• Teachers become expert questioners rather than providers of answers;
• Teachers become designers of learning student experiences rather than just providers of content;
• Teachers provide only the initial structure to student work, encouraging increasing self-direction;
• Teacher presents multiple perspectives on topics, emphasising the salient points;
• From a solitary teacher to a member of a learning team (reduces isolation sometimes experienced by teachers);
• From total control of the teaching environment to sharing with the student as fellow learner;
• More emphasis on sensitivity to learning styles;
• Teacher–learner power structures erode.

Changing student roles

• From passive receptacles for hand–me–down knowledge to constructors of their own knowledge;
• Students move from memorising facts towards solving problems;
• Students view topics from multiple perspectives;
• Students devise their own questions and search for their own answers;
• Students work as group members on more collaborative/co-operative assignments: group interaction significantly increased;
• Increased multi-cultural awareness;
• Students work towards fluency with the same tools as professionals in their field;
• Increased emphasis on students as autonomous, independent, self-motivated managers of their own learning;
• Discussion of students' work in the classroom;
• There is a change in emphasis from receiving information from the teacher and learning to 'pass the test' towards using knowledge;
• Emphasis on developing effective learning strategies (both individually and collaboratively);
• Students have greater access to resources.

The University of Glamorgan found that the success of their collaborative e–learning project rested upon an integrated team involving all the University's support departments working alongside the Business School from the beginning. For many staff this way of working can be strange exposing them to new and different concepts, new ways of working and challenging traditional boundaries (Jones & O'Shea, 2004).

For some tutors these changes are challenging and exciting but for others they are more threatening. It is worthwhile talking to colleagues who have used a VLE and discussing the impact that it has had on their role as a tutor and the student response.

This case study from Fermanagh College shows how in using a VLE you can engage with your students more effectively (available as a video in Windows Media Player and QuickTime formats, as a transcript of the video and a case study pdf document).

Summary of Approaches to Course design with Technology

In this section, we have drawn upon the key thinkers in using technology in learning and teaching. All the models are based on constructivism and emphasise dialogue between the tutor and the students. It is essential for you, the tutor or member of a teaching team, to be comfortable with your preferred model before proceeding to course design using a VLE. Further advice about preparing to develop a course in a VLE is available within this infoKit and also in an HE Academy Resource.
The Student Perspective

Students think very differently now from the ways students thought ten or twenty years ago; their attitudes to and expectations of learning and teaching especially with technology are also very different (Oblinger, 2003; Haywood et al). This section discusses:

- Changes in student attitudes to IT and IT in learning and teaching;
- Student use of Virtual Learning Environments;
- Changing student roles in a VLE;
- Introducing a course with a VLE to students.

A New Generation of Students

Student attitudes to and skills in IT have changed considerably over the last 10 years. The Edinburgh University Survey (Haywood et al, 2004) indicates that in 1990 educational use of IT was predominantly male and limited to word-processing. Their work suggests that by 2003 most students are skilled in IT, own their own computer and that gender differences are small and declining. Most use IT in their social and recreational lives; this is mainly based on email but also includes shopping and banking online. These findings are mirrored in student usage of IT in Edinburgh's European partner universities (SEUSISS, Report 2002) and supported by recent surveys that indicate that younger students now expect to be in 'constant connectivity' with friends and family. Almost all of them use email and instant messaging to contact friends (DfES, 2002).

Increasingly students expect technology to have a significant role in their learning (DfES, 2002, Becta, 2002, Haywood et al, 2004). For example, most teenagers currently use the Internet to help them with their homework. However, students often see IT as a supplement to traditional teaching and do not wish to lose face-to-face tutor input which is considered the preferred mode of learning.

Frond provides us with 10 attributes of today's students who he refers to as having an 'information age mindset' compared to those who were born over 40 years ago who have an 'industrial age mindset'. These attributes significantly impact on learning and teaching, for example:

- students prefer a 'trial and error' approach to learning (strongly influenced by their use of computer programs and games) rather than the linear approach (learn the theory, review examples and then apply the theory) which is the mainstay of much teaching in institutions;
- students expect education to emphasise the process of learning rather than the content since the shelf-life of information is so limited;
- students want to be part of a community for learning and social support and expect to have access to that community on almost a 24/7 basis.

Diana Oblinger develops this theme further in Learners, Learning and Technology, Educause Review Sept/Oct 2005.

It is important to remember that not all students will be confident with IT and will need support to work effectively using a VLE. This is discussed more fully in a later section 'Preparing students to use a VLE'.

Students' Use of a VLE

Edinburgh University's study indicates that over 50% of their current students use their VLE at least 2 – 3 times per week.
Most students use a VLE to access resources, for example, tutor notes from their face-to-face sessions, PowerPoint presentations online, handouts, course information, additional links and high-quality digital readings (Crook and Barrowcliff (2001), Haywood et al (2004), Conrad (2002)). Students see this as a way of organising their study hours more effectively (Moore & Aspden, 2004). Easy access to these resources did not discourage them from seeking other resources but inspired them to search for others. In comparison, there is limited use of online discussions and interactive features, for example, simulations, online movies and quizzes. Research shows that students want VLEs to provide more information, for example, PowerPoint presentations and digital readings (Haywood et al, 2004).

There are two problems with this approach. Firstly, by placing emphasis on content delivery, many tutors spend a great deal of time designing and producing new learning materials and uploading these within the VLE. This is an expensive and unsustainable strategy. A second problem is that this approach does not make use of the most powerful aspects of VLE systems: their ability to support collaborative student learning and providing an environment for students to complete the necessary learning activities to meet the learning outcomes. VLEs can be more effectively used to support students in sharing materials, and reflecting upon and integrating new ideas into their existing knowledge. Further discussion on this area is available in the Communication Tools within this infoKit.

Changing student roles

As indicated in a previous section (The impact of VLEs on the roles of tutor and students), VLEs can have an impact on student and teacher roles.

The SOLE (Students' Online Learning Expectations) project investigated the changes that occur. SOLE looked at students' usage of VLEs in higher and further education and explored the effectiveness of VLEs in supporting different subject areas and student learning in general. The research was carried out at several UK universities and FE colleges, covering a broad range of subjects with diverse online learning requirements. The project showed that there was only a limited change in student roles but now although the tutor is still seen as central, students are adapting to VLEs and using it to support and guide their learning. This is clearly linked to the ability of the tutor to move to a more egalitarian role with shared responsibility and control (Timmis & O'Leary, 2004). The final report is available from the SOLE Project Website.

A study by Frederickson et al (Frederickson 2005) at University College London found that web-supported learners become more independent, taking responsibility for their learning – 'Participants in the web-supported sessions seemed motivated to take responsibility for directing and assessing their own learning while participants in the lecture sessions appeared, without question and despite the lecturer's best endeavours, to vest these roles and responsibilities in the lecturer'.

You need to consider this changing role and the associated expectations when designing your learning activities and resources.

Preparing Students to Use a VLE

When you are designing your course using a VLE it is important to think about how you are going to introduce this way of learning to your students. Research suggests that students can struggle in this environment and drop-out rate can increase unless there is a thoughtful induction (Lynch, 2002). Moore & Aspden (2004) indicate that students will use a VLE when they know why it is being used and how it will benefit them. Students are not negative or particularly positive about using a VLE but need it to have an explicit role and that needs to be explained and reinforced by the tutor, for example in the student's attitude towards the tutor's use of Blackboard.
Some of the issues that you may consider when introducing the use of a VLE to your students include:

**Access to a reliable computer**

Although the majority of students are likely to have access to a computer and the Internet, it cannot be assumed that all students will. It is important to liaise with your IT department regarding the facilities for students to access computers within your institution. Make sure your students know about these facilities since lack of or restricted access will have a significant impact on the use of the VLE by your students (Williams, 2002).

**IT skills**

Although many students will have adequate or more than adequate IT skills to access your course on the VLE, there may be some who will feel ill-prepared to be learning online. This may include older or international students. Studies indicate that pre-conceived ideas about information technology skills being a barrier were not substantiated; students found VLEs easy to use and a way of developing their confidence with information technology (Moore & Aspden, 2004). Nevertheless, some students will need help. You may need to offer signposting for areas within your institution which provide help in improving information literacy skills, for example, study skills centres or learning centres. In addition, you will probably want to circulate guides about how to access and use the tools within your VLE.

If you are using tools within a VLE that require specific IT skills, for example, synchronous chat, it is important to check that everyone in the group has similar ability in typing (neither too fast nor too slow) since this can lead to students dominating the discussion or feeling disenfranchised.

**Learning with a Virtual Learning Environment**

Many students, especially those physically attending a course delivered at an institution, have a very traditional perspective of education. Therefore, the introduction of a VLE and the associated changes in their role as a learner, may not fit comfortably with their expectations. For example, they may perceive the requirement to function as an independent learner a type of abandonment and feel isolated (Howland & Moore, 2002). Also, they may have previous or current experience of using a VLE which focusses on a more content-based approach to learning and teaching and this may cause complications. Students may find it difficult to combine a new approach to learning in your course with other courses which use a VLE for a more traditional role.

At the beginning of the course, you may wish to give students advice about being an independent learner, changes in their role and using a VLE. You will need to explain about how using a VLE will change their face-to-face sessions and what you expect from them in the VLE. In some cases you may decide to provide further guidance on independent learning and study skills which may be in collaboration with your study skills centre at your institution.

**Benefits for students**

It is worthwhile providing the students with an overview of the benefits that using the VLE will have for them. For example, there may be organisational benefits: you can help students plan their time for studying during a course if a timetable, activities and related materials are available on a VLE from the first week of study. This will help them organise work, family commitments and plan time for studying. Also, by using a VLE, a tutor can plan for distance or blended learning, reducing face-to-face sessions and students’ travel time to classes.

From the learning perspective, a VLE can accommodate different student learning styles, for example, some students will find learning online easier by engaging in an online discussion as
opposed to face−to−face discussion. In addition, a VLE can provide opportunities for practice and recall when convenient for students, especially without others seeing the mistakes they have made. They can find the appropriate materials they need in the format they like since VLEs can accommodate a wide range of learning materials especially through their use of multimedia (graphics, audio, video) and their ability to allow the user to create their own learning journeys (for more information, look at the SFEU materials; writing for online learning, section 1, learning styles). Finally, they can receive immediate feedback, for example, in simulations and quizzes rather than waiting for the tutor to respond in the face−to−face session.

A VLE can allow learners to learn more and faster, by fully utilising the administrative tools of the VLE, streamlining communications and refining tutor feedback to learners. This enables learners to focus upon learning−related tasks (Kvavik and Carvso, 2005).

You may also want to emphasise that VLEs can also improve the face−to−face learning environment. If students know that materials are on the VLE, it means they can listen and think more in the class than worry about catching every single word in a face−to−face session as seen in LTSN LEAP Case Study 4.

It also means they will have more time to ask questions and work on materials with you in a more active learning environment in the face−to−face sessions.

**Introductory activities**

Research indicates that introductory activities especially involving online discussions can have a positive impact on active participation (Ellis & Llewellyn, 2004). In your introductory session, it is essential that you provide a rationale for your use of the VLE including the benefits it will have for your students, ensure that they can access the VLE but also provide an introductory activity. This may be using some of the online quizzes or the online discussions.

**Summary for The Student Perspective**

Many younger students have an information age mindset; they are ‘digital natives’ rather than ‘immigrants’ and use ICT in their studies and for recreation and social activities (Haywood et al, 2004). This means that they expect ‘total connectivity’ – when they want and need it – through email, internet relay chat and mobile phones. In their learning they have a preference for doing rather than knowing and can readily multitask. Most of them are extremely comfortable with IT and the Internet and do not perceive computers as technology.

Research indicates that students are mainly positive about VLEs but they need to know its purpose. There is a tendency for students to focus on content and materials hosted in the VLE; in the Edinburgh survey when asked about other uses (besides providing content) for a VLE, the answer was often ‘don't know.’ Students have a limited knowledge about what a VLE can do for them. As Haywood et al (2004) state there is a need to increase student awareness of the full potential of online learning if it is to be fully accepted. Therefore, students will need guidance, especially in the early part of a course, into how to use the VLE for active learning.

Not all students will have a positive attitude to VLEs and may feel that using a VLE is taking them out of their ‘comfort zone’ – it may not meet with their expectations and previous experience of how they learn and how they want to learn. In addition, they may not welcome the changes to the face−to−face sessions which move away from a more didactic approach. A clear introductory session explaining the rationale for the use of the VLE and signposting for support is essential.
Special Educational Needs

One of the advantages of using a VLE is that it can provide 24–hour access for students who are unable to physically attend a course or unable to work during the allotted hours the course is delivered in. It can also help to accommodate, with a small degree of planning and forethought, those with special needs. Used without planning and forethought on the part of the administrators and the tutors who populate it, however, it can be an impenetrable barrier to many students.

The Disability Discrimination Act (1995), in particular Part 4 as amended by the Special Educational Needs and Disability Act (2001) – (SENDA), has affected all aspects of life in tertiary education (for further information see Willder, B. (2002) ‘Disability legislation: implications for learning technologists in the UK’ in Phipps, L., Sutherland, A. and Seale, J. ‘Access All Areas’). This imperative has been heightened by the Disability Equality Duty. Not only do you need to ensure that your physical spaces and buildings are accessible to those with mobility and vision impairments, but also that your teaching and online material (including that within a VLE) is also as inclusive as possible. By inclusive, we mean something designed so as to be accessible to all users, regardless of impairment.

The couching of the DDA in general phrases such as 'less favourably', 'reasonable adjustments', 'substantial disadvantage' and 'anticipatory' created a sense of anxiety in some while others recognised an opportunity to take a more learner–centred approach and evolve good practice. There has been a distinct shift in recent times away from a rigid standards–based approach to electronic materials and towards a more holistic approach that discriminates between delivery mechanisms, content and context, focusing more on the learner's experience than meeting any checkboxes and guidelines.

If we make the distinction between the vehicle of delivery and the context of use it becomes possible to distinguish quite separate issues requiring quite separate guidance.

Vehicle of Delivery

The VLE is the mechanism by which all resources will be stored, shared or otherwise delivered – i.e. the actual VLE package (for example: BlackBoard or Moodle).

In January 2003, TechDis undertook a survey to consider the position and documentation of VLEs with regard to accessibility. The full report is available on the TechDis website and is reprised in Cann,C., Ball,S. and Sutherland, A. (2002)'Towards Accessible Virtual Learning Environments' in Phipps, L., Sutherland, A. and Seale, J. ‘Access All Areas’.

Resources

British Education and Communications and Technology Agency (Becta) (2002) – ImpaCT2

Department for Education and Skills (2002) – Young People and ICT

JISC, as part of their e−learning programme, are conducting a learner consultation on effective pedagogies for e−learning.

SEUSISS Project (2002)

Students Online Learning Expectations Project
The survey covered seven off-the-shelf VLEs and asked the suppliers of each for details of the product's accessibility and the work being done by the developers to enhance this. It indicated that most VLEs still need further development before they are completely accessible for a majority of disabled students. WebCT and BlackBoard were at the time leading the field in terms of accessibility features within their products and assistance offered via their websites. The position is consistently improving, but even now the responsibility still lies with the person creating the learning materials and putting them into the VLE to make them as accessible as possible within the confines of what the VLE will allow.

Following on from the research outlined above, TechDis undertook a user testing trial in conjunction with the Royal National College at Hereford, using WebCT and BlackBoard. Students who were hard of hearing, dyslexic or with motor or vision impairments tried carrying out simple learning tasks within the VLEs, such as uploading assignments, accessing a discussion facility, creating a home page and accessing a multiple choice quiz. If they used screen reading software (a package that converts what is displayed visually on-screen in words into 'spoken' words) such as JAWs or SuperNova, this was incorporated into the trial.

The results of the trial

The results of the trials showed that students using screen readers initially needed a great deal more support to overcome problems with navigation and actually accessing content. Most students spent three quarters of their task time actually undertaking the task in hand, and one quarter accessing the necessary information. In comparison, for students using screen readers the figures were almost reversed, with only a third of the time being spent on actually undertaking the given task. This emphasises therefore that the mere availability of assistive technology does not immediately mean that your students using that technology will be able to access a VLE without problems. However, students with other needs (such as using a screen magnifier for example) were able to operate within the VLE relatively successfully. The trial also showed that, however many difficulties the students had encountered, they still enjoyed the experience of interacting with the VLE. The message to tutors is to use the VLE to its fullest and try a range of methods to ensure access for all.

Context of Use

Materials within the VLE will have a wide range of uses and contexts. Some will be specifically designed to be delivered in an online environment, others will be materials from lectures or classrooms that have been put up for students to refer to later. Some audiences are highly specialised and their needs known (such as password-protected modules) and others are publicly available. There are essentially four scenarios with relation to how the accessibility of materials within a VLE needs to be viewed.

**Scenario 1.** Materials created specially for online purposes, audience unfamiliar (e.g. a basic 'introduction to maths' course utilised by several faculties for first year students, or an online key skills support course). Because you have no idea of the needs of your students and will not be able to interact with them face to face, the highest technical standards need to apply in this arena. It may well be worth procuring specialist assistance to ensure the materials are as inclusively designed as possible. In this instance the guidelines for web content accessibility will be a useful aide and benchmark.

**Scenario 2.** Materials created specifically for online purposes, audience familiar (e.g. resources created specifically to encourage online discussion between a known set of students, or resources delivered to support the write-up of fieldwork). Because of the online nature of the materials high technical standards need to be applied, but where you know your audience it is possible to utilise resources that are inaccessible to some groups if they add value for some users without detracting from the experience of others.
Scenario 3. Materials created for a face to face environment, audience unfamiliar (e.g. a visiting speaker’s supporting resources). Basic accessibility concerns should be addressed but potentially more important is the presenter’s skill in engaging with a broad audience with a variety of needs, for example in describing the content of a slide where visually impaired learners may be present.

Scenario 4. Materials created for a face to face environment, audience familiar (e.g. supporting resources for lab or seminar activities, resources for use in a lesson with an interactive whiteboard). Basic good inclusive practice should be employed in conjunction with experimentation with new types of media and resources that will make the material more accessible to all learners. Resources that work well for some but not others should still be used if more appropriate alternatives are available for those who need them.

When you are thinking about creating materials for your course that will be placed within a VLE, it is worthwhile considering:

• the extent of the accessibility features within the VLE;
• the assistive facilities for students at your institution.

For example, if your students have network access to a screen reader such as JAWS, then it would be an obvious adjustment for you to make your materials as compatible with JAWS as possible, and to offer alternatives when this is not possible. Similarly it may be possible for students at your institution to apply their own 'roving profile' to whichever PC they are using at the time; this means they can apply their chosen colour scheme, font size and type and so on, to whatever material they are viewing (providing the materials has been created in a way that allows them to do this). Contact your IT or student support departments to determine what facilities are offered to students. You could ask support staff at your institution to give you a demonstration of a screen reader. You can experience what it is like to have a screen reading actually reading some material from your VLE; this will give you some idea of the difficulties that can occur if materials are not created with accessibility in mind. It is also possible for you to download an evaluation copy of JAWS onto your PC so that you can check your materials yourself before they go live.

When you have discovered what technologies are available for students at your institution, the TechDis Technology Database) can be used to discover more about the technologies.

Making VLEs Accessible

There are many things you can do to make your VLE–based materials accessible for a wider range of users. Some of the checks you can employ are outlined below:

<table>
<thead>
<tr>
<th>Area</th>
<th>Checks</th>
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<tbody>
<tr>
<td>Navigation</td>
<td>• Remember not to use confusing terms – if the VLE has ‘forward’ and ‘back’ features, don’t also use ‘forward’ and ‘back’ to move between pages of your material – use ‘next page’ or ‘next module’ instead.</td>
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<tr>
<td></td>
<td>• Remember sometimes users cannot ‘see’ where they currently are within the VLE, so remind them by putting an explanatory title or heading at regular intervals.</td>
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<tr>
<td></td>
<td>• Some users cannot use a mouse, so try moving around your materials just by using the Tab and arrow keys – can you do it? Can you check option boxes and access drop–down menus using just the keyboard? It should be possible within most VLEs to enable features like these.</td>
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Keyboard Dexterity
- Some users can only hit one key at a time – are there places in your materials where two keys have to be pressed simultaneously?
- If a student accidentally gets to the wrong page or enters the wrong information is it obvious how to backtrack?
- Drag and drop questions may be difficult for some vision impaired users, but can be preferred by users with limited keyboard dexterity – try to keep a variety of material types within each class or module.

<table>
<thead>
<tr>
<th>Audio content</th>
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<tbody>
<tr>
<td>• Audio content can be of great benefit in providing a varied experience for students. Ensure that it is captioned or that a transcript is provided for students who are deaf or hard of hearing.</td>
</tr>
<tr>
<td>• Many institutions do not allow sound cards to be fitted into machines for student use (or for staff use in some cases) – check the situation in your institution before placing sound files into the VLE.</td>
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<th>Language</th>
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<tr>
<td>• Many students do not have English as their first language (including those whose first language is British Sign Language) so ensure language is clear and instructions are unambiguous.</td>
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<tr>
<td>• Dyslexic students may have additional difficulty in comprehending long and complex sentences. Break sentences down into shorter chunks by the use of punctuation where possible.</td>
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<th>Screen Magnifiers</th>
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<tr>
<td>• Ensure graphics and charts make sense at increased magnification (where only a portion of the whole may be visible at any one time)</td>
</tr>
<tr>
<td>• Do not use images of text (they tend to pixelate at increased magnification)</td>
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<tr>
<td>• Consider your choice of colour – imagine lime green text magnified sixteen times!</td>
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<table>
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<tr>
<th>Screen Readers</th>
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<tr>
<td>• These read in linear fashion, so try to ensure the items on your pages run in a logical order – this can be seen using the TAB key to jump between items.</td>
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<tr>
<td>• Tables can be a feat of memory for someone listening to them being read out, so try to design them so they are easy to comprehend when accessed aurally (for example: ‘Chelsea 56 Liverpool 47 Wigan 45 Bolton 42...’ is far easier to comprehend than ‘Chelsea Liverpool Wigan Bolton....56 47 45 42’).</td>
</tr>
<tr>
<td>• Links, action buttons, and diagrams often have names that make no sense when taken out of context. Some screen readers can pull all of the links from a page into a separate window for the user. If all of these are ‘click here’ they are meaningless – try to label each link and button with something contextual.</td>
</tr>
<tr>
<td>• Provide a text description of images and diagrams so blind students can access the information contained within the images. This will also aid those accessing materials using PDAs or phones.</td>
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<tr>
<th>Colour</th>
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<tr>
<td>• Be aware of red/green combinations – a large proportion of students cannot distinguish between them.</td>
</tr>
<tr>
<td>• Do not use colour alone to convey meaning. How does a blind student know which are the important points written in red? Use heading tags as well, which will then be picked up by screen reading software.</td>
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</table>
Try to keep a mild background colour, such as cream, pale green or pale yellow, rather than white, primary colours, or distracting background images.

Hopefully your institution will allow students to choose their own preferred font size and style, but if not, use one which will be as accessible to as wide a range of students as possible – a sans serif font such as Arial or Comic Sans, and minimum of 12 point – in navy, purple or dark green rather than black. Use a minimum of 1.5 line spacing.

Other sites showing handy hints and tricks for increasing the accessibility of online materials are available from Aberdeen University and the University of Essex.

These are just a few suggestions for making the materials you put into a VLE more accessible to a wide range of students. There are many more techniques you can use. Above all, though, there are two key things to remember:

- decide how accessible you can realistically hope to make each item within your VLE, and then how you can create alternatives for those students who still can't access it;
- if you aren't sure how your material will work with certain pieces of assistive technology or with certain students, contact the student support office and ask them to find you volunteers who would test out the materials (these are students remember, a small fee will usually get you volunteers!). Try to avoid approaching 'obviously disabled' students directly as they can find this troubling (personally, or in terms of increased workload) or even offensive.

Nationally, work on making VLE materials accessible has so far been isolated, as highlighted in an extremely useful report by Sara Dunn. However, this should simply be an added driver for you to try to get it right with your own materials and more widely across your own institution. Most institutions have an accessibility policy, but many do not tie this in with learning and teaching policy. It may be worthwhile finding your institution's accessibility policy, and perhaps using your intranet to identify colleagues who have already produced accessible VLE content who may be able to share their experience with you.

**Resources**

National organisations and initiatives have provided staff with a wealth of information on making their learning and teaching more accessible to disabled students:

- Ferl's Students With Disabilities Focus Area
- The ALERT project aimed to improve the accessibility of online learning in specific subject areas. In particular, to identify methods of supporting disabled students to enable them to achieve the pedagogical objectives of their modules through a Virtual Learning Environment (VLE) [http://www.bournemouth.ac.uk/alert/](http://www.bournemouth.ac.uk/alert/)
If you are using BlackBoard you will find Carol Doyle’s article very useful. Entitled ‘Making Your Module Accessible in BlackBoard’, it gives a slightly outdated but nevertheless excellent overview.

For more information regarding the legal responsibilities to provide accessible materials, visit the JISC Legal website.

Accessibility information from specific VLE suppliers can be found from WebCT and Blackboard.

Rob Woodford and Sally Bradley provide an example of how VLEs can be used with dyslexic students. ALT News Issue No. 45 April 2004.

UK Government Disability website

Moving forward

‘A VLE is not a panacea – it will improve flexibility and access to a wide range of content and support. It won’t, of itself, automatically improve teaching and learning, unless it is implemented with a clear understanding on the part of the staff of the role the VLE will play within a given course or programme of study’ – FERL

This final section considers the support that is available to you, the tutor or member of the teaching team, within and outwith your institution when designing a course using a VLE. We also consider issues that you may encounter when using a VLE and possible solutions. Finally we provide a number of pointers to the other units within this infoKit.

Support Available to the Tutor

When starting to design a course using a VLE, the tutor or teaching team will find there is a range of support available, both within and outwith their institution. This support will be vital in helping you, especially in the design and deployment of the course using a VLE.

Support at your institution

Your primary source of support will usually be within your institution. It is worthwhile spending time finding out who can provide you with that just in time, day-to-day support at your institution, for example, a Centre for Learning and Teaching, an Information Services Department or maybe a colleague who is already proficient with your institution’s VLE.

It is very easy in your planning to forget that one of the advantages of using a VLE is that you can use it to signpost resources for your students that are already available at your institution. For example, a course in a VLE can link to:

- Your library’s online catalogue;
- Your institution’s online electronic resources through an icon or a tab;
- Resources developed by your Library for subject areas and to improve general information literacy;
- Online articles with the negotiation of your Library.

The librarian or learning centre staff at your institution can provide you with a wealth of information and help about supporting your course in a VLE. For example, Gary Sparham of Tameside College, one of the FERL case studies, discusses his development of a module in Blackboard to help study skills.

Jacqueline Chelin has written two articles outlining how librarians can help tutors developing courses in a VLE. In her article for ALT–N she provides an overview of how librarians can help academic tutors developing courses in a VLE. This is further expanded on the Sconul website.
Moore & Aspden, 2004, also show the importance of improving students’ information handling skills when using a VLE.

Your institution may have developed some staff development materials, possibly using the VLE for delivery. This example has been produced by John Beaumont–Kerridge of The University of Luton Business School. Some are also produced by the vendors, for example BlackBoard Quick Tutorials.

Support outside of your institution

There are many organisations that can provide you with help about using a VLE environment. The Higher Education Academy has a number of guides about using VLEs especially in its e–learning section. In addition, the FERL website provides a guide to using a VLE with case studies.

The Joint Information Systems Committee (JISC) and its Regional Support Centres

The Association for Learning Technology

Netskills

The British Educational and Technology Agency (BECTA)

Online Centre of Excellence for Scottish Further Education

The National Grid for Learning

The National Information and Learning Technologies Association (NILTA)

The National Learning Network

The Resource Discovery Network

BbMatters

Available Resources

When you are designing your course, you may be concerned about the time required to create new materials. However, you will find that you can source many materials that have already been developed for use in an online environment and can quickly be incorporated into the VLE. For example, from the appropriate LTSN subject centre, the JISC or from the NLN.

Generally you will gather materials from:

- Subject specific gateways and websites such as those previously mentioned.
- Publisher’s materials. Some of the textbooks that you recommend may provide a website or additional online materials. This may include quizzes, readings, additional notes, diagrams or links to further resources. It is also worth checking if publishers provide materials on a CD–ROM and if they would mind you transferring these materials into a VLE or if you can link to their website. You may also find that the publisher will be able to provide you with materials that can be downloaded into your VLE.
- Generic websites. There are a number of websites that you might like to point to for your students. For example, RDN Virtual Training Suite materials.

You may also have your own materials that you have already developed for the course. For example, you might have a PowerPoint for a face–to–face session. This could be narrated and
linked to your VLE course. Alternatively you may have some slides which can be incorporated into an image database (providing you have copyright permission). Your Word documents can be easily converted into html pages using software such as CourseGenie which allows you to add features such as a table of contents that can be used for navigation and self test questions. These web pages can then be loaded into your VLE. BbMatters published an article authored by the Learning Technical Support Service at The University of Bristol entitled CourseGenie: Observations on the journey so far. This article documents how the tool is being used and supported at the University of Bristol. Susie Beasley and colleagues at Queen Margaret University College have written a guide to using CourseGenie. Although this tool is easy to use if your word document is straightforward, there are sometimes problems with such features as tables. The following provides a list of the materials that you might include in your VLE course:

<table>
<thead>
<tr>
<th>Teaching materials</th>
<th>PowerPoint slides, lecture notes, additional materials for further study, extracts from case studies, guidance on how to use equipment, sample assessments and examples of previous student work (after agreement has been gained from the students)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course information</td>
<td>Information about tutors, groups, timetable, reading lists, assessment information</td>
</tr>
<tr>
<td>Links to further materials</td>
<td>Links to the institution's library and online resources, perhaps links to the subject librarian and materials developed by the library for your students. Links to websites with brief explanations.</td>
</tr>
</tbody>
</table>

These resources will usually be a combination of text, images, sound and video files.

Your resources should support the design for the delivery of your course using the VLE. For more details on designing your course see the 'Designing Sustainable and Scalable Courses' section of this infoKit.

**Copyright**

It is essential that all materials that you use in your course on your VLE have copyright permission. For example, if you are using an image from a website or material from a publisher's CD-ROM, always ask for permission. It is also worthwhile keeping a copy of the letter/email that has granted you permission. You will also need to check that you can use materials to which you have individual access, for example, through membership to professional bodies. This will include electronic (through online websites) or paper-based materials.

You will probably find that there is support available at your institution regarding copyright. Further online information about copyright is available at:

- The Copyright Licensing Agency
- JISC Briefing Paper Number 19
- The JISC Legal website provides a thorough guide to copyright and intellectual property rights.

**Intellectual Property Rights**

This is a complex area especially in the development of materials that may be available through your VLE. JISC Legal has an introductory guide to IPR and e-learning that covers the basic aspects of IPR, especially copyright with an emphasis on reusing third party materials. It has hints and tips and provides an overview of the wider picture.

When designing your course, it is very easy to focus on resources especially since students perceive this as one of the key uses of e-learning. However, the crucial focus on your use of a VLE
should be on how you are going to help the students meet the learning outcomes of the course and what are they going to do with these resources to meet the learning outcomes. A good example of this is available through the FERL website, through a case study of using BlackBoard to complement and support A Level English Literature. Further guidance on designing and developing your course is available in this infoKit.

**Issues when using a VLE**

In this section, we describe some common problems that might occur when you are using a VLE for the first time. Many of these issues can be overcome through careful planning and course design.

Some of the technical issues that you may experience could be related to:

- Robustness of system;
- Lack of access to the Internet and computers for students;
- Lack of student IT skills.

Any technical system from time to time will have downtime; this may be planned due to updates and necessary maintenance or may occur due to unforeseen difficulties, for example, an electrical surge. In such circumstances it is better to be honest with students and explain that the systems should be available shortly. Despite Oblinger and Frand's ideas, students can be very accommodating of such issues, as long as they are not on a regular basis.

Williams (2002) highlights one of the major barriers to using technology is enabling student access. Students may have access on campus but may have problems in connecting to the VLE off-campus (for example, from home, in outreach centres or when on placements).

**Lack of attendance at face–to–face sessions**

Many staff are concerned that making learning resources available to students will discourage them from attending class. There is evidence that that this is not the case. Sometimes attendance may be increased at face–to–face meetings. This depends on the perceived ‘added value’ in attending class. Also, research indicates that if tutors do not make PowerPoints available that this is linked with tutor fears that the VLE will replace them (Urquhart et al, 2004).

Omitting key words and concepts on the PowerPoint Presentations held within a VLE has been demonstrated as a powerful way of ensuring students attendance in class. As outlined in the LEAP Case Study 4, making slides available prior to class means that students can spend more time listening to the tutor and adding additional notes instead of copying down information. However, they key is careful planning around what you, as the tutor, will do in the face–to–face sessions and what you will ask the students to do.

**Maintaining the momentum**

Learners will need constant reminding to use your module in a VLE and will need a specific reason to visit. It is useful to keep reminding students about the VLE and its uses and role in the face–to–face sessions. Ensure that there are links from any documentation that you provide to the VLE module. You may wish to release materials from time to time to ensure that there are reasons for the students to return to the VLE. However, if you have carefully planned your module, with activities linked to content and your face–to–face sessions, students will return.
Lack of student involvement

Tutors often complain that students will not engage with a VLE. They will visit the VLE once or twice and print out all the materials and then not return again. This reflects the earlier simple use of a VLE as an information repository referred to by Sigala (2002). As we will see in another section it is important in the planning stage to think about how the student will use the resources. VLEs are about content and activities: as the tutor, your role is to guide the student through the content and the related activities. It is better in the design stage to focus on small sections which comprise a task and associated content. An example of this is the LEAP Case Study 12.

Coping with the demands of online students

Once students are involved in online learning and using the VLE, they can become very demanding in their support requirements. Having moved from one setting with very set boundaries and defined times, they find that a VLE can provide them with instant and constant support. As Breen et al (2001) state students understand that they have to wait for a book, they do not have the same perception of waiting for a computer or waiting for a tutor to reply to a posting. Oblinger (2003) and Frand (2000) recognise that increasing expectations from students are resulting in a need to provide 24x7 IT student support. It is essential that the tutor or teaching team set clear guidelines at the beginning about their role, their frequency of access and particularly with online discussions, their input.

A new way of learning

Not all students find working online and using a VLE easy. Students, like tutors, are used to working in a face-to-face learning environment and will require support to help them adjust their study skills to the VLE environment. Comments from students using VLEs have included:

‘I paid for lectures so why aren’t you providing them?’

Students are familiar and comfortable with ‘chalk and talk’ face-to-face sessions. They are used to being passive receivers of ‘content’ from the tutor. Taking responsibility for their learning and becoming more independent learners may place them outside their comfort zone. Therefore it is important that you prepare them for this experience especially when launching your course in a VLE. Careful planning of your course with a VLE is essential.

Lack of spontaneity

Students may complain about the lack of spontaneity in a VLE especially using computer mediated communication; they may dislike the lack of immediacy, quick responses and turn taking which are common in seminars but not possible in online discussions. They could also be frustrated with the time required for asynchronous online feedback and the increased length of time for decisions to be made. Further information about how to overcome such issues is available in the Communication Tools section of this infoKit.

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Effective Use of VLEs: Evaluating your Practice

- Feedback Sources
- Personal Development
Evaluating Your Practice

This section is about gathering feedback on your own practice, with an emphasis on formative evaluation, looking to improve ongoing teaching provision and learning support, rather than summative evaluation, providing an overall judgement of value or quality at the conclusion of a module.

Some of the reasons why you evaluate your practice are:

- For personal development.
- To ensure that your teaching is effective from the students' viewpoint.
- Quality audit (department / institution).

The evaluation cycle below illustrates a continuous process, each turn invoking five 'Rs' – Rationale, Resources, Review, Reflection and Revision.

*Rationale* – purpose(s) of the item (e.g. material / conference / assessment), models of why this might be the way to achieve it(them),

*Resources* – (people, materials, technologies) available to support it

*Review* – tools and instruments for monitoring/investigating the processes/outcomes. These should adapt over time to fit need, and themselves stay under review so that they do not become mechanical, missing possibly valuable information.

*Reflection* – making sure that this part of the process involves sharing and exchange of thoughts and ideas with all participants

*Revision* – large or small–scale changes required to the item(s), addressing points of concern, and keeping the overall picture (rationale) in mind – and updating it.
You should build evaluation into your practice as a continuous or periodic event rather than as an add–on or something to conduct at the end of a module delivery.

It is important to develop an evaluation plan, and this will help you consider:

- what are you evaluating?
- why are you evaluating?
- when will the evaluation take place?
- who is it for?
- what type of questions will you ask?

Answering these questions will guide your methods and question design which will lead to meaningful and useful answers that can be easily analysed.

A guide to help you produce an evaluation plan is available from Interact issue 30

**Feedback sources**

Sources of information for your evaluation could include self–reflection, peer review, external consultation and, most importantly, student activity or performance and what they can tell you from their own experience of your provision.

Student feedback can come from many sources, including

- exams, assignments and projects,
- formal staff–student meetings,
- focus groups,
- informal class discussions,
- interviews,
- questionnaires and checklists,
- attendance records,
- notes, diaries, log books, portfolios,
- observation records of class activity,
- diagnostic tests.

'The evaluation cookbook' and other evaluation resources on the JISC infoNet website give 'recipes' and guidance on positive and negative aspects of these methods.

The section ‘design of sustainable and scalable courses’ gives more detail about using questionnaires to elicit feedback from your students.

Examples of the type of questions that you may wish to ask your students are shown below.

Do you (as a tutor):

- Encourage student–tutor contact and interaction?
- Encourage student cooperation?
- Encourage active learning?
- Give prompt feedback?
- Emphasise time on task?
- Communicate high expectations?
- Respect diverse talents and ways of learning?
- Let students know what to expect?
- Make effective use of technology?
You will also need to ask questions concerning the use of the VLE and the adequacy of the training that your students received.

**Personal development**

Phil Race has written an excellent article on evaluation for professional development 'Evidencing Reflection: putting the 'w' into reflection'. The article is available on line from http://www.escalate.ac.uk/resources/reflection/index.html

**Peer observation**

The purpose of peer observation is to share excellence in teaching and teaching practice. A peer observation scheme can be used to promote individual reflective practice and a culture of collaborative reflective practice. The observation is confidential between the 'buddies' with confirmation that the observation has taken place being lodged in a central place (department or institution). Such a scheme should be supportive in nature, not a fault flagging process. The School of Informatics at Northumbria University introduced a peer observation scheme in 1999; this was superceded by a university−wide scheme introduced a few years later.

Another example of a peer observation system is that from Queen Margaret University College. Details are available from http://www.qmuc.ac.uk/cap/Guidelines/Page.asp?ID=PeerObs1

Although these schemes were originally developed for face−to−face teaching, they can easily be tailored to apply to use of a VLE in teaching and learning. A 'buddy system' is also an excellent way of starting to share teaching material.

Reflective practice should not be a 'once a semester' activity; it should be ongoing. Keeping a reflective journal or portfolio can assist in the continuous nature of reflection. A peer observation scheme together with individual and collective reflective practice can lead to scholarship of teaching. Visit the Higher Education Academy website for more information on this topic.

**Resources**

Guidelines on peer observation are available from the Escalate website at http://www.escalate.ac.uk/resources/peerobservation/

'The evaluation cookbook'
http://www.jiscinfonet.ac.uk/Resources/evalkit/toolkit−database/ev019/view

Evaluation resources on the JISC infoNet website
http://www.jiscinfonet.ac.uk/Resources/evalkit/resource−eval−methods/view

HE Academy resources page
http://www.heacademy.ac.uk/979.htm


HE Academy: Peer observation of teaching
http://www.heacademy.ac.uk/988.htm

e−learning centre has a page of links relevant to evaluating online practice
http://www.e−learningcentre.co.uk/eclipse/Resources/effective.htm
'Interact' is published twice a year by the Learning Technology Support Service at The University of Bristol. 'Interact' Issue 30 is devoted to evaluating e–learning and includes an article on evaluating the the costs and benefits of e–learning.

Approaches to evaluating the effect of ICT on student learning. Rob Phillips and Tony Gilding. An LTSN leaflet ELN015 (Rich Text Format (RTF)) available from the HE Academy Website This guide is aimed at teaching staff and project managers involved in developing ICT applications. 'We will focus on the hardest part − planning an evaluation study. Once a plan is in place, people with social science research skills can be employed to do much of the leg–work of the study.'

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Effective Use of VLEs: Managing for Sustainability

- System Requirements
  - Content Packaging
  - Using & Integrating Tools
  - Interoperability Standards

- Cultural and Organisational Issues
  - Overcoming Barriers
  - Changing Working Practices
  - The Roundtable Approach
  - How a Roundtable Operates

- Risks & Benefits of e-Learning Investment

- References
Managing for Sustainability

You may find that, if your institution has a centrally−managed VLE system, it is based on a 'one size fits all' philosophy: the system is trying to accommodate different styles of teaching across the institution and, as a result, is likely to be a compromise for everyone. No single system can manage all aspects of course building. This requires a range of software, each of which focuses on one particular aspect of the educational process. All of these must be 'interoperable' (i.e. must be able to pass information from one system to another). VLEs are now being constructed by integrating two or more systems to build online environments that suit particular learning situations. These specialised systems can support:

- Storage and sourcing of resources: digital libraries, web based digital repositories.
- Moving and packaging of resources: content packaging tools.
- Usage and integration of resources: VLEs, e−Portfolios, shared workspaces.

Some of the current issues with Virtual Learning Environment systems include:

- Flexible course design – Many systems are focussed around a single educational method (usually the lecture−tutorial), which limits the potential of the VLE to support other methods.
- Control – Some VLEs do not allow students active roles such as negotiating assessments, setting up online discussions, or developing and uploading their own learning resources.
- Reusing resources – VLE systems do not always have an integrated database or digital repository. This means that resources cannot easily be shared. As a result, multiple copies of a single resource may be generated – all of which have to be updated individually.
- Integrating different e−learning tools – Not all systems are interoperable. Therefore, once a VLE has been adopted, it may be difficult to transfer courses to other VLEs. As a result you can be 'locked in' to a single system.

VLE systems under development are allowing resources to be stored, sourced and reused in a flexible way. These systems are underpinned by learning technology standards that allow materials to be reused and shared across systems. This section reviews some of the systems that can be integrated with VLEs to help tutors and students easily manage learning materials.

The JISC e−Learning Frameworks (eLF) programme is developing a range of open source software tools that can work together or with other systems to provide a comprehensive framework for the support of e−learning. The tools allow resources to be stored, sourced and reused in a flexible way and are underpinned by learning technology standards that allow reuse and sharing across systems.

What Systems Are Required to Manage Learning Resources?

If you want to easily store and share your own learning resources you will need access to a digital repository. Digital repositories are systems that facilitate the upload, storage, retrieval and reuse of resources. The main difference between a digital repository and a digital library is that any user can upload resources to a repository, but not to a library. Repositories are being implemented at local (institutional), national (for example Resource Discovery Network) or international levels. An example of digital repository software is Intralibrary (see figure below used by kind permission of Intrallect Ltd).
You can make use of Digital Repositories in a number of ways. At a basic level, you (or your students or colleagues) can search for resources (or Learning Objects) by keying terms into a simple search tool. If you are uncertain of the terms you should use, some repositories (such as Intralibrary) will allow you to make use of a browse tree which corresponds to a taxonomy of educational classifications. The search results will return metadata information about each Learning Object, such as the author, format and description of the resource. This information can help you quickly evaluate the suitability of each resource for your teaching.

You can upload resources (or Learning Objects) to a digital repository in a variety of formats. During the process of uploading, you will have to complete an online form that will ask you information about the resource (purpose of the materials, etc). This information is linked to the
Learning Object as metadata. Other metadata information is automatically recorded by the system (author, date, etc). To complete the upload process someone, usually a librarian, has to classify the Learning Object using an appropriate taxonomy.

The figure below show an example of reviewing content metadata within intraLibrary (image used with kind permission of intrallect)

Other examples of widely used digital repositories include:

- Dspace – an open source system that can be customized and extended. Developed jointly by MIT Libraries and Hewlett–Packard (HP)
- Xtensis – commercial software

For take–up and use of digital repositories, it is important that they are sustainable and trusted, well–supported and well–managed (White paper from the ALT/SURF/ILTA Spring conference 2005).

**Content Packaging Tools: Moving and Packaging Resources**

RELOAD is a freely available software tool that allows you to store your learning resources as compressed 'content packages'. These packages can be transported and reused across any online learning environment which is standard compliant. Content packages are important for tutors who don't have the time to build a complete course from individual components and who prefer to work with a series of aggregated resources. However, there is still a potential problem with the use of content packages, in that they may steer tutors towards planning courses in terms of content rather than student activity. This effect can be reduced by using storyboards, since the content is thereby linked to an activity; constructing a lesson which allows for student interaction requires integration of these content packages into an online learning environment, where they may be linked to online activities, discussions, chat, assessments etc.
The figure below illustrates packaging content from Intralibrary using the RELOAD content packaging tool (image used with kind permission from Intrallect and RELOAD).

Tutors have found Reload easy to use and user−friendly.

Using and Integrating e−Learning Tools: VLEs, e−Portfolios and Shared Workspaces

The integration of e−learning tools, such as Virtual Learning Environments, e−portfolios and shared workspaces, are opening up new opportunities to create better integrated virtual learning spaces. These systems aim to provide a focus for student learning activities and their management and facilitation, along with the provision of content (Conole, 2004).

e−Portfolios can either be personal digital records containing information such as personal profiles and collection of achievements or a combination of mixed media (EIfEL). e−Portfolios can support a range of functions, from providing records of achievement to supporting student reflection and assessment. The figure below shows an example of an e−Portfolio used to help students reflect upon their learning. This example is from a Masters course in Engineering at the University of Strathclyde. The course tutors noticed that when students were asked to collaborate within groups, there were often problems in terms of time management and around the effectiveness of assigning roles to each of the students. The e−portfolio was used as a means by which all students and tutors could review the information and resources pertaining to the group project. The students designed the structure, with advice from the tutors.
The figure below shows the students' reflections midway through their project.

To encourage students to think about their current and future progress, they were required to provide a progress report on a weekly basis through a project log, to reflect upon this and to draw up a plan of action for the coming week. Midway through their project, the students are aware that the tutor is concerned about their progress. They draw up a plan of action and improve the overall effectiveness of their work plan. Without the e-portfolio, the tutors would not have had sufficient information on project progress to offer level of feedback and help students get their project back on track.

There are other systems that support student collaboration – including shared workspaces. A ‘shared workspace’ is a software system that can support a number of functions including document upload, event notification, group management and so on. Shared workspaces are useful
to students working on collaborative group projects. Although they provide a good environment for informal archiving, they are not useful as communication tools. An example of an open source shared workspace system is Tiki-Wiki shown below.

This figure illustrates a file gallery where students can store and share learning materials.

Integration of learning tools is important in order to allow students to manage and share their own work—in-progress documents and learning resources, for example using shared workspaces and e-portfolios. Effective interoperability of systems depends on the implementation of underpinning learning technology standards.

In December 2005 we launched a more substantial resource on e-portfolios.

Interoperability Standards: Exchanging Information

There are many benefits to implementing VLE systems that have a standard way of exchanging information:

1. You can use and reuse learning materials across multiple systems. This means that you will not have to worry about adapting resources for use across a variety of different platforms.
2. If you have invested time developing a module or learning activity, you can easily ‘pick it up’ and ‘drop it in’ to another course. Alternatively it could be placed in a ‘repository’ for easy storage, retrieval and sharing with your colleagues or students.
3. If you don’t like a particular tool within your VLE (for example the assessment system, or the discussion board), you can link in another tool that will meet your requirements.
4. Perhaps most importantly, your department, school or faculty may have more flexibility in terms of choosing the VLE tools that can support the type of teaching and learning within your subject discipline. For example, schools of social science may emphasise the use of discussion boards, whereas engineering schools may focus on collaborative design tools.

If we want e-Learning systems that can work together (or be ‘interoperable’), the software for these systems must have some sort of standard way of exchange information (Liber and Olivier, 2003).
These standards all have the broad aim of increasing interoperability and reducing major inhibiting factors inherent within most current VLEs when information and content becomes 'locked in' to a particular software system. A learning technology standard is a recognized technology, format or method that has been ratified by a recognised standards body. Currently, there are various international standards bodies working in this area, for example ISO (International Standards Organisation), CEN (Comité Européen de Normalisation) or IEEE (Institute for Electrical and Electronics Engineers), or national bodies such as BSI (British Standards Institute) (Currier and Campbell, 2003). According to IMS, ‘The development of a framework that supports pedagogical diversity and innovation, while promoting the exchange and interoperability of e−learning materials, is one of the key challenges in the e−learning industry today’ (IMS, 2002).

The concept of learning technology standards may seem very alien to you as a tutor, particularly since it has its own set of terminologies. Standards may seem like a technical issue, secondary to the process of teaching. You may perceive your ‘real work’ as designing, developing and implementing e−learning courses. You may think that standards is not an issue that impacts upon your work: that someone else (e.g. software developers who are developing ‘interoperable’ systems) should deal with it. However, standards developers need to know how tutors would like to use VLEs â€“ in order to develop systems that can support a broad range of pedagogic approaches. The development of these specifications requires clear identification of good practice in the use of existing VLE systems. Ideas from tutors who have experimented with VLEs and have identified issues surrounding reusability of resources and transferability of information is essential to inform the development of future specifications.

Further information is available from:

- The UK Centre for Educational Technology Interoperability Standards http://www.cetis.ac.uk
- The IMS Organisation www.ims.org and
- A Short Course on Structured Course Development, Learning Objects, and E−Learning Standards http://careo.prn.bc.ca/losc/losccourse.html

Cultural and Organisational issues

In a previous section of this infoKit, we presented an educational paradox: tutors are today expected to teach larger numbers of students while, at the same time, providing for the needs of individual students. So far, we have explored ways in which we can deal with this by designing courses that enable large numbers of students to communicate with each other and with their tutors through technology. In carrying out learning activities your students will need to be able to source, store and manipulate learning materials, and, at the same time, to be able to discuss their ideas and receive feedback from you and/or from other students. Students are likely to integrate a mixture of resources: both formal (e.g. articles, notes) and informal ‘work in progress’ documents (e.g. notes, sketches, essays, reports).

Implementing these novel learning and teaching practices will require changes in institutional culture and organisation, particularly across Higher Education (for example towards sharing and reusing resources). Partnerships will have to be established involving students, educational developers, IT and audio−visual (AV) support staff and information specialists (such as subject librarians). Information specialists can provide support across both formal and informal collections of resources – offering curatorial advice on the management of informal, locally owned resources. Your students are likely to need support in developing the information literacy skills that will enable them to source, interact with and create new learning materials. They also need the flexibility to initiate discussions with tutors and peers using both electronic (mobile phone, email, chat rooms, texts, instant messaging) and face−to−face methods. Your role will also significantly change. You will probably spend time devising learning activities for your students, searching for and linking
resources and offering feedback to students.

Transformational change in how we use Virtual Learning Environments to support effective learning is best achieved by involving a range of stakeholders and considering as wide a range of perspectives as possible. The risks and benefits of change can be viewed in terms of the wider benefits to your institution – in particular, how the use of the VLE can be improved at all three inter-related levels: e-administration, e-content delivery and e-Learning.

The problem is that the main barriers to e-learning innovation and effective deployment of VLEs across FE and HE are cultural and organisational. Changes in working practices can be difficult. Marris (1986) compares the changes in working practices from known ways of doing things to implementing on new strategies with a sense of bereavement. It is difficult to reach agreement on key strategic priorities in transforming working practices. This section identifies some of the barriers to implementing e-learning together with suggestions for overcoming these, explores the difficulties associated with changing working procedures, outlines a method for achieving transformational change and explores the relationships between risks and benefits of change.

How to overcome some of the barriers

The table below shows some barriers to successful implementation of a VLE that have been identified by delegates attending JISC infoNet workshops. Some ways in which you can overcome the barriers are suggested.

<table>
<thead>
<tr>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Drop-in development sessions allow staff to spend varying amounts of time in the centre − byte-sized staff development</td>
</tr>
<tr>
<td>• Use the ‘Wednesday afternoon games’ slot as staff development time</td>
</tr>
<tr>
<td>• Allow staff to develop own resources during training sessions</td>
</tr>
</tbody>
</table>

http://www.fairenough.ac.uk

| Copyright/IPR concerns |                                                                 |
|------------------------|
| • Run workshops perhaps using the streamed recording of the JISC Legal webcast |
| • Provide clear guidance |
| • Incorporate as part of institutional policies and procedures |

JISC Legal website

| Students won't use |                                                                 |
|--------------------|
| • Ensure interesting and relevant learning activities and materials are available |
| • Ensure that staff and modules enrolment data is available for the VLE as soon as possible after enrolment and preferably prior to induction |

| Skills/training |                                                                 |
|-----------------|
| • Undertake a staff skills audit and use the resulting analysis to feed into the staff development programme |
| • Recognise the training that staff undertake |
| • Encourage PDP processes |
| • Publicise a programme |
| • Be reactive and able to respond to current issues |
| • Organise drop-in sessions |

| Technology (lack of, access to, |                                                                 |
|-----------------------------|
| • Undertake a technology audit and publicise results |
inappropriate, cost)  
Examine cost effective/alternative options e.g use of mobile devices  
Build supporting infrastructure into development plan  

Lack of sharing culture  
Lead by example  
Develop a communication plan  
Focus on community benefits  
Identify and work with early adopters  
Integrate VLE and the digital repository  
Focus on context as opposed to content  

Fear of change  
Prepare for change (examine strategies, policies, business process and ways of working, undertake a skills audit)  

Implementing e-Learning  

Expectations  
Implement a communications strategy  
Adopt clear policies and guidance  
Work with early adopters who can demonstrate what is possible as part of managing expectations  
Take an institutional approach to embedding the VLE  

Whatever the perceived barrier, it is vital that you have senior management support.  

The FAIR enough project found that planning is key – a clear e-learning strategy is required with implementation policies to prevent the institution going round and round with no clear destination.  

Changing Working Practices  

Changing working practices is complex. Working practices are usually interconnected, rather than being isolated: simply changing the way you distribute notes to students will impact upon how you prepare the notes, what format they are in and your timescale for preparation. Johnson (1992) suggests that, rather than trying to change working practices one by one, it is better to focus on issues that seem to be diametrically opposite. Examples include 'top down' versus 'bottom up' approaches to change management, 'central' versus 'local' support issues and 'collaboration' versus 'individual approaches'. In her study on changing practice in learning and teaching Australian institutions, McNaught (2001) came across three broad approaches to the management of change:  

1. Integrated approach ('all eggs in one basket') Many institutions, particularly those with a strong managerial ethos, implement a top–down approach to change management. This has several benefits, including coherent policy implementation and better co–ordinated planning of resources resulting in reduced duplication of provision. However, this approach has some major disadvantages. It may have the effect of restraining creativity and focussing on one methodology or technology.  
2. Parallel approach ('never the twain shall meet') Some institutions, particularly larger and older universities with a collegiate ethos, have a completely delocalised approach to change management. Benefits include creative development and concentration of expertise in the development of novel methodologies. However, co–operation between different stakeholders may be uncoordinated, resulting in inefficiency and sometimes competition.  
3. Distributed approach ('organic sprouting') This approach lies between the two previous extremes. Some institutions have a range of stakeholders, located both centrally and locally. This approach is less restrictive of innovation and local development and can be
economical. However, 'visible' institutional support is frequently required to sustain the initial momentum of change management.

A key question is – which of these approaches is likely to be most effective? However according to McNaught (2003), 'Because the two sides of a polarity are interdependent, it is not possible to choose one as a solution and neglect the other.' This means that strategic planning should take into consideration both ends of the extreme, rather than focussing on one or the other. In other words, we should implement 'top down' as well as 'bottom up' and 'central' as well as 'local' support.

These basic principles have been reaffirmed in studies on change management across the Further and Secondary Education sectors. For example Fullan (1993) highlights the complexities of change within his eight fundamental lessons. He emphasizes the fundamental position of conflict within change management:

1. 'You Can't Mandate What Matters' – change is too complex to impose. It requires insight, guidance and voluntary participation;
2. 'Change is a Journey, not a Blueprint' – change is uncertain and non-linear;
3. 'Problems are Our Friends' – every stakeholder involved in change will have their own perspective on how change can best be achieved – therefore conflict is inevitable. Like McNaught and Johnson, Fullan underlines the importance of these sorts of tensions in finding potential solutions for change; To some extent this will depend on the prevailing culture within your organisation. Follow this link to find out more about 'understanding your organisation'.
4. 'Vision and Strategic Planning Come Later' – since change is complex and unpredictable, it is impossible to strategically plan for change. There is evidence that many institutions act first, then draw up strategic plans at a later date – a tactic Fullan terms 'ready, fire, aim'. This seemingly topsy-turvy approach can help encourage creativity;
5. 'Individualism and Collectivism Must Have Equal Power' – no single solution will effectively bring about change. Therefore, Fullan encourages brainstorming and group thinking, involving a wide range of stakeholders;
6. 'Neither Centralization Nor Decentralization Works' – like McNaught and Johnson, Fullan supports a top-down and bottom-up approach to strategic planning.
7. 'Connection with the Wider Environment is Critical for Success' – organisations can learn to be seeking solutions from outside their usual domain, as well as internally;
8. 'Every Person is a Change Agent' – Fullan believes that change is too important to leave only to one set of stakeholders (e.g. senior managers). Effective change requires 'buy in' from across the organisation (i.e. senior managers, tutors, students and support staff, including librarians, audio visual, learning technologists, educational developers and IT staff).

Fullan's eight lessons provide a fundamental blueprint for transformational change. Three major factors emerging from these lessons are that change must involve multiple groups of people, representing a range of perspectives and working on a range of solutions. Therefore, to ensure that your institution can effectively change to exploit the potential benefits of using a VLE, it is essential that good partnerships are formed. One way of achieving this is to use the Roundtable approach as a means of collaborative change to support sustainable e-learning.

**The Roundtable Approach**

The previous section outlined that the successful deployment of sustainable e-learning programmes requires that the VLE systems and tools are fully integrated and interoperable. Therefore, the staff who are responsible for ensuring that these systems and processes are integrated (for example tutors, IT support staff, AV staff, librarians as well as educational and staff
developers) need to collaborate. However, there are major issues in ensuring effective communication: this diverse range of staff tend to focus on different issues and use very different forms of language. The American Association for Higher Education: Teaching, Learning and Technology Group were the first to devise a Roundtable Approach to overcome these problems.

A ‘Roundtable’ is a group of people who aim to develop recommendations to enhance teaching and learning through uses of technology (Kemp and Peacock, 2003). Its objectives focus on the promotion of effective communication and to improve collaboration amongst its members and across the university or college. This is achieved in four ways:

- The Roundtable is activity related, comprising task-focused working groups.
- Members agree common goals and a mission.
- Members are encouraged to be appreciative of the perspectives of others.
- Emphasis is on educational design, rather than technology.

The studies previously highlighted by McNaught, Johnson and Fullan highlight the importance of making sure a diverse range of perspectives are represented. Therefore a ‘Roundtable’ group typically includes:

- Those who have and have not implemented technology.
- Educational developers.
- Library staff.
- Technology professionals including IT support staff.
- Audio visual staff.
- Administrative staff (including registry).
- Students.

Not all of the members are necessarily enthusiastic about sustainable e-learning. Therefore, when selecting members it is necessary to think about potential political or personal tensions. For more information about the membership of the Roundtable you may want to read the development team membership, sheet 5.

Initially a Roundtable is established by a Development Team comprising two or three staff. To support sustainable e-learning, it is important that the Development Team has representation from a member of staff who understands educational design issues as well as someone who has knowledge of interoperability concerns. Further information about the role of the Development Team is available from the following information sheet 1 and information sheet 2.

The development must be visionary, willing to take risks and able to consider and understand institutional politics. Once the Roundtable is established, the Development Team is replaced by co-chairs and a Champion:

**Co-chairs:** To ensure parity in consideration of the diverse perspectives of the group members, the Roundtable is not chaired by a single individual, but is co-ordinated by two or three members. These co-chairs would usually include a member of support staff and an academic. Development Team information sheet 4 has more information about the co-chair system.

**The Champion:** The Roundtable has a Champion whose role is to strategically influence the development of e-Learning across the institution. Development team information sheet 3 has more information about the Champion.

The Roundtable is structured around task-oriented teams. A Roundtable by definition aims to have representation from as many appropriate areas across an institution as possible. However, membership is likely to change over time as new members can be brought into the Roundtable for specific projects.
Further information is available at:

- Section on Roundtables in the infoKit on Creating an MLE
- Roundtable project pages.
- The SFEU has a Broadcast article by Oliver, Kemp and Peacock that provides an overview of this approach
- Oliver, M & Kemp, C (2001) Roundtables: realising the myth? ALT-N 34 4

How a Roundtable Operates

**Mission and goals**
The first task for a Roundtable is to establish its mission and its short–term and long–term goals. The mission will not only define the long–term strategic remit of the group, but will limit the scope of e–learning across the institution. A critical part of this process is the identification of barriers and how they may be overcome. For example, one barrier that a Roundtable might identify when focusing on sustainable e–learning might be the requirement for tools and systems that encourage resource sharing.

**Key task areas**
Having identified the short–term and long–term goals, the next step is to identify key task areas. To achieve this, the Roundtable will establish working groups comprising Roundtable members and relevant individuals drawn from the institution (to provide grassroots perspectives). These groups will aim to raise awareness of key issues and provide meaningful support.

**Future goals**
One of the key activities is to encourage staff to reflect upon past ‘gains’ and ‘losses’ in e–learning. Staff then consider future goals they would like to achieve as well as what they would be prepared to compromise to achieve these objectives. This activity aims to help staff think of VLE implementation from an institutional perspective, rather than taking a departmental focus. It is likely that some staff will have to make difficult compromises to aid overall progress. Critical to this approach is the need to develop an environment where individuals feel confident enough to hold frank and open discussions.

**Other key factors**
Other key factors for a successful Roundtable include:

- Encouraging commitment and enthusiasm of the development team and the co–chairs and the Champion.
- Establishing agreement of the Roundtable mission to ensure ‘buy in’ from all staff.
- Ensuring good representation of perspectives by achieving a good balance in membership: senior staff and grassroots involvement, enthusiasts and sceptics.
- Communicating the focus and ethos of the Roundtable.
- Encouraging a sense of ownership by retaining the task–focus of the Roundtable.

Transformational change in how we use VLEs to support effective learning is best achieved by involving a range of stakeholders and considering as wide a range of perspectives as possible.

In summary, the Roundtable is a task–focus approach to reviewing organisational structures. One of the main advantages is that it provides an inclusive forum for informed decision–making.
Risks and Benefits of e−Learning Investment

One of the key factors of interest to a Roundtable group will be the risks to the institution from any e−learning investment strategy. Many studies of costs and benefits have been based around simple scenarios, where the benefits are easily identified (e.g. as the provision of a single online course within a VLE). A study funded by the JISC investigated more complex scenarios. This study generated guidelines to help identify the relationships between the 'costs' of e−learning investment and potential 'benefits' to learning (Nicol et al, 2003). This study provides a Cost Benefit Analysis model that allows you to evaluate the cost−benefit relationships of a range of e−learning scenarios. This information can help your Roundtable to identify priorities across your institution. The risks−benefits model is applied in two main stages: the identification of cost centres (i.e. infrastructure, support services and 'value−added' costs) with full costing followed by the identification of benefit types. Each benefit type is allocated a weighting that reflects institutional priorities and relative merit.

This model can be used by Roundtable groups to inform strategic decisions. For example a fundamental issue you may consider is − is it better to transform how you use a VLE in a way that has a small impact on large numbers of students or a big impact on a smaller group of learners? The Cost Benefit Analysis model can help you compare the merits of each approach and can help establish relationships between benefits and e−learning innovations. This is partly because the model takes into consideration the mission and strategic objectives of the institution. In other words, it guides you in exploring benefits across the institution, rather than focussing specifically on IT or on educational benefits. ‘Spin offs’ from implementing a VLE could be developing staff skills, improving communication across the institution, or enhancing the external standing of the institution in relation to recruitment in specific subject areas.

The risks and benefits of change can be viewed in terms of the wider benefits to your institution − in particular, how the use of the VLE can be improved at all three inter−related levels: e−administration, e−content delivery and e−learning.

Further resources on risks and benefits:

- JISC infoNet Risk Management infoKit
- Bacsich, P., Ash, C. and Heginbotham, S. (2001) The costs of networked learning: Phase Two. Sheffield: Sheffield−Hallam University Please note that the link to the report from Sheffield Hallam University is not live – we are trying to source the article
References


http://www2.atl.ualberta.ca/downes/naweb/Learning_Obects.htm


Koper, R. (2003), Combining reusable learning resources and services with pedagogically purposeful units of learning, Chapter 5, Reusing Online Resources: A Sustainable Approach to eLearning, pp 46−59 (Ed. Littlejohn, A.), Kogan Page, London, ISBN 0−7494−3950−5


Newland, Barbara (2003), Supporting the Reuse of Learning Objects and Processes in VLEs, Supporting Sustainable e−Learning Forum briefing paper http://www.ltsn.ac.uk/application.asp?section=genericpord

http://www.jiscinfonet.ac.uk/Resources/external−resources/strathclyde−insight−case−study


http://www.jiscinfonet.ac.uk/Resources/external−resources/RTFL_finalreport.doc


Websites

Blackboard


Course Development, Learning Objects, and E−Learning Standards http://careo.prn.bc.ca/losc/losccourse.html

JISC Legal Services http://www.jisclegal.ac.uk/publications/copyrightcoppenheim.htm
**LAMS:** Learning Activity Management System

**Learning Objectives Using Bloom's Taxonomy**

Storyboarding [www.indezine.com/ideas/storybrd.html](http://www.indezine.com/ideas/storybrd.html)

**SENDA:** Special Educational Needs and Disability Act 2001 [http://www.ukcle.ac.uk/directions/issue4/senda.html](http://www.ukcle.ac.uk/directions/issue4/senda.html)

**TechDis**

**WebCT**

**Useful Texts:**


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Effective Use of VLEs: Designing for Sustainability

– Design Issues

• Blending Online & Classroom Activities
• Delivering Content Efficiently
• Supporting Learning & Teaching Methods
• Supporting Student Activities
• Learning Objects
• Next Generation VLEs

– Designing Sustainable & Scalable Courses

• Planning: The 7 Step Model

– Resource Authoring & Sharing

• Digital Learning Resources
• Types of Resource
• Finding Resources
• Sharing Resources
• Digital Repositories
• Reusing, Sourcing & Managing Resources

– References
Designing for Sustainability

As tutors, we are faced with an educational paradox. We are expected to offer high quality learning to a larger, more diverse and dispersed student population than ever before. Class sizes are increasing while, at the same time, we must make provision for the needs of individual students. Virtual Learning Environments (VLEs) can help us deal with large numbers of students. They allow us, not only to distribute course materials to large numbers of students, but to interact with these students. Effectively, there are three levels of use of a VLE:

- **e−Administration**: providing individualised information for students (e.g. class F);
- **e−Content Management/ e−Content Delivery**: allowing tutors to disseminate learning materials and students to store their materials (e.g. articles, images, essays, work−in−progress documents) within a personal, online space;
- **e−Learning**: supporting communication with tutors and other students (through e−mail, bulletin board discussions as well as use of e−Portfolios and shared workspaces).

Until recently, the widespread use of Virtual Learning Environments has been limited to e−administration and e−content delivery. This has mainly been due to the levels of time−investment and skill required to use a VLE for e−Learning. However, effective use of technology to support learning with large numbers of students will become increasingly important. One reason for this is due to student retention. A major factor affecting retention is poor socialisation in class. This issue is becoming increasingly worrying as classes grow in size. Ever−increasing use of technology−supported learning could aggravate the problem. When we use technology, we have to be sure that learners do not feel isolated. Fortunately, technologies such as Virtual Learning Environments are extremely effective in supporting a variety of interactive methods of learning, such as collaborative and peer assisted learning (Caplan, 2004). However, to ensure online courses are sustainable and scalable with large numbers, they have to be carefully planned.

This section suggests ways in which you can optimise the potential of VLE technology: to extend your ability to communicate with your students. VLEs can also support communication amongst your students themselves, giving them more opportunities to discuss concepts and share ideas. Effective management of peer interaction will help your students to learn more effectively. This is discussed more fully in the section 'Computer Mediated Conferencing'. You will spend your time most efficiently if you design your courses such that they can be easily updated, and easily tailored to meet different students’ needs. You can also speed up your course development by reusing digital educational resources; reuse is perhaps a strategy that you already adopt when using paper−based resources. This section will also guide you through important issues you may need to consider while developing and implementing sustainable and scalable courses.

The topics covered in this section are:

- Issues in course design within VLEs
- The design of sustainable and scalable courses
- Resource authoring and sharing

Design Issues

**What difference can VLEs make in supporting student learning?**

Most tutors currently use VLEs to allow students to access course materials and learning resources (such as articles, case studies, guidelines and simulations) in a wide variety of formats (for example text, video, interactive Flash animations and so on). In many classes in both FE and HE, students
already have the opportunity to download lecture notes and PowerPoint slides from a VLE. The problem with this way of working is that it does not take account of how students will use these resources to help them learn. More importantly, tutors have no way of knowing whether students have truly learned a concept.

Some tutors are using VLEs to allow students to submit coursework electronically, and to support online student discussions (see Gilly Salmon's text on 'E−moderating', 2002). For example, your students may download a course reading (from a VLE) and discuss their views on a topic articulated by the teacher using an online bulletin board. The main problem is that interactions will only take place online, even though it may be more effective for your students if they were to discuss ideas face−to−face, particularly if they are campus−based learners.

The true potential of VLEs extends well beyond these scenarios, as they offer a chance to move from a 'directive' approach to teaching towards an 'active' approach to learning. For example, your students might download a course reading from a VLE and discuss their ideas face−to−face in small groups of three or four. These discussions could take place in any 'real space' of their choice: the classroom or lecture theatre, 'breakout' rooms or a coffee house. When the students have reached a consensus, and within an agreed timeframe, the views of the group can be drawn together and posted to a bulletin board within the VLE, where students are invited to review and reflect upon the postings of other groups and to respond online.

Many tutors in FE have changed short teaching sessions to loosely structured, two−hour gatherings in a classroom. Some HE tutors are reviewing their teaching methods in a similar way. Students may be divided into small groups and given a series of learning tasks. The students are free to walk around the classroom and discuss ideas with their peers or with tutors. Within the classroom students can use computers to access the VLE where they can search for and retrieve information, upload information resources to a shared group workspace, access and evaluate resources sourced by others and integrate the ideas gleaned from these materials into 'work in progress' documents. The materials are stored and shared in the VLE, but the interactions (discussions/brainstorming and writing reports) will be mainly in 'real space'.

These scenarios illustrate an approach that combines the use of a VLE with real−life interactions. This is currently referred to as 'blended' or 'flexible' learning. Unfortunately, most courses within VLEs do not fully integrate the interactions of students with tutors and peers across real and virtual spaces. A recent review of the use of VLEs in UK Higher Education by Britain and Liber (2004) confirmed that most tutors are using VLEs simply to distribute class information (e−administration) or course materials (e−content management), rather than to enhance face−to−face classroom interactions (e−learning). This is not quite the case in FE, though there is still considerable scope for supporting the 'blending of online and classroom activities'.

**Blending Online and Classroom Activities**

When you start using a VLE, you may find it difficult to balance online student activities with face−to−face interactions. It may seem unclear to you whether some activities should be entirely online. This usually depends on two factors: the proximity of the students and the learning goals.

Distance learning students will have limited scope for dialogue with you and their peers, so you will have to help them use the VLE to support all their interactions (Timms et al, 1999; Ingraham et al, 2001). This not only includes discussions about concepts and ideas they are learning about, but also the social interactions that are an essential component of learning (see Introduction to VLEs section and also Salmon, 2002 for a good overview of this topic). If your students are based on campus, a major part of their learning comes from the everyday face−to−face social interactions they have: chatting in a cafe or over lunch, working together out of class and chatting in the classroom (whether you like it or not!). They will have opportunity to engage in a range of face−to−face interactions (in classroom settings or lectures and tutorials) that enable them to discuss ideas with you and with their
peers. This provides you with considerable scope for integrating real and virtual learning activities through 'blended learning'.

The second factor concerns the learning goals. If you would like your students to learn how the structure of molecules relates to the outcome of a chemical experiment, it may be useful to allow your students to view online animations or simulations that allow them to visualise molecular structures and view how these interact. This is a particularly useful way of teaching students who have a more 'visual' bias in their learning style. However, if you want them to learn a laboratory technique, they are likely to learn much more from being in the laboratory. It can be difficult to strike a good balance between integrating face-to-face activities with online interactions (such as simulations and online chat).

Confusion partly arises because online interactions are often viewed as analogous to face-to-face communications. In reality, these types of interactions are very different, yet they are associated with a similar metaphor. For example a 'bulletin board discussion' or 'internet relay chat' may appear similar to a classroom discussion, because all of these involve some sort of dialogue. Clearly the types of social interactions afforded by these three tools will vary. Therefore, one tool is likely to be more appropriate to a particular learning situation than the other two (Nicol et al, 2003). When designing a course, it is important to take into account the potential of all three.

Although VLEs can support new ways of learning, recent studies provide evidence that most tutors are using VLEs primarily for delivering learning materials, such as course notes, handouts and class information (Crook and Barrowcliff, 2001; Crook, 2002; Britain and Liber, 2004). This is probably partly because electronic delivery of content is relatively easy. However designing effective e-learning requires time, careful planning and skill. That is not to say that delivering content is bad practice – it simply does not fully harness the power of communication technologies. The following sections will examine strategies that will allow you to deliver content to your students efficiently and to explore ways to support more active methods of student learning.

### Delivering Content Efficiently

If you do start off using a VLE through 'e-content delivery' it is important you do not fall into the trap of spending all your time designing and producing new learning materials and uploading these within the system. A good strategy may be to reuse any digital learning resources that already exist. The first place to look for reusable learning materials is within your own collection: sharing your own resources is a good place to start. Materials could also be sourced from colleagues who may be willing to share, or even 'swap', informal compilations of resources (course notes, slides, student activities etc). Alternatively you may choose to tap into formal resource collections (e.g. digital libraries, national repositories of resources – JISC, Jorum and NLN).

Until recently, the tools and systems required to support resource sharing have not been widely available. However, an increasing number of VLEs are based around a core 'digital repository'. Essentially this is a store for digital learning resources. You can use the repository to source, access, recombine and reuse learning resources within and across a series of online courses. There are benefits in adopting this approach. Firstly you could spend less time creating new resources and have more time to interact with and give feedback to your students. Secondly, your students could have access to a wider pool of learning resources, through direct access to the digital repository, offering a range of perspectives.

### Supporting Learning and Teaching Methods

Although current VLEs offer a significant step forward in terms of enabling the creation, management and sharing of learning resources, most current VLEs are limited in terms of the methods of learning and teaching they can adequately support. They do not have sufficient flexibility to allow students to take control of their own learning. For example, most VLEs do not allow students to set up their own
discussion groups. To deal with this problem, researchers at the Open University of the Netherlands (Koper, 2003) analysed a range of different online course designs. They discovered that each of the course designs could be simply described as:

"People engage in activities with resources".

In other words, effective courses designed for use within VLEs will involve student and tutors carrying out learning tasks and accessing relevant materials and systems (discussion boards, etc). By focusing on each of the three key elements, people, activities and resources, VLE systems can be built and used in a flexible way. Tutors can develop course designs that:

- are based around student activities (or tasks)
- in which people (students and tutors) are assigned particular roles (for example group moderator, reporter etc.)
- the students have access to resources (content and software systems) appropriate to each task.

The activities and resources can be reused across a range of courses. As outlined in the previous section, you can reuse activities and resources across a number of your own courses, or share them across your department or institution. A specific combination of activities and resources can be viewed as a mini lesson plan or 'learning design'. According to Oliver and McLoughlan (2003) a learning design is a 'set of learner activities and roles within a specific context whose completion is likely to bring about the development of particular forms of knowledge, skills and understanding'. Therefore, you may find it useful to look at the ways your colleagues have set up their courses within a VLE and may see an interesting learning design that you could reuse within a different teaching context. Your colleagues’ design could be copied and you could repopulate the course with your own set of student activities and resource materials. Alternatively, you could integrate the same set of resources in different ways to suit varying teaching scenarios or the same lesson could incorporate different resources to suit students’ special needs. Therefore, it is important to remember that learning designs can also be reused.

To help students learn effectively within the VLE, you need to plan tasks or activities that will help them gain knowledge and understanding of concepts. These activities will help your students in constructing their ideas about concepts through interactions with you (as their tutor), with other students and with learning materials: the students learn from the feedback they receive from you and their peers (Palinscar, 1998). Activities can range from something as short as reading an article and discussing core issues, to completing a group design project lasting several weeks. The former is likely to be composed of a single activity with an associated article, while the latter may integrate a range of activities and resources. Designing activities that can be reused or repurposed is of essential importance in ensuring that the design of your course can easily be updated or scaled up.

Until recently, online courses have been designed as large, monolithic blocks (Downes, 2000), rather than as small chunks comprising activities and content resources that will allow courses to be much more easily scaled up, updated and repurposed for specific learning contexts. These chunks – reusable learning resources – are sometimes referred to as "Learning Objects".

**Supporting Student Activities**

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### Learning Objects

There are many definitions of 'Learning Objects'. One of the most often quoted comes from the Institute of Electronic and Electrical Engineers (IEEE) who define a Learning Object as ‘any entity, digital or non–digital, that may be used for learning, education or training’ (IEEE LTSC, 2002). Examples include online articles, PowerPoint slides, digital images, animations, video clips and simulations.

Learning Objects can be thought of as blocks of content that can be interlinked to produce a course (Duncan, 2003). This method of course building has been compared to building with Lego bricks: blocks of content can be recombined in different ways with other blocks and reused across a number of different courses. This view of building courses is simplistic because it implies that ‘teaching’ is simply the transmission of blocks of content to students and that ‘learning’ is the consumption of information. A different metaphor to course building involves viewing educational content and activities as ‘atoms’ that are combined in particular ways that adhere to rules (Wiley, 2004). In other words, not every educational resource can be linked to every learning activity. You can read more on this perspective from a special edition of the Journal of Interactive Media in Education: Wiley, D. (2004) Commentary on: Downes, S. Journal of Interactive Media in Education, 2004 (5), Special Issue on the Educational Semantic Web.

See Commentary on: Resource Profiles.

Designing courses in small, reusable chunks may seem intuitive to you if you already reuse and repackage paper based content from several different sources into a single course. On the other hand, assembling a course from a large number of individual resources may seem daunting. One way of making course design easier is to start off by designing simple learning activities with associated resource materials (e.g. an online discussion with associated course readings). A series of learning activities can be linked within a single course design based upon an educational model (Koper, 2003). (You may want to refer to the types of educational models in the Introduction to VLEs section). Each course design can be drawn up as a storyboard: a template that can be reused. This method of course design and planning is outlined later in this section.

If you decide to reuse learning materials, you may quickly discover conflicts between the educational value and the reusability of a resource. In theory, the smaller a resource, the greater the possibility of it being re–used in another educational context (for example an individual image is likely to be more readily reused than an entire course). However, larger resources may have greater educational value (it may be less time consuming to reuse a larger resource, such as a learning activity, rather than to construct a course from its most basic components). Therefore, the optimal size for learning resources is a fine balance between the educational and reusability factors. It is likely to include a number of learning resources linked to a student learning activity (Thorpe et al 2003).

To increase their reusability content, resources should not contain information specific to a particular subject discipline, course or class (Naeve, 1999). This contradicts the way you might normally modify and adapt non–digital resources to fit specific teaching situations (i.e. by contextualizing these materials). One way of tackling this problem is to detach context information from resources, rather than having contextual information as an integral part of a resource. For example, an image of Van Gogh’s Sunflowers could be used across a number of subject disciplines. A horticulture tutor may
attach context information about the propagation of the flowers. An Art tutor may attach information on about the history of the artist or style of painting and so on. By keeping the context information and resource separate, the image could be reused. The image and information can be hyperlinked through the VLE. Therefore, the context information itself can become a reusable resource that could be made available to other tutors.

Next Generation VLEs

The simple formula ('people engage in activities with resources') is used as the basis for the next generation VLEs − through the collaborative development of an international, notational system, IMS Learning Design http://www.ims.org. IMS Learning design is currently being implemented within a range of tools that support e−learning − for example the Learning Activity Model System (LAMS) being developed at the Macquarie E−Learning Centre of Excellence in Australia (Dalziel,2003). LAMS takes a different approach to designing e−Learning courses compared with other VLEs (such as WebCT and Blackboard) because it is based upon linking sequences of collaborative learning activities. LAMS provides the tutor with a visual authoring environment for the development of activity sequences, together with a learner run−time environment and a system for monitoring student progress as described in the LAMS Teacher's Guide. An example of a simple course designed in LAMS is shown in Figure 1a. This course comprises a series of learning activities for students. It guides students in reading an article, sourcing and sharing other relevant information, discussion key concepts then reflecting on new ideas.

Figure 1a: The LAMS visual authoring environment (used with kind permission from James Dalziel and WebMCQ)

The course has been authored by the tutor, using the 'toolbox' to the left of the screen. The tutor can quickly set up activities by dragging and dropping the relevant icons onto the 'authoring area'. Essentially the tutor is constructing a 'storyboard' or 'learning design' of the course. The tutor then connects these activities to guide the students through the course. Figure 1 illustrates a learning design with a fairly linear course sequence. This design could be reused and repurposed to construct a less linear design – as illustrated in Figure 1b. In this example, the design has been repurposed to divide the class into small groups. Each group is asked to summarise ideas and share relevant resources. Readings and posting ideas are offered as optional activities (located at the right hand side of the screen).
The JISC e-Pedagogy programme has evaluated LAMS. The findings suggest that LAMS can support a variety of pedagogical approaches. Feedback from learners is generally very positive − they like the freedom to work at their own pace. However, the linearity is not suited to all learners and learning styles.

Becta has an ongoing LAMS evaluation study. Some significant points from the report are that teachers reported greater levels of pupil motivation as compared with traditional lessons, and that LAMS increased the likelyhood of all class members contributing. Pupils reported that LAMS was ‘fun’.

Integration with Moodle, BlackBoard and Sakai is available and is planned for WebCT and uPortal. A presentation given at an RSC London BlackBoard User Group meeting on the BlackBoard Building Block is available here. You can sign up for a LAMS trial account at the LAMS website.

Tools like LAMS will enable content, activities, and designs to be developed and transported across systems. Conformity to the principles of IMS Learning Design is one of the standards that will be adhered to in constructing more flexible VLEs.

**Personal Learning Environments**

With advances in technology and developments in interoperability standards, the idea of personalised learning environments (PLEs) is taking shape. The focus is on the learner being able to define and use the tools that they require to support their learning, link with institutional systems when needed, and keep their personalised learning environment as they move through their learning journey. A presentation by Oleg Liber on Personalised Learning Environments is available from here. Developments in PLEs are the subject of a blog by Scott Wilson of CETIS.

Another development that you might be interested in is Elgg. Elgg is an open source product that is founded on a blogging principle and includes social networking tools.

**Designing Sustainable and Scalable Courses**
Researchers at the Open University in the UK have been pioneering the design of courses that are sustainable and scalable. They have found several advantages to designing courses in small, reusable sections: this type of learning design can help support activity or problem–based learning; interactivity and collaborative work and learner diversity, choice and selection within a Virtual Learning Environment (Mason, 2003). We look at each of these advantages in turn and then consider the 7–step model of sustainable course design.

**Problem–based reflective learning**

Firstly, let’s consider supporting problem–based reflective learning. A common problem in student group projects is poor critical reflection and project planning. Students are inexperienced in assigning roles to group members and timetabling activities. One approach to tackle this issue is for you to ask students to provide a weekly account of the progress of their project. The problem with paper based, group portfolios is that not all students within a group may have equal access to the portfolio at any given time. This is less likely to be an issue if students construct an online, reflective log within the VLE (provided students have online access). You can guide your students in designing and structuring their reflective log. It can be arranged as a series of sections, outlining: information about the project team; a repository of digital assets related to the project; a week–by–week progress report; a literature review; and links to external sites. You will be able to keep track of the students' work and identify poor progress, which can then be discussed with the students by email or face–to–face. Each student group can then take steps to reflect upon how to address the problem and draw up a new action plan. This has been shown as an effective way of supporting student reflection. You may be interested in reading the article by Stefani, Clarke and Littlejohn (2000) in the references for this section.

**Students' collaborative work**

Secondly, you may want to support students’ collaborative work. Shared workspaces and digital repositories integrated within the VLE can allow students to store and share a variety of materials useful to collaborative group projects. The students can arrange their own resources into an informal shared workspace, to be easily accessed, repurposed, reflected upon and reused. There is increasing emphasis on students collecting electronic learning materials and creating assignments in a digital format, uploading these resources to a repository and sharing these resources with tutors and peers. Work is already underway to explore not only how to document ideas arising from student assignments, but the process by which their ideas were developed. This may be achieved by capturing unwritten thoughts and courses of action as metadata. You may be interested in reading the book chapter by Littlejohn (2004) – in the references for this section.

**Learner diversity**

Finally, designing courses in small chunks can help improve learner diversity, choice and selection. For example, if you present your students with chunks of learning resources in a variety of formats (e.g. video, text, etc) they can choose a resource format that best suits their learning style (e.g. visual, abstract, etc). Alternatively, students with special needs or specific learning styles can select materials that best support their learning. Tutors at the Open University have found that chunks of materials that have been written with a particular student culture in mind can be rewritten and replaced with materials more appropriate for another culture. For more information, read the chapter by Thorpe et al (2003) in the references section.

**Planning Sustainable Course Design: the Seven Step Model**

It can be very tempting to begin creating an online course within a VLE by uploading a variety of content resources for your students. After all, you probably have a clear idea about the content you want to use, but may be less certain of course designs or activities. However, the most effective and
time efficient approach to course design is to draft your design on paper first. The following seven–step model can be used as a framework to help you plan learning activities for your students, explore how you will integrate these activities with learning resource materials, and reflect upon how you can effectively offer feedback to your students.

Advantages to planning course design using the seven–step–model

There are several advantages to this approach to planning course design:

- By basing course design around student tasks or activities, emphasis is focussed around learner interaction.
- Within each student learning activity the role of the tutor and of each student should be clearly outlined.
- The storyboards document learning designs that can be reused. A good example of a learning design is a role–playing activity. According to Oliver and McLoughlan (2003) this sort of activity represents a planned and coordinated set of tasks within a setting, the process of which will cause conceptual change among the learners. The levels and forms of conceptual change will depend very much on the background of the learners, their roles and responsibilities within the activity and the forms of collaboration, articulation, reflection and self–regulation involved. The design of this activity can be reused across different learning and teaching contexts by substituting the activity and content resources.
- When updating a course, individual resources or activities can be easily substituted.
- Storyboards can help plan support for students with special needs.
- Students find it helpful to know the learning objectives that specify what they will learn and what they will be able to do if successful learning has taken place (Frederikson et al, 2005)

This approach to course design can also be used to plan face–to–face courses. It simply provides you with a means of planning the integration of a series of activities and how to review student communication and feedback.

Step 1: Writing Learning Objectives

Course planning begins by defining the course aims and learning objectives. Learning objectives are specific statements about the kinds of learning students are to experience. Each learning objective
may focus on a key concept. The objective should be discrete and uncompounded. To take the example of this section itself, we could write the learning objective as 'By the end of this course, students will understand the key concepts of designing an online course'. Writing clear objectives will ease the process of designing learning activities and deciding on an appropriate assessment method.

Step 2: Designing Learning Activities

When you have written your learning objectives, you should plan at least one activity for your students that will help them achieve each objective. Planning activities will be a key element in the design of your online course. Activities can be performed by students on their own, in pairs or in small groups of, say, 3 to 6 students. These groups of students can collaborate either face–to–face or online, using asynchronous technologies – such as e–mail, online discussions, collaborative workspaces (groupware) and digital repositories/libraries; or synchronous technologies – such as chat, shared whiteboards and videoconferencing. Frequently students will find interesting resources (websites, articles, etc) that they want to share with other members of the class. This can be achieved through posting to a discussion forum or to shared workspaces. Student reflection can be encouraged through the use of e–portfolios and/or reflective journals, so that individual, or groups of, students can keep track of ideas about what they have read and discovered.

Examples of learning activities are as follows. If your objective is 'By the end of this course, students will understand the key concepts of learning design', you may devise an activity or series of linked activities that guide your students in learning about 'learning design':

- **Activity 1**: download and read Koper’s article on Learning Design.
- **Activity 2**: devise a short course design that is based upon Learning Design. Upload your design to the discussion forum within the VLE.

Alternatively, the activities could be redesigned for peer assisted learning:

- **Activity 1**: in groups of three, download and read Koper’s article on Learning Design.
- **Activity 2**: individually devise a short course design that is based upon Learning Design. Upload your design to your group discussion area within the VLE.
- **Activity 3**: read and respond to the other two designs. Identify the strengths and weaknesses.

These activities could be further redesigned to allow for blended learning:

- **Activity 1**: in groups of three, download and read Koper’s article on Learning Design.
- **Activity 2**: individually devise a short course design that is based upon Learning Design. Upload your design to your group discussion area within the VLE.
- **Activity 3**: examine the other two designs and discuss face–to–face the strengths and weaknesses they have in common.
- **Activity 4**: upload a summary of the common strengths and weaknesses of your designs.

When designing learning activities it may be useful for you to answer the following questions:

- what are the core concepts to be communicated to students?
- what activities are students asked to do to learn this concept?
- how do you know the students have understood this concept?
- when is it appropriate to find out if they have understood this concept (by assessment)?
- what feedback do they get and from whom/what?
- how is the technology adding value to this process?

The LTSN Generic Centre has commissioned a series of case studies which explore how different pedagogies are being employed across different Virtual Learning Environments (VLEs) including BlackBoard and WebCT: Learning Environments and Pedagogy (LEAP). These case studies may help you plan successful teaching strategies when using a VLE. The LEAP case studies are now on
Step 3: Planning the Course Design: Integrating Online and Face–to–Face Interactions

When planning your course design it is important to consider whether the student activities and interactions should be entirely online. As outlined earlier, this depends on two factors: the proximity of the students and the learning goals. If your students cannot meet face–to–face, all interactions must be online. (Timms et al, 1999; Ingraham et al, 2001). However, in most college and university teaching, students have the opportunity to engage in a range of face–to–face interactions with you and with their peers. The integration of face–to–face activities (e.g. group discussions) with online interactions (e.g. posting discussion summaries online) must be carefully planned and articulated to students. It may be useful to document this within a course plan or storyboard.

Use of Storyboarding

One way of planning your course design is by drawing out the learning activities within a clearly documented storyboard. 'Storyboarding' – a term derived from a technique commonly used in scripting plays – is an effective method for planning online courses, and is somewhat similar to devising a lesson plan. In the context of course design, storyboarding involves linking activities, resources and roles within a common environment. Here is one approach to constructing a storyboard, based upon the study carried out at the Open University of the Netherlands, referred to earlier, in which a large range of e–learning designs were analysed and abstracted to a single statement: 'People engage in activities with resources' (Koper, 2003). Within this context:

- Activities are tasks that students complete in order to attain one (or more) learning objective(s).
- People refer to students and teachers who are assigned roles within these activities (e.g. moderator, group summariser etc.).
- Students are given access to resources (learning materials and software resources, such as discussion boards, groupware etc) to support their learning.
- These resources and activities are integrated within a learning environment.

Learning activities

Using this approach, you would begin designing a course by thinking up a number of learning activities for your students – both online and face–to–face. The storyboard can be used to illustrate how these activities link with the learning resources and roles assigned to teachers and students. This involves documenting individual activities and linking these together in an overall plan outlining:

- the aim of the activity,
- how the tutors and students will interact (for example through online discussions or groupwork),
- the resources which are available (e.g. texts, simulations and so on), and
- how the students will receive feedback (e.g. from tutors, peers etc) – see the following table which gives an example of a storyboard of a series of learning activities on 'Integrating evidence of evolution' (used with kind permission from Jane Tobias, Bell College of Further and Higher Education).

<table>
<thead>
<tr>
<th>Tutor Activities</th>
<th>Student Activities</th>
<th>Resources</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FACE–TO–FACE</td>
<td>Divide students into four groups (in class). Introduce students to task 1 (in class);</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ONLINE</td>
<td>Initiate a 'translation' list on a separate board. Place a few words and their translations as exemplars (online). Moderate stage 1 discussion (online). Each student group investigates one piece of evidence for evolution. Students upload terms they are unsure about into a 'translation' board – then respond to others by providing definitions in their own words.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>'Evolution and Early Development' article Discussion Board for translation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peer feedback on meanings of terms. Tutor encouragement and feedback when terminology is misunderstood.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FACE TO FACE</td>
<td>Give feedback re translations and encourage continued use Group discussions offline (in class) about evidence. Group agrees on a summary and group summary writer posts this to the discussion board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discussion board Feedback from peers during group discussion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ONLINE</td>
<td>Monitor boards, ask relevant questions to stimulate discussion Post initial group summary. Read postings from other groups. Determine what the common themes are across groups (by accessing bulletin boards and holding group discussions around a single laptop) – post ideas onto submission board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feedback from student groups to other groups. Overview from tutor – summary of main issues articulated by student groups.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The main problem with this type of storyboard is that it does not illustrate non–linear relationships across activities. These sorts of relationships can be represented in a concept map, which can help to populate the virtual learning environment with learning resources and activities.
A concept map of the online course outlined above

Resources on storyboarding:

- Presentation storyboarding − INDEZINE Website

Step 4: Considering the Needs of Individual Learners

In the UK, tutors are required by law (SENDA, 2001) to identify and provide for the needs of individual learners. Digital learning resources can be provided in a variety of formats to help meet the needs of students who are visually impaired, have hearing difficulties, are dyslexic, or have physical disabilities. Case studies are available to illustrate ways in which students with disabilities use the Web to meet their needs:

http://www.w3.org/WAI/EO/Drafts/PWD−Use−Web/20010104

You can find out more about this topic in the section on Special Educational Needs.

Step 5: Creating the Course − Integrating Activities, Content Resources and Tools

Once you have planned your learning activities using a storyboard, you can construct the course by linking these activities within the VLE. Tutors quote lack of time as a major obstacle to course implementation, so the reuse of existing resources, outlined in the following section, is an important
strategy to employ. Most VLE systems are relatively simple to use, allowing the easy creation of activities by using an online form to upload content and activities.

For example, with WebCT Vista you can upload activities and content resources in a variety of formats (including pdf, doc, rtf, gif, jpg etc) using a 'browse' facility. The following figure (used with kind permission from WebCT) shows how to move content files from your computer to the Vista – other VLEs have similar ways of performing this task. This VLE allows multiple files to be uploaded and added to the course page. WebCT Vista is based around a digital repository, or database where resources can be stored. Therefore uploaded files are automatically placed into a content store and can be reused anywhere else in the course:

![Uploading learning activities](image)

Once the learning activities have been uploaded, the students need some way of collaborating. For example, if your students have read an article, you may ask them to discuss on debate issues through an online discussion forum. How this is achieved depends largely on the VLE. The next figure illustrates how specific learning activities might be linked to individual discussion threads within WebCT Vista. These discussion threads can be released to specific students or groups, since discussions can be set up around allocated student groups, grading settings and so on.
In most commonly used VLEs, discussion areas are usually set up by the tutor or a VLE administrator. This may limit the way students collaborate, though they may use chat or email instead. Next generation VLEs will allow students to have better control over their learning. For example, within WebCT Vista, students can decide on which groups or activities they would like to participate in and will receive confirmation of their choice. You, as tutor, can define these sign up sheets for students to self enrol into groups or activities. You can release activities or discussion threads to the students based upon the group they have signed up for. For example, you could set up a course where students receive a particular learning activity depending on which student group they are within, their role within the group or the previous activities, assessments or assignments they have completed.

The creation of a sign up sheet (used with kind permission from WebCT).
Confirmation to the student that he or she has signed up to set of activities (used with kind permission from WebCT).

Future VLEs are being developed that will allow students even greater flexibility in managing and sharing their own content within personal learning spaces.

Resources integrating face-to-face and online interactions:

  http://www.ltsn.ac.uk/application.asp?app=resources.asp&process=full_record$ion=generic&id=32

Step 6: Implementing the Course

The key to successful implementation of any course is good communication with your students. It is important that you clearly communicate what they are required to do during the course as well as the concepts they are trying to learn.

When you are running your course, it is essential that your students know exactly what is expected of them. Remember, when your students work online or in small groups, you may have fewer opportunities to give them verbal instructions – or clarify written instructions. If your students are unclear about their tasks, they are likely to ask for clarification from you. Therefore one of the most time consuming tasks for you may be explaining aspects of the course assignments. According to Oliver and McLaughlan (2003) 'Throughout the course, online teachers will frequently find themselves responding to emails and requests from students for clarification of tasks, elaborations of activity descriptions, more detail about assessment requirements, and questions about procedures for completing activities.' Most of these questions can be avoided if the initial instructions are clear and concise enough for your students. Therefore, your time can be used effectively in writing detailed instructions for your students. It is also helpful to provide students with guidelines, exemplars and clear assessment criteria.

The other important category of communication is feedback to your students. The section 'Introduction to VLEs' outlines a broad range of ways you can provide feedback to your students. Examples include providing exemplar assignments, individual feedback to students or groups, peer feedback, etc.. A good text on supporting online dialogue is E−moderating by Gilly Salmon

Step 7: Evaluating the Course

It is important to find out what your students think of your course. Are your instructions clear to them? Are they receiving adequate feedback that helps improve their learning? This is when course evaluation becomes invaluable.
There are many ways to evaluate a course. Which method you choose depends partly on whether your course is by distance or by 'blended' methods and partly on what sort of information you want to find out.

It is useful to elicit feedback early in the course: aspects causing difficulties can be amended to avoid later problems and positive aspects can be built upon. The most commonly used evaluation method is the questionnaire. These are typically six to twelve closed questions (answered by ticking a box or ranking answers in order) with some open--ended questions (questions that allow the respondent to express an opinion answered by filling in a box or online form). Questionnaires can give you rapid feedback, but the problem is that, if the questions are not carefully worded, they can give misleading results. For example, if you ask students if they have enjoyed a session, you may receive positive feedback. However, this is no indication that they have learned relevant concepts. For this type of information, questionnaires can be used in combination with confidence logs. These provide a 'snapshot' of the students' understanding of concepts and can indicate areas where students are experiencing problems. For example, you can ask students to rank their confidence level in understanding specific concepts (usually from low=1 to high=5). Comparative logs, or logs that are measured before and after a class, can give a reasonable indication of learning development. However, the only true measure of how well students have learned a concept is by comparative pre and post testing. Concept maps are another excellent way of testing students understanding of ideas. You could ask the students to draw a concept map illustrating how concepts link.

More detailed evaluative data requires combinations of standalone and face--to--face methods – for example a questionnaire with a follow up interview with an individual or focus group. There are a number of different ways to conduct an interview: you can use open--ended questions (e.g. how did you use online resources sourced by other student groups?) or semi--closed guided questions (e.g. did the online resources used by other groups help you with your assignment?). There are advantages and disadvantages to both methods. The open--ended questions allow the students to express their views, but can be difficult to interpret. The guided questions can close down the responses. Focus groups involved students being engaged in moderated discussions. These discussions can be used to follow up answers to questionnaire questions.

This approach may be time--consuming but can be invaluable to your learning experience as an e--tutor, especially in your 'early days'.

If you are using 'blended learning' methods, it may be useful to have quick feedback from your students at the end of a face--to--face session. You could ask the students to write on a piece of paper the concept that they felt most difficult to understand: 'muddiest point'. Alternatively, you could ask them to write the aim of the session. This may provide some interesting reading!

You also need to record your own evaluation. For example:

- how do you rate the learning activities and how does this compare to that of your students?
- what learning resources can you reuse?
- what would you do differently next time?
- what was time--consuming? Can you save some time next time round?

**Other resources on evaluation:**

- The LTDI (Learning Technology Dissemination Initiative) Evaluation Cookbook offers an excellent overview of all these evaluation methods found on at the LTDI Website
- 'Muddiest Point' method found on the Campus Technology Website
- One minute paper found on the Teaching Resource Center Website
Resource Authoring and Sharing

Creating learning materials for your students is a time-consuming business. One way of using your time efficiently is to reuse or repurpose (edit) existing resources, rather than spending time creating and often duplicating materials that are already available. The 'Introduction to VLEs' section has some examples of repurposing existing materials. Many electronic resources are relatively easy to repurpose (or edit) for a specific class. This depends on the resource format. For example, text based resources in standard formats (e.g. .doc or PDF) can be quickly and easily repurposed or updated, though other more specialist formats, such as .mov files, may be more complex to amend. The question is – where can you find resources to reuse or repurpose?

As a tutor, you probably have experience in sourcing, repurposing and reusing learning materials for your teaching. This may involve searching for materials within the library, asking colleagues for useful resources or even reusing material sourced by previous cohorts of your students. These are useful ways of sourcing resources for reuse within a VLE. This section will explore where you can find electronic learning materials as well as why you might want to share your own resources with others.

Repurposing Your Existing Materials

You can use tools within The Microsoft Office suite to make your materials more usable and accessible within your VLE, for example by using the 'save as a web page' function, or use tools such as CourseGenie (see the 'Introduction to VLEs' section for further information). Before converting your Word and PowerPoint documents it is worth spending some time checking that you have used the features of these packages in appropriate ways. For example in Word there are built-in styling and formatting features and PowerPoint there are design templates and colour schemes. BbMatters have published a useful article 'Effective Use of MS Office Products in Creating Usable and Accessible Course Materials' which gives guidance on using these built-in features.

Digital Learning Resources

If you try searching for electronic learning resources using Google you will find that there are a huge number of potential resources. The problem is that they are not all reliable in terms of the subject matter or their 'durability' (i.e. how likely they are to remain online). It is important to become familiar with the places where you can reliably locate resources. You probably already locate materials from a variety of locations, including:

- The library – A good place to start looking for resources is through your institution's library. Most universities and colleges now have access to e-books and e-journals.
- Publishers – Learning resources can also be purchased from publishers. Many publishers already have digital resources freely available to supplement texts. These resources are usually available from websites or can be purchased as materials that can be uploaded to VLEs.
- National organisations (e.g. JISC, HEA, NLN): these have a wide range of reusable resources available. There is also a range of nationally available resources that have been commissioned by support organisations such as JISC. http://www.jisc.ac.uk/index.cfm?name=services_contentlist
- Institutional Audio Visual staff can author bespoke resources that are beyond tutors' areas of specialism (e.g. Flash animations, video clips)
- Tutors can author specialist resources as well as contextualising existing materials for reuse within their courses.
- Students can author their own resources, particularly within e-portfolios and shared workspaces.
Types of Resource

Several publishers are currently creating 'e−pack' materials for use within commercial VLE systems such as WebCT and Blackboard. These resources are created in formats that can be quickly uploaded into a new course within a VLE and include lecture notes, glossaries, animations, video clips and test banks; they can be repurposed or customized to suit the requirements of an individual course. Publishers producing content of this type include:

- John Wiley and Sons
- Jones and Bartlett
- McGraw–Hill Higher Education
- Pearson Distributed Learning
- Thomson Learning

Resources on information on e−packs:

- Blackboard http://www.blackboard.com/addons/cc/index.htm
- WebCT http://www.webct.com/content

Another potential source of materials is through the JISC funded Resource Discovery Network (http://www.rdn.ac.uk). This is a collaboration of over seventy educational and research organisations. It consists of a central RDN Centre and eight independent service provider hubs:

- ALTIS − Hospitality, Leisure, Sport and Tourism http://www.altis.ac.uk
- Artifact − Arts and Creative Industries http://www.artifact.ac.uk
- BIOME − Health and Life Sciences http://biome.ac.uk
- EEVL − Engineering, Maths and Computing http://www.eevl.ac.uk
- GEsource − Geography and Environment http://www.gesource.ac.uk
- Humbul − Humanities http://www.humbul.ac.uk
- PSiGate − Physical Sciences http://www.psigate.ac.uk
- SOSIG − Social Sciences, Business and Law http://www.sosig.ac.uk

Resources can also be found within a growing number of national and international digital repositories and initiatives, including:

- Jorum Service−in−Development − a JISC funded learning and teaching materials repository service for UK FE and HE institutions http://www.jorum.ac.uk
- National Learning Network (NLN) − resources designed to increase the uptake of Information and Learning Technology in education http://www.nln.ac.uk
- SCARAN − Scottish Cultural Resource images from museums, galleries and archives http://www.scran.ac.uk
- Fine Arts Resources http://www.fineart.ac.uk
- Stor Curam − a collection of resources for social work used across a number of Scottish Universities http://www.storcuram.ac.uk
- Galileo − a repository in Canada that encourages the sharing of ideas on how to reuse resources http://www.galileo.org/
- MERLOT − a North American collection of learning resources from a wide variety of subject areas. MERLOT offers quality control through a peer review system for learning objects http://www.merlot.org
- SMETE − resources from the US in Science, Maths and Engineering http://www.smete.org
- Britain in Print provides resources for history http://www.britaininprint.net/

Finding Resources

There is so much information available on the WWW that it can be difficult to search for and evaluate
resources for online learning. The following guidelines may help you:

1. Search for 'small' resources – you may be searching for large resources which fulfil several objectives, rather than integrating a number of smaller resources. Try to search for small resources, each fulfilling one learning objective.

2. Search in places where copyright is not a problem – You are likely to feel under more scrutiny with regard to copyright of materials distributed to students online, compared with the distribution of paper based resources. For guidance in the relevant legislation and local sources of advice, contact JISC Legal [http://www.jisclegal.ac.uk/publications/copyrightcoppenheim.htm](http://www.jisclegal.ac.uk/publications/copyrightcoppenheim.htm).

3. Look in places where the resources are maintained – You may have concerns over the durability of some online resources. If a resource is contained within a repository or digital library, rather than an informal website, it is likely to be more robust.

4. Seek out resources from reputable sources – You may be sceptical of the quality assurance of materials. Many tutors share these concerns, which are part of a more general issue affecting the design and management of future repositories. Although some repositories do have quality assurance measures in place, many do not. One project which has implemented a peer review process within communities of practice is MERLOT, 'Multimedia Educational Resource for Learning and Online Teaching' [http://taste.merlot.org/catalog/peer_review/process.htm](http://taste.merlot.org/catalog/peer_review/process.htm). In MERLOT, peer review comments are generated within web-based worksites and attached to each resource (Schell and Burns, 2002). Key factors in evaluating the usefulness of a resource include: accessibility, relevance, writing style and language, durability, quality assurance, copyright and ease of customisation (Littlejohn, Campbell, Tizard and Smith, 2001).

You are likely to start off by sourcing these 'formal' materials, but you may also want to share your own 'informal' learning materials across a number of courses that you teach to save time spent on material development (Mason, 2003).

Sharing Resources

As a tutor, you probably have a large number of learning resources at your disposal that are also potentially useful to other tutors and students. There are many reasons why you might want to share these resources. However, it may seem daunting to upload your own materials to a repository and to share them with others. This could be because:

- You may feel your materials are open to scrutiny by your peers.
- You may be worried about Intellectual Property Rights.
- Designing for reuse means designing with a range of users in mind and this is probably a new experience for you.
- While uploading a resource, you may have to take some time to describe the resource using keywords or metadata.

A relatively easy and straightforward way to start sharing resources is to modify existing materials. The more experience you have in customising resources for a variety of needs, the more acquainted you will become with the design aspects which will improve the reusability of your own resources. Apart from sharing formal texts, it may also be useful to share 'informal resources' (such as course plans, PowerPoint slides and course notes). This approach will allow you to share specialist expertise with other tutors.

Digital Repositories

The simplest way of sharing these resources is by making them available online. The problem with this method is that anyone searching for your resources has to rely on a search engine (such as Google) to find that resource. A more effective way of managing content is to use Digital Repository
software. A Digital Repository is essentially a database that allows the storage, sourcing and retrieval of resources, or Learning Objects, in a variety of standard formats including HTML files, images and animations.

Some VLEs have integrated repositories that allow tutors easily to manage their learning resources. However if you have multiple VLEs in your institution or intend to change your VLE, then a digital repository independant of your VLE would be a good choice. You could upload your resources into a repository using a simple browse tool. During upload the system will record your name (as resource author), the date, file format etc, but you may have to add some information about the resources (frequently referred to as metadata). This is likely to include a description of the resource and its intended use. This description may help others to source your resource.

The following Figure (used with kind permission from WebCT) illustrates how you could upload resource materials from your computer to a repository within WebCT Vista. This system requires you to describe each resource with metadata, so that these items can be re-used any number of times within courses or modules. Institutions have implemented repositories like these at Institutional, Departmental, Course or Module level, allowing content to be stored in one location and reused many times.

[Image: Uploading to WebCT from a Desktop]

Learning resources contained within the database can quickly and easily be sourced by keying in search terms as shown in the following figure:
These resources can then be made available to students within a course. Until recently, most commonly available VLEs did not have this facility available. This resulted in duplication of materials within institutions with multiple copies of single resources having to be updated individually. Temporary solutions had been tested, including storing resources at a location outwith the VLE and creating links to these resources from online courses contained within the system. These temporary solutions usually have limited success, since there is no means by which tutors can easily source available resources. The best solution is to store resources within a searchable database or digital repository.

Metadata is often seen as a barrier to the uptake in use of a repository – generally we are not skilled in this area. We advise discussing your requirements with your librarian as they will have experience in defining metadata. For example what will be compulsory, what can be optional, who should have responsibility for the metadata? For some ideas take a look at Jorum. You may find it useful to have some procedures in place before roll–out for general use.

A repository is only as good as the materials that are stored within it and you may have difficulty encouraging tutors to use it; especially if metadata and procedures are viewed as obstacles. A view taken by a group at the ALT/SURF/ILTA Spring Conference Research Seminar (G.Roberts et al, 2005) was to allow the repository to be 'an uncontrolled system to begin with, allowing anyone to deposit anything'. It was recognised that this would be an anathema to some as quality controls are high on the agendas of most institutions.

There are real gains to be made by using a digital repository but these will only be realised when it becomes embedded into practice. Further discussion on some of these topics can be found in a JISC funded UKOLN/AHDS Digital Repositories Review.

**Reusing, Sourcing and Managing Resources**

**Reusability**

If you want to reuse learning materials across different courses it is important that these resources are not bound to specific contexts. Separating context from resources may be counter–intuitive to the way you usually develop resources for students. The Centre for Educational Technology Interoperability Standards (CETIS [http://www.cetis.ac.uk](http://www.cetis.ac.uk)) has produced guides to authoring reusable materials, which...
may help you customise resources for reuse within your teaching context to:

- provide special needs students with resources in specific formats which would better support their learning;
- customise resource in formats which suit specific teaching situations (e.g. HTML may be a preferred format for a resource in an online course, in campus based teaching the same resource may be customised to PDF for printing and distributed to students on paper);
- develop a sense of ownership through adding information on local, institutional support or linking to preferred texts.

The CETIS guides can be found online at

- Wiley, D., Instructional Use of Learning Objects

**Sourcing**

If you want to share learning materials, it is important to ensure that other tutors or students can source them. In order to achieve this, each resource must be tagged with standardised search terms and/or descriptions. This information about the resource, or 'metadata', is provided by selecting from a controlled vocabulary or entering free text. The metadata information 'fields' will vary according to each repository system, but are likely to include author information, copyright, educational level and/or how to use the resource. The use of standards ensures that any set of resources can be migrated from one VLE to another. Another important aspect of agreed metadata standards and vocabularies is that they are vital for the cataloguing of resources within a digital repository – for example, under a Dewey–style subject scheme or a taxonomy of agreed terms for resource types. Without cataloguing and search systems, it would be difficult for tutors or students to find what they are looking for in a repository.

**Managing Resources**

There is some debate as to who should be in charge of entering metadata, particularly since most academics and students do not have the skills to select appropriate search terms. To help overcome this issue, many digital repositories automatically create as much metadata as possible. Many repositories are regulated by librarians who can ensure quality assurance of metadata tagging to enable easy sourcing of materials. However, resource authors are best placed to describe the educational intent of their material (Currier and Barton, 2002). Effective use of virtual learning environments will increasingly depend on tutors, students and library specialists working in partnership.

In most VLE systems tutors are responsible for managing learning resources, rather than students. However, information flow concerns a number of stakeholders, including:

- librarians – few VLEs are fully linked to institutional libraries to allow students to search online journals within their subject discipline,
- students – it can be difficult for students to manage and share their own resources within and across student groups. This requires the integration of shared workspaces or e–portfolios within the VLE,
- registry and finance – many institutions are now linking their VLE with a student information system. This allows students to access personal details on their progress and financial details. Information regarding linkage of systems can be found in the Creating an MLE infoKit.
Designing for Sustainability: Summary

Reusing resources, or repurposing existing resources for a new teaching context, is a good way to use your time as effectively as possible. This section has outlined a range of places where you locate digital learning resources. However, making your own resources available for reuse across a number of different courses within a VLE is an equally important strategy for efficient use of your time. A later section examines a range of systems currently available to support resource sharing.

References


http://www2.atl.ualberta.ca/downes/naweb/Learning_Objects.htm


Barbara Newland (2003), Supporting the Reuse of Learning Objects and Processes in VLEs, Supporting Sustainable e−Learning Forum briefing paper http://www.ltsn.ac.uk/application.asp?section=genericpord


Websites

Blackboard


Course Development, Learning Objects, and E−Learning Standards http://careo.prn.bc.ca/losc/losccourse.html

JISC Legal Services http://www.jisclegal.ac.uk/publications/copyrightcoppenheim.htm

LAMS: Learning Activity Management System

Learning Objectives Using Bloom's Taxonomy

Storyboarding www.indezine.com/ideas/storybrd.html


TechDis

WebCT

Useful Texts:


Littlejohn, A.H. and Buckingham−Shum, S. (2003), Journal of Interactive Media in Education, Special Editing on Reusing Online Resources http://www−jime.open.ac.uk/2003/1/


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Effective Use of VLEs: Computer–Mediated Conferencing

- Features of CMC
  - Advantages & Disadvantages
  - Theoretical Frameworks

- Starting to Use CMC
  - Roles and Competencies

- Implementing CMC
  - Measuring Practice & Change
  - Planning Activities for Purpose
  - Assessing e–Learning Interaction

- Examples of CMC in Practice

- Useful Links & References
Features of CMC

Getting to know your local VLE resources through use, practicing with colleagues and engaging in familiarisation sessions with students before using communication tools ‘for real’ in the support of learning, makes enormous sense. Some ‘warm-up’ activities are suggested in the ‘getting used to it’ section. Meantime it is worth flagging four key features of CMC support of teaching and learning, each with its own positive, negative or problematic aspects, to think about in the context of your own course development:

- the asynchronous nature of any exchange
- the text-based form of the individual contributions
- the potential permanence of the resulting record
- the facility to impose specific topic headings to structure discussion.

Asynchronicity

The exchange involves participants contributing ‘turns’ to the debate at different times and often from very different places. This has implications for the pace and rhythm of the communication. Whilst it gives opportunity for composition and reflection on response to another’s contribution, it can impede the sort of spontaneity that might be desirable in an exchange of ideas. The time spent crafting a response can seem wasted when, on re-entering the discourse, further messages have appeared either refuting or developing the idea, perhaps even using your own intended content ideas.

This experience in itself, however, can be positive if it supports a more equitable exchange of developing information and drafts, acknowledging similarity of ideas as a feature rather than feeling it to be a bug. Interaction can then take these forward, through argument and development.

Text as a communication medium

Discussing an issue through the exclusive medium of text brings authoring demands that are different to those experienced by speakers in an oral debate. For many novices, using the written word to sustain a discussion is an unusual experience. Course participants may bring varying expectations of how to manage their learning communications in this way.

In particular, the lack of ‘non verbal’ cues such as intonation, expression, gesture etc may prove demanding for inexperienced users. It may be difficult to mend misunderstandings that arise from using written language carelessly. To some extent self-correction becomes automatic as people gain more experience with the medium but some of your students may need warning about the effort needed to communicate conversationally, and appropriately, in text. See http://www.windweaver.com/internet.com for more information.

Experience is the best tutor, as a group learns to find its own common language(s) for development and crafting of ideas, as well as (if required) formally presenting them for peer review.

Permanence of the communication record

What is written down (as opposed to spoken) is more readily preserved and made to seem permanent. The computer-based archive that defines a text conference can be visited and revisited, by members of the learning group, ‘privileged outsiders’ or, in the case of an open forum, anyone with access to the online address.

This can clearly be an advantage, both for revision and for ‘vicarious learning’. Your students can review and develop their own and their colleagues' learning, as well as using the archive as a
reference resource. Interesting options for ‘crafting’ an archive for such use are possible.

However, if editing permissions are not held by the whole participant group, then this ‘fixing’ and lasting accessibility of messages can be unwelcome to some participants. In particular, it may cultivate feelings of self-consciousness or vulnerability, and impede communication by some of your students.

Communicative structures

Finally, most text conferencing technologies invite an explicit structuring of texts or discussion threads, by use of headings and a ‘reply-to’ facility. Such organisational structure is less typical of much informal spoken discussion and debate. Your students may feel constrained by such discipline and yet without it may not actually be able to allow useful structure to emerge. ‘I am not sure whether to post this here, in the cafe, or in the plenary’ is becoming a common phrase among online learners!

You may find it useful to agree and set some ground rules for interaction, and familiarise your students with the functions and the value of retaining topic headings for theme interaction, ‘cafe’ areas for social exchange, ‘plenary’ areas for cross-group course communication etc. Most VLE resources support this variety; the degree of ‘fit for purpose’ uptake will differ between your different groups of students.

Advantages and Disadvantages

You might like to return to this (non-inclusive) listing of advantages and disadvantages of CMC for reflection, after familiarising yourself with the CMC tools available to you.

Advantages

• time and place independence
• no need to travel to the place of learning
• time lapse between messages allows for reflection
• speakers of other languages have added time to read and compose answers
• questions can be asked without waiting for a ‘turn’
• it allows all students to have a voice without the need to fight for ‘airtime’, as in a face-to-face situation
• the lack of visual cues provides participants with a more equal footing
• many to many interaction may enhance peer learning
• answers to questions can be seen by all – and discussed.
• discussion is potentially richer than in a face-to-face classroom setting
• messages are archived centrally providing a database of interactions which can be revisited
• the process of learning becomes more visible to learners and tutors.

Disadvantages

• communication takes place via written messages so learners with poor writing skills may be at a disadvantage
• paralinguistic cues (facial expression, intonation, gesture, body orientation) as to a speaker’s intention are not available, except through combinations of keystrokes (emoticons) or the use of typeface emphasis (italics, bold, capital letters)
• time gaps within exchanges may affect the pace and rhythm of communications leading to a possible loss in textual coherence
• the medium is socially opaque; participants may not know who or how many people they may be addressing
• the normal repair strategies of face-to-face communication are not available and misunderstandings may be harder to overcome
• context and reference of messages may be unclear and misunderstandings may occur
• loss of spontaneity and quick-thinking and response type of debate / discussion.

Following the next page link below will take you to some suggestions as to how to apply this to your practice. First time users should find this particularly helpful.

Reference: Higgison, Carol & Harris, Rachel (2002) Online tutoring: the OTiS experience from the OTiS website. Accessed 23.03.04

Theoretical Frameworks

This section discusses some of the research that forms the basis for our current practice on CMC.

Online conferences can be seen as evolving spaces, living organisms co-constructed by teachers and learners as they move through them (Turner, 2001). Burge (1995) uses the metaphor of 'weaving-loom'. The focus is on the creativity, multiplicity and growth characteristic of constructivist learning theory, which holds that there are many ways to structure the world, and many meanings or perspectives for any event or concept (Duffy and Jonassen: 1992).

In asynchronous CMC, thinking is done 'interactively and iteratively, as in cross-country skiing across the intellectual landscape' (Burge, op. cit. p.155). Mason (1991) suggests that the tutor should play an active role in scaffolding experiences for learners working in the medium by weaving together the main points and suggesting further directions of study. Weaving is thus an open ended and challenging intervention as opposed to the closed and final intervention of summarising.

The claim is that in conferencing, participants may learn as much from one another as from course material or from the tutor, through a process of offering up ideas and having them criticised or expanded. Knowledge construction occurs when participants explore issues, take positions, discuss their positions in an argumentative format and reflect on and re-evaluate their positions. (Jonassen, 1995).

Several models of interaction towards knowledge construction within CMC TBC (text-based conferencing) have been proposed. Gunawardena et al (1997) offer a five phase model of sharing and comparing information; discovery and exploration; negotiation of meaning and co-construction of knowledge; testing and revision of ideas, leading to awareness of newly constructed knowledge.

'If knowledge construction is the task, then the sharing of different perspectives through debate and dialogue is, within a social constructivist framework, a precondition for it but does not simply constitute it. Getting to the point of actually constructing new knowledge (new to individuals and maybe new in the public domain) requires skilled, sustained, purposive and directed analytic and creative conceptual communication practices' (Edwards, 2002).

At issue are the learning interactions afforded between the learner and the content materials, between learner and learner, and between learner and tutor. Interaction between learner(s) and the mediating technology should not be, but often is, a factor for concern. Also important, surely, is conceptual change – interaction 'within the learner' of ideas and understandings as an outcome of what she or he takes into a 'learning encounter'.

What fosters collaborative learning? On or off-line, an environment that supports the construction of 'shared understandings' (Crook 1997) and the development of individual conceptual change through group interaction. Also, I would say, time and space to reflect, to interact and to reflect again. Of key importance is mutual access to essential information and to a common record.
Psychological research in compulsory and post-compulsory education provides us with models of both the character and function of ‘productive’ communication within learning environments (Howe et al 1992, Howe et al 2000, McAteer et al 2000, 2002).

**Socio cognitive conflict**

This framework derives from the work of Piaget (1932), Vygotsky (1978) and their followers, since expanded via empirical research on interaction and learning (Azmitia & Perlmutter, 1989; Cazden, 1988; Howe, Tolmie, Duchak–Tanner, & Rattray, 2000) At its core are three basic processes: socio–cognitive conflict, expert guidance and social management.

**Example:** Piaget proposed that whilst learning was a matter of individual cognitive adaptation to the world, there might be an important role for discussion between peers. In particular, where there was disagreement over expectation or interpretation of some event, this would cause as much conceptual conflict as actually experiencing events that departed from expectation. In both instances, this conflict would provoke a process of reflection and conflict reduction. Children would attempt to find improved conceptualisations that accounted for the apparent discrepancies. In this way, learning would take place.

Subsequent work by Doise and Mugny (1984) suggested that this process of 're–equilibration' might not require post–event reflection. It could occur through joint attempts to construct new conceptualisations at the point of disagreement. More recent work indicates that both processes occur (Howe, Tolmie, Anderson & Mackenzie, 1992a; Howe, Tolmie & Rodgers, 1992b; Williams & Tolmie, 2000). Furthermore, factors such as age, familiarity with subject matter, friendship, etc are significant. Basically, the more familiar participants are with resolving conflict in given circumstances, the more likely they are to negotiate some improved agreement 'on the spot'.

**Expert Guidance**

According to Piaget, conflict and discussion of this productive kind can only occur among peers. When there is an imbalance of status, the less expert individual simply defers to the person with more expertise. Vygotsky (1978), however, proposed that under these circumstances, a different type of learning dialogue occurs within the zone of proximal development.

Vygotsky theorised that learners could perform at a higher level when working with more expert others who help direct activity. Learning thus occurs via the appropriation and internalisation of the 'moves' initially performed under guidance. Bruner (1985) and Wood (1986) suggest that this might take place through a process of scaffolding or contingent support and recent research confirms the existence and impact of this kind of 'tutor–ly' dialogue (Howe et al, 2000). These behaviours can equally be typical of learners, of course, particularly in adult on–line learning contexts such as those described in this work.

**Social management**

One further strand of behaviour in co–operative learning contexts, noted as important by socio–cultural, activity, and situated learning theorists (e.g. Crook, 1994; Leont'ev 1981, Engestrom, 1987; Wenger, 1998) relates to what might be called the 'social glue' of interaction. This includes strategies employed in managing and maintaining learning community activity. At the simplest level, this can be reduced to ‘chairing’ behaviour: interactional turns aimed at specifying what should happen when, and who is responsible for this. At a more sophisticated level, this might involve managing the process of uncovering and resolving conflicts, without provoking outright hostility.

These behaviours have been less researched than those relating to socio–cognitive conflict and expert guidance, but appear to be highly sensitive predictors of learning outcomes. For instance, overmuch routine chairing can lead to negative outcomes (Tolmie et al, 2000). At the more
sophisticated level, interactions aimed at generating shared community views of activities, especially at an early stage, appear crucial to the success of collaborative outcomes (Lewis, 1997). There is good evidence to suggest context influences upon the incidence and effectiveness of these sorts of interaction, depending for example on subject discipline, the make-up of the learning community, or the nature of the communication medium in use.

Starting to Use CMC

Using CMC in learning and teaching may not come naturally to even those students and tutors who are 'browser literate' and for whom email has long been a comfortable resource. A sense of novelty predominates, more exciting than familiarity, but a lot less comfortable.

Both research and practice experience indicates that CMC skills develop best through tasks or activities which are familiar, meaningful and relevant to our learning needs. It is through such tasks and activities that your students (and possibly yourself) lacking experience within a particular learning environment can be drawn into confident and regular usage, gaining sufficient understanding of how that environment operates to explore new and productive ways of using it.

We do improve with practice and the aim here is to suggest some activities which should familiarise you, your colleagues and perhaps your students, in the use of computer mediated communication.

In familiarising yourself with the technology, you should concentrate in the first instance on carrying out activities that are familiar, and building up experience of how to do this using the resources to hand. Some pointers on starting to use the technology are given below.

Some form of local CMC system guide sheet for the use of VLE resources in your own institution may be available to allow you to establish log-on permissions, to check ways of using options and features and to identify useful resources before beginning. Check this with your service provider and/or educational development unit.

Establish a group – colleagues in the same institution may be sensible, unless there are common resources (VLE, version, server access etc) across institutions which allow freedom of inter-access.

Set a time frame for each activity, and agree this between yourselves.

**Activity One:**

1. Each member of the group composes and posts an informal message to the conference, giving their name and department, then your reasons for engaging this learning activity at this time.
2. Each of you responds to at least one of the contributions made by colleagues. Perhaps you might agree, or comment on, someone’s reasons for taking the module where these concur or contrast with your own.

**Activity Two:**

Each member of the group thinks back over the issues raised in the introductory sub-section – the four key issues of asynchronicity, text format, permanence and structure, and the listing of advantages and disadvantages of CMC given there.

1. From what each of you know of the range of tutorial activities you engage for the support of learning in your own learning environment. What concerns, potential worries, might there be for realising these in a VLE? What, on the other hand, might work well – and why?
Select one or two issues and put them to the group for discussion.

♦ For example, participation is a known concern – some conferences attract little activity by the student group. If it is important for their learning that they do contribute, how can they be encouraged?
♦ Another problem can be the student who dominates the conference – possibly with good work, but which might daunt less confident students, or irritate others. How to support the group development without thwarting that of the student?
♦ Abuse of the system can be a worry, though it is found less frequently than might be feared – how to deal with the rogue contributor who may be using offensive language, spreading rumours, challenging staff?

2. Looking at the issues raised by your colleagues (which may or may not concur with your own, or with those suggested above), what solutions can you suggest? Spend a bit of time in discussion, responding to messages or putting new topics up.

Once you are all comfortable with writing and sending, each member of the group undertakes the next activity:

Activity Three:

The context checklist template below can be used to organise your information (though there is no need to stick to it absolutely). Use this information to post a message about a course that you teach, support, or plan, for which CMC might enhance your learner support provision. This template is also available to download as a Word document.

Subject Discipline
Course title
Course level
Who are the students?
Where are they studying?
Why are they studying
Available technological resources
Other course activities
Other course resources
purpose of CMC for this context:
Particular concerns or points of interest:
Comment, question and respond to others' context messages if you wish to, then leave it for review in the light of practice experience?

This might be a good point at which to review information available from the ‘Useful Links and References' section.

Roles and Competencies

Given the range of purposes and contexts for group online tutorial classes, suggesting generic roles and competencies for tutors is problematic. Shifts between ‘sage on the stage', 'guide on the side' and ‘friend to the end' will be required depending upon the nature and level of your student group. Something across all three stances may be called for when supporting adult life–long learners and continuing professional development (CPD) groups.
That said, the list below is drawn from work with a project group spanning three UK and two mainland Europe institutions, as part of a European Commission Framework 5 programme: E−Quality in E−Learning (EQUEL). Any one student class online may demand several, perhaps all, of these roles from their tutor:

- **Designer:** sometimes of the whole course or course module, sometimes simply of the 'lesson' itself. Identifying and implementing the pedagogies, the teaching and learning activities and the tasks to be done by the learners.
- **Content facilitator/Resource provider:** sometimes as subject expert, sometimes as interpreter and guide through the concepts for study as expressed in the course materials; identifying and locating, developing and producing further resources to provide 'just in case' or 'just in time' learning support for the development of course−related concepts and skills.
- **Metacognition facilitator:** supporting reflection on learning activities and outcomes, study skills development: giving feedback, arguing, agreeing, challenging.
- **Process facilitator:** supporting learning strategies, study skills, time management, helping the learners to help themselves.
- **Collaboration/communication facilitator:** encouraging participation and showing ways of participating by example, engaging in a non−directive way to support good interaction between the learners to take the learning forward.
- **Advisor/counsellor:** providing pastoral support, acting as doorway to institutional or local support systems.
- **Assessor (formative and summative):** giving feedback on task achievement and performance, supporting assignment development, marking assignments, examining.
- **Technologist:** guiding early users, fielding problems, being first−post support with technologies and tools for learning.
- **Manager/administrator:** keeping records, setting calendars, booking spaces, general course management.
- **Researcher:** the line between the reflective practitioner and the action researcher is often thin.
- **Co−learner:** importantly, and often, the role of the tutor is not 'sage on the stage' or even 'guide on the side', but genuinely 'friend to the end' of the course, walking with the learner−participants and learning alongside them.

One aspect of your role will be common across the range of contexts: a primary purpose to support learning and to that end a small checklist of general features probably apply as well to the virtual as to the face−to−face environment:

- a climate of acceptance and respect for one another across both similarities and differences in the group
- openness of communication
- listening being valued as much as talking
- everyone taking responsibility for their own learning and for their own behaviour
- the development of clear processes for making decisions
- problems and conflicts being faced openly and constructively
- clarity in the setting (and agreeing) of tasks and activities
- everyone's contributions being acknowledged and valued.

Adapted from Stanford, 1990

See 'e−tutor readings' for a summary of papers that deal with issues directly related to different e−tutoring roles: learning, learner management, learner experience, tutor perspectives, teaching and learning contexts and e−tutoring experiences.

See 'practitioner enquiries' for summaries of the work of some of the foremost practitioners in CMC.
Implementing CMC

You may have a variety of reasons for introducing CMC resources for students on their courses. These could be pragmatic – distributed class, need for common 'workspace', availability of adequate technological resources, mixed timetable demands across a student group – or pedagogical, offering perceived benefits for student learning through 'virtual' written discussion.

Critical factors for success are the integration of the communication resource within the programme, and its relevance to programme objectives which should be clearly understood and agreed by all concerned. Whether, and how, discussion topics and task activities relate to course outcomes and procedures influence the ways in which your learners use the resource. If online communication skills are themselves a learning outcome, then feedback on performance is critical. It may be, however, that the value gained by your students from the resource will differ for active and passive participants and you will need to acknowledge and respect this.

Practical issues are important. Individual participants, your students and yourself, need easy access to the resource whether working through local area networks, or a modem at home. The resource functions and navigation should be transparent and intuitive – the effort to communicate should be towards expression of ideas rather than mastery of technology. Taking space to familiarise the learning group with the software is sensible, though it is important that the tasks set to achieve this are usefully related to their social needs within the learning context of the resource.

Other issues relevant to general educational provision apply particularly for CMC. Learning support and access for physically and socially disadvantaged groups, ethics of practice, copyright and plagiarism, privacy, confidentiality and data protection need to be considered in line with national and institutional policy and the special constraints of the online context. Guidelines for various levels of learner and case illustrations from a range of learning contexts can be accessed and reviewed through the resources section.

Broad tips for implementation:

- Allow space, time and relevant resources for familiarisation and grounding the group.
- A getting−to−know you session can be a good way in, sharing experience, motivations, worries. If possible, face−to−face then hands−on, if not then make this the first online exercise.
- If the students would like to, provide a 'photo−space'.
- As soon as is sensible, engage tasks round the learning content and intended outcomes of the course.
- Share purpose, agree rules and roles, and review these as the course continues.
- Evaluate process and outcomes against plans.

Measuring Practice and Change

A recent study (MacDonald & McAteer 2003) looked at tutor use of media within both distance and campus−based learning environments. All participating tutors recorded learning support as opposed to direct teaching interventions during key periods within a single module block or lecture unit within the courses for which they had tutorial responsibility. Intervention purpose (administrative, pastoral, conceptual support, skills development, assignment feedback, etc) was logged against media used (email, face−to−face, telephone, e−conference, paper−based).

<table>
<thead>
<tr>
<th>Intervention function</th>
<th>Medium used</th>
<th>Contacts with group</th>
<th>Contacts with individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>bulletin board</td>
<td>letter</td>
<td>face−to−face</td>
<td>CMC forum</td>
</tr>
<tr>
<td>phone</td>
<td>face−to−face</td>
<td>email</td>
<td>letter</td>
</tr>
</tbody>
</table>

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An adaptation of MacDonald and McAteer's logging instrument is shown here. You might find it useful to make your own record of practice over a current period of your teaching, doing the same with the following year's cohort to check changes with technology availability and use. You can download the above table as a word document for your use (opens in a new window).

The study showed that face−to−face, written and email interaction featured most strongly across all campus based and distance environments but, where VLE tools were provided, use of Computer Mediated Conferencing (CMC) increased. Feedback from study participants raised a host of concerns about good practice in its use.

### Planning Activities for Purpose

The broad examples of categories and purposes of use illustrated here are not exclusive, there is inevitable overlap. Success depends on many interactive factors, and will obviously be influenced by purpose.

Context information about the student group is important. Who they are, what their subject and information technology experience has been before coming into the course, where they might be at the times when they are studying e.g. at home (study, bedroom, kitchen), at work (shared office, temporary classroom, own workspace) and when they might be studying (after the kids are in bed, in between teaching and project meetings) is critical for you to have an understanding of your students' resource and support needs. Such knowledge does not always help to predict participation, but it can help to explain participation patterns.

Whether or not the technology and technological support available to them is adequate, i.e. accessible on demand, easy to use to the point of being invisible, and lends itself to the tasks in hand is another obvious factor influencing motivation to participate.

Most important is why they are taking the course – interest, professional development, company requirement, scholarship etc.. Their reasons may or may not closely match your reasons for providing it, and inevitably your reasons for the particular provisions you make – teaching strategies, learning tasks, support resources – may not be clear to them, or agreed with even if understood.

The critical thing here, as in traditional classroom environments, is to ground learning community relationships and task activities in a shared understanding of learning outcomes and agreed pathways to their achievement.
<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharing information, building up a knowledge archive</td>
<td>Question/answer sessions can be valuable for developing 'why' or 'how' knowledge. It can also help with the refining of questions. Management and role responsibilities here, of course, depend on learner level, available resources and depth of issues to be covered.</td>
</tr>
<tr>
<td><strong>Group activities</strong></td>
<td>Too large a range of possibilities here for truly generic advice but – small numbers work best (4–6), purpose–relevant tasks should be set, based on existing knowledge/skills for developing into the new environment. Time should be allowed for familiarisation, without pressure. The point, and the goal, of activities should be understood/agreed across the group(s). Role/tasks distribution should also be agreed and understood – decisions here on choice criteria, allocation responsibility.</td>
</tr>
<tr>
<td><strong>Debates</strong></td>
<td>Adapting traditional rules – e.g. 'position statement' prepared, proposer and opposer identified, perhaps support team allocation to 'provide evidence' or 'support arguments'. Time deadlines established, form of debate itself agreed, judgement criteria (and roles) established. Resources for debate information should be available and accessible!</td>
</tr>
<tr>
<td><strong>Master class</strong></td>
<td>This can be a good way for students to take their ideas further and get useful expert feedback, but can be a rather daunting experience – on both sides. The 'guest expert' might need a 'lead–in' and one or two students might be encouraged to seed the discussion with (genuine but not too esoteric!) questions or comments. It could be that the expert starts the discussion with a prepared paper, or it could be that she or he rounds off the 'open floor' by summarising and drawing issues into a report paper. Whether, and which, other resources might be provided depends on topic and practicality, but it may be appropriate to provide links to other papers, illustrations, etc.</td>
</tr>
<tr>
<td><strong>Cooperative/Collaborative Project work</strong></td>
<td>Again too great a potential range of need and context for generic guidelines, but many activities may combine, sequentially or together, for success. Grounding – clarifying and sharing objectives and rationales. Brainstorming – generating and exploring solutions. Task allocation/sharing – taking and giving responsibility, group awareness. Self–peer evaluation/assessment. Critical reflection, revision, change.</td>
</tr>
<tr>
<td><strong>Tutorials</strong></td>
<td>Generally these precede, or follow, class activities such as labs, field trips, lectures. A major issue here could be spontaneity – sessions should be as freely interactive as possible, with all participants at their ease, and resources (lecture notes, assignment papers, whatever) to hand for common discussion. The first session for a new group could be deliberately set up as 'practice' with provided, but relevant, items for discussion and perhaps ending with a 'focus session' on the experience itself, and ways of improving it.</td>
</tr>
<tr>
<td><strong>Seminars</strong></td>
<td>With a different agenda, ground rules and practice need to be agreed – probably on the basis of group experience, though with reference to guidelines if these are appropriate. Whilst there may be a necessary formality, a relaxed atmosphere should be encouraged, and contrasts of presentational style. Availability of common resources is essential and, importantly, any preparatory work should have been done by all concerned!</td>
</tr>
</tbody>
</table>

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**Assessing e-Learning Interaction**

We know that the methods by which we assess our students strongly influences what they learn, and how. It is also claimed by many, as commonsense knowledge, that students are less likely to engage in any demanding course–work activity that does not carry some weighting for summative assessment.

Another commonsense understanding in education today, better grounded through research as well as practice experience, states that it is good for students to learn together – that group work is good for learning.

If collaboration in its own right is valued as a learning support, then it is understandable that teachers seek ways of involving students in group discussion activities, online or face–to–face. Even if not participating, students say (and evidence supports them) that they learn a great deal by reading others' comments and responses.

In a collaborative learning environment, what is the role and limit of vicarious learning? At what point do we say that the level of contribution is so minimal as not to be sufficient or acceptable? Is all participation the same, and is participation always a good thing? What criteria can we apply to help define the nature and extent of participation that is necessary for us to be able to say that 'collaborative learning is occurring'?

One critical point for discussion, raised frequently in the e–learning context where often the conference or discussion forum is the only means for student interaction, is whether or not participation itself should be assessed.

If contributions should count for assessment, what weighting should they receive within the overall course mark, and what criteria can be defined for grading? This is more difficult to decide on than it may seem at first sight.

The critical issues are those of the learning purpose of the group work, a shared and relevant set of assessment criteria (for teachers and for learners) and the quality of feedback – whether given by teacher or peers.

One major issue for assessing CMC activity, or group behaviour in other learning environments, formatively and summatively, is the learning purpose of such activity, and how that purpose can be measured through study of the activity itself.

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**Table: Discussion forums vs Review groups**

<table>
<thead>
<tr>
<th>Discussion forums</th>
<th>Review groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special interest groups. Separating out for study, bring back to topic group. Following individual course interests/objectives in company with peers – extending general knowledge</td>
<td>'Ownership' and freedom of speech need attention, if the desire is to allow open discussion of agreed issues. Students are likely to develop their own rules and codes of practice, and management of these, if left the space to do so. If teaching and support staff are present, it is a good idea if that is on an equal basis.</td>
</tr>
<tr>
<td>These can be very good ways of covering a lot of subject ground – content, issues, readings, performance. A key aspect is the pre–task activity of identifying sources and agreeing criteria for review/assessment. Different disciplines will inform quite different patterns of activity.</td>
<td>Adapted from McAteer et al 2001, see also McAteer &amp; Harris 2002</td>
</tr>
</tbody>
</table>
If one element for assessment is the development of appropriate communication skills within on-line learning environments, then those skills must be developed through use and feedback, and actual contribution to on-line task activities and discussions could (should?) contribute to any grade or mark awarded for module outcomes. Decisions as to the value of individual contributions might not be easily made!

One solution could be to weight assessment grades for 'contribution' in terms of:

- presence – just 'being there',
- interaction – responding and seeking feedback,
- transaction – sharing/exchanging useful information and resources and, perhaps,
- transformation where ideas and understanding clearly develop as a function of interaction and transaction?

The usefulness of this rule of thumb is limited unless all concerned agree on a sensible and achievable set of outcome criteria, and agree on what constitutes evidence of meeting them. Which communication skills are to be developed? Sympathy, support, encouragement, objectivity, criticality, equity? A bundle of behaviours would surely combine to promote, or thwart, a 'success' for the group working space? To what extent can (should) we ask the students to take responsibility for assessing, and grading, contributions to conferences?

Some people find that putting thoughts, ideas, and understandings together and posting to the conference, whether they receive feedback or not, is itself very useful for learning. Others gain confidence, and understand the benefit, from seeing the productions of others – whether they interact or not. This is not necessarily to be derogated – lurking is neither anti-social nor dishonest! People learn in different ways and ideally can take what they need from a range of course resources – reading and reviewing, practising, testing, arguing, drafting and reflecting alone or together.

If on the other hand the aim of the conference is to engage and support peer group discussion because it is believed that people learn best together and the intended learning outcomes relate to subject discipline knowledge and understanding, assessed entirely by performance (essay, practical task, exam paper, workplace development) outside of the conference space itself, then assessment of communicative performance within it becomes problematic.

Here the value of the conference interactions for the learning outcomes evidenced by individual group members might be visible in the content of summative assessment submissions, or in feedback elicited from learners once a course is completed and examined, and they are 'in the world' applying the learning?

**Examples of CMC in Practice**

The opportunities and limitations of CMC require changes and adaptations in human behaviour for successful communication to take place. Skills develop over time and in service of the task in hand. In short, they are functional and context-specific. This 'evolution of practice' is (inexactly) matched by developments in technology and of the software that support its use – which, however welcome, call again for adaptation and change. Every teaching and learning domain is unique and, even within institution, subject discipline and course itself, there is no guarantee that what works for one cohort of students will do so the following year for another.

For this reason we are unable to give a generic set of guidelines that meet the needs of all CMC users. The guidelines linked to this section are grounded from studies of CMC experience across a range of teaching and learning environments. Individual case summaries, from which you might recognise circumstances and issues that are similar to your own, are also linked.
Each case study text, and the guideline documents themselves, are organised under five broad areas of concern, identified by teachers and learners as 'issues to manage' for effective educational communication within CMC environments:

- **Character of the communication**: interaction, spontaneity, pace, coherence, permanence, medium, register, topic threading.
- **Self–perceptions**: confidence, visibility, benchmarking, equity, management.
- **Learning and teaching relationships**: roles, attributions, social patterns.
- **Getting things done**: task grounding, preparation.
- **Continuity with curricula**: context, co–ordination, integration, assessment.

A specific evaluation section per case study is also included.

The Grounded Guidelines and Case Studies section opens in a new window for easier navigation.

Literature sources are listed for those who are interested in developing their own understanding.

**Useful links and References**


An experiment in group learning technology: evaluating critical thinking in face–to–face and computer–supported seminars D. R. Newman, Chris Johnson, Clive Cochrane and Brian Webb School of Finance and Information, Queen's University Belfast [http://www.qub.ac.uk/mgt/papers/ccvsem/contents.html](http://www.qub.ac.uk/mgt/papers/ccvsem/contents.html)

FDTL project 'Assessing Groupwork' outcomes.

Internet Detective: an interactive site on evaluating the quality of internet resources: [http://www.sosig.ac.uk/desire/internet–detective.html](http://www.sosig.ac.uk/desire/internet–detective.html)

[http://www.windweaver.com/internet.htm](http://www.windweaver.com/internet.htm) – 'how to fight fair online' and 'recommended emoticons' might be useful. Sensible guidance about online communication – useful for students as well as worth keeping in mind ourselves.

[http://www.atimod.com](http://www.atimod.com) accesses the home page of Gilly Salmon, of the Open University's Business School. A lot of useful information from recent presentations and publications. Those who are 'emoderating' (managing an online discussion group, or actually tutoring online) might find the 'techniques for CMC' chart useful to reflect upon.

The Moderators Home Page Zane Berge and Mauri Collins page of advice and resources, with link to Interpersonal Computing and Technology Journal (IPICTJ) [http://www.emoderators.com/](http://www.emoderators.com/)


The learning commons resource from staff at the University of Calgary [http://commons.ucalgary.ca/about/index.html](http://commons.ucalgary.ca/about/index.html)

Four papers on CMC by Jacob Palme at the University of Stockholm [http://www.dsv.su.se/~jpalme/four–papers.html](http://www.dsv.su.se/~jpalme/four–papers.html)
References


Higgison, Carol &Harris, Rachel (2002) Online tutoring: the OTiS experience from the OTis website.


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Effective Use of VLEs: e-Assessment

– What Do We Mean by Assessment?
  ● Methods of Assessment
  ● Characteristics of a 'Good' Assessment Programme

– What Do We Mean by e-Assessment?

– What Do We Need to Consider?
  ● Reasons for Use
  ● Policy Considerations
  ● Practical Considerations

Creating and Using e-Assessment
  ● Assessment Questions
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  ● Interoperability and Reusability

– The Student Perspective
  ● Feeding Back to Students

– References
e-Assessment

Introduction

The idea of having our assessments computerised is obviously attractive and e-assessment is emerging as a major driver for e-learning for both students and staff. e-Assessment (sometimes known as Online Assessment, Computer-based Assessment or Computer Assisted Assessment – CAA) certainly has advantages. However, it also has some disadvantages and associated problems.

In this section we shall look at advantages and disadvantages, the practical considerations that need to be taken into account and some background considerations. For a start, particularly if you are new to this area, it may be useful to look at the definitions on the JISC and QCA (Qualifications &Curriculum Authority) e-assessment glossary.

What Do We Mean by Assessment?

Assessment is one of the most significant areas of an educational system. It defines what students take to be important, how they spend much of their academic time and in may ways how they value themselves. Rowntree (1987: 1) says of assessment 'if we wish to discover the truth about an educational system, we must look to its assessment procedures.' In addition, assessment is important because students cannot avoid it, as Boud (1995: 35) says:

'Students can, with difficulty, escape from the effects of poor teaching, they cannot (by definition if they want to graduate) escape the effects of poor assessment'.

This underlines the importance of getting our assessment practices right for our students.

Rowntree (1987: 1) states that assessment procedures offer answers to the following questions:–

'What student qualities and achievements are actively valued and rewarded by the system? How are its purposes and intentions realised? To what extent are the hopes and ideals, aims and objectives professed by the system ever truly perceived, valued and striven for by those who make their way within it?'

Allied to this is the fact that assessment has two main purposes within further and higher education:

• The first reason is to assist learning. When looking at this area we must always strive to make the assessment relevant to the overall goals of the unit and to make our assessment part of the learning process.
• The second is to determine the effectiveness of the education system. Only with this can we as educators improve the education of our students. However we must be able to determine not only the overall learning but which areas are not effective and need modification.

As tutors we assess for a variety of reasons:

• To pass or fail a student.
• To grade or rank a student.
• To select for future courses.
• To predict success in future courses.
• To provide a profile of what a student has learnt.
• To diagnose students’ strengths and weaknesses.
• To provide feedback to students to improve their learning.
• To help students to develop their skills of self-assessment.
• To motivate students to provide feedback to teachers.
• To evaluate a course’s strengths and weaknesses.

We must then question what we are assessing in the first place. A number of assessment points must be considered among which are:

1. What do we want to assess?
   - Basic knowledge, skills, higher cognitive skills.
2. For what purpose?
   - Diagnostic, formative, summative.
3. In which mode?
   - Norm-referenced, criterion referenced.

We need to be specific; for our students we need to ask the questions why, what and how, and relate these to the objectives of our courses and the learning outcomes we devise for our students.

We must ask these questions to make sure that our assessment matches our educational purposes. As a tutor we then should find the most appropriate assessment method for the set assignment or to assess the desired learning. When considering the assessment tasks we set we need to consider the strengths and weaknesses.

We should also appreciate that students expect to receive much of their information, whether educational or social, from online resources and so we should be moving to assessing them by congruent means. As student numbers have increased, and staff contact hours have in many cases decreased, students have asked for supplementary support. An example of this is given by Clarke: ‘Students had requested additional ways in which to learn and judge their progress during periods of low contact time with their tutors – especially in the lead up to examination’ (Clarke et al., 2004:250)

‘From the INQUIRE evaluation it is strongly indicated that reinforcing the content of the lectures through formative assessment can act to cement students’ understanding of key concepts and ideas’ (Clarke et al., 2004: 259).

Methods of Assessment

We have already dealt with the different reasons for assessing students and the purposes for which students are assessed. Here we will look at the different types of assessment, whether assessment is diagnostic, formative or summative, and what different methods may be employed to assess students, whether these are in-course or end of course. Students can be assessed by their tutors, placement or professional mentors, their peers or by themselves. However, as Ramsden (1992) says, it will be rare to find one assessment method which will satisfy the assessment of all the intended learning outcomes for a course, so it will be necessary to consider a range of assessment methods for our students. Weavers (2003:13) concurs:

‘diversity decreases the dependency on the traditional formal examination, a method that does not suit the learning styles of many students’

Diagnostic Assessment

As it suggests, diagnostic assessment is used to diagnose the level of learning that has been achieved by our students, and is generally used at the beginning of course units for staff to determine the level at which they should be aiming their teaching, or to suggest to staff (or students
themselves) the level of support that may be required. Staff may use diagnostic assessment at the
end of a lecture, or a series of lectures, to see if students have comprehended the information
conveyed, and students appear to like this, as it is a way for them to keep a track on their learning.
However, diagnostic assessment does not provide a tool to enhance student learning unless it has
an element of feedback within it, unless it becomes formative.

**Formative Assessment**

Assessment that is formative occurs during a course, and provides feedback to students to help
them improve their performance. The feedback need not necessarily be derived from only the tutor,
but can be from students’ peers or external agents such as clinical tutors or placement supervisors.
It is important that the feedback should be given in relation to the criteria against which the work is
being assessed. Involving students in peer assessment aids students in understanding and using
the assessment criteria (Bradford, 2003). Indeed, ‘Giving feedback on another student’s work, or
being required to determine and defend one’s own, not only increases a student’s sense of
responsibility and control over the subject matter, it often reveals the extent of one’s
misunderstandings more vividly than any other method’ (Ramsden, 1992: 195–6).

**Summative Assessment**

Assessment that is summative may or may not include feedback. The main difference between this
form of assessment and that which is purely formative is that grades are awarded. The grade will
indicate performance against the standards set for the assessment task, and can either be part of
in−course assessment, or assessment at the end of a course or module.

Boud (2000:160) says that assessment activities ‘have to encompass formative assessment for
learning and summative for certification’. We should move away from providing merely summative
assessments of our students’ learning, especially when these occur at the end of units of study,
because students will not be able to use these to improve in their learning. Summative and
formative are not types of assessment but rather purposes to which assessment are put.

A case study from Oxford Brookes University shows how the use of formative assessment can play
a part in reducing the failure rate and increasing the performance of students.

**Characteristics of a 'Good' Assessment Programme**

Who is assessment for? There are many stakeholders in assessment. Students are obviously
stakeholders, because they submit work for feedback and grades. Teachers and tutors wish to
monitor student progress and can receive feedback about the quality of the students’ learning
experiences from their assessment performance. Employers want to know how well students have
done, as do professional bodies. In addition, the wider community wants to know that education is
providing value for money and they gauge this through the assessment results. Institutions are
subject to Quality Assurance and assessment is regarded as a major component in this.

The key factor in determining whether an assessment programme is good depends on whether the
assessment tasks are relevant to the aims and intended learning outcomes for the course, not
forgetting the attitudes and skills that are to be tested. Brown et al., (1997) declare some common
weaknesses in assessment systems, providing a checklist against which assessment programmes
can be verified.

1. Overload of students and staff
2. Too many assignments with the same deadline set in the department/school.
3. Insufficient time for students to complete the assignments in the time available.
4. Insufficient time for staff to mark the assignments before the next semester.
5. Inadequate or superficial feedback provided to students.
6. Wide variations in assessment demands of different modules.
7. Wide variations in marking across modules.
8. Wide variations in marking within a module.
9. Wide variations in marking by demonstrators.
10. Fuzzy or non-existent criteria.
11. Undue precision and specificity of marking schemes or criteria.
12. Students do not know what is expected of them.
13. Students do not know what is a good or bad assignment/project.
14. Assessment viewed by some departments/schools as an extra rather than a recognised use of staff time.
15. Project supervision seen as an extra or the real time involved is not recognised.

Students gauge the requirements of a course from the assessment that they are expected to do to attain that course:

‘Assessment sends messages about the standard and amount of work required, and what aspects of the syllabus are most important. Too much assessed work leads to superficial approaches; clear indications of priorities in what has to be learned, provide fertile ground for deep approaches’ (Ramsden, 1992:187–8).

Providing a range of assessment methods for students can make administration of assessment programmes more difficult, as it can prove difficult to combine marks from a number of different tasks, however, a range of methods is important to students, as this can accommodate the range of students learning preferences (Weavers, 2003).

Ideally any assessment should be valid, reliable, practicable, and fair and useful to the student. It should demonstrate whether and to what level students have met the intended learning outcome(s) of the course or programme.

**Validity:** The degree to which you are able to measure what you think you are measuring, and may require assessment within real life, and variable settings (Ashcroft and Palacio, 1996).

**Reliability:** the degree to which the scores of every individual are consistent over repeated applications of a measurement procedure and hence are dependable, and repeatable; the degree to which scores are free of errors of measurement.

Assessment should have a clear purpose, it should be clear what is being assessed and how the judgements are reached. It should enable the learner to review their progress in the light of the assessment criteria, and then plan for their further learning. It should also be subject to quality assurance procedures and allow the assessor to review teaching effectiveness. An outcome will be clear records of attainment which will be useful to all the stakeholders in assessment, as these will be required for the awarding of degrees or the achievement of professional certification.

The assessment should be based upon certain standards and these should be well articulated to form a reliable basis for determination of whether or not a student has achieved the learning outcomes of the educational programme. Simple ways of improving reliability in assessment include:

- the use of more than one method to assess achievement (Rovai, 2000, Sim *et al.*, 2004)
- setting more, albeit smaller assessment items (Gipps, 2003, Weavers, 2003)
- and the use of more than one assessor

When creating effective assessments a tutor should look into the nature of effective assessment. Brown and Knight (1994) suggest some requirements for creating effective assessment methodologies:
• give full feedback, related to the criteria that has been established for the assessment in the first place,
• identify with the student points for development,
• generate and share criteria which blend departmental requirements with student priorities,
• be supportive, foster intrinsic motivation, preferably by being interesting and enthusiastic,
• grade rapidly – effective feedback is swift feedback.

All forms of assessment are problematic to some degree. Continuously assessed work such as essays, projects and reports can be open to claims of plagiarism (Carroll, 2002 and http://www.brookes.ac.uk/services/ocsd/4_resource/plagiarism.htm) and can be very time consuming to mark. Exams can encourage surface learning, guess work, and probably don't lead to effective long-term learning (Ashcroft and Palacio, 1996) as they generally do not include any elements of feedback, and are not returned to by students.

What Do We Mean by e-Assessment?

e-Assessment is often seen as providing a partial solution to providing assessment for increasing numbers of students and declining staff to student ratios (Sim et al., 2004). In addition, students may experience cognitive conflict because they are generally expected to word process essays and engage in online tasks but use pens in examination halls (Brown et al, 1997) such that we are training them in one system and testing them in another. Gipps (2003: 26) reasons that:

'If teaching and its associated resources become electronic, then assessment too will need to take that route, to ensure alignment between the modes of teaching and assessment.'

When e-assessment is mentioned people often have certain assumptions, that:

1. The assessment will be objective.
2. The assessment will be limited in the type of question to multiple choice questions (MCQs).
3. The assessment can only test recall or low level learning outcomes.

We will address each of these in turn.

Assumption 1: Objective assessment

• There is no such thing. Subjective judgment is always involved – when an educator creates a test they do so with their internal biases on the type and nature of material. When the limit of the assessment and the type and nature of the 'correct' answers are preset, the educator introduces their own judgement and bias into the system from the start.
• However the extent of bias can be reduced because in e-assessment, the judgments made are only made based upon the original criteria and not on 'human introduced error' (e.g. marking at 2 a.m.) so that a second level of error is not introduced. In addition, levels of correctness can be programmed into the system that can score partially correct marks in a more consistent manner.

Assumption 2: Limited Types of assessment tools

Communication and information technologies have been incorporated into assessment in further and higher education in a number of ways. For example:

• the analysis of student postings to discussion boards (Rovai, 2000; MacDonald and Twining, 2002) as discussed in the 'Computer Mediated Conferencing' section of this infoKit

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• the delivery of exam papers (Pass−IT project and Technologies for Online Interoperable Assessment (TOIA))
• use of modified essay questions (MEQs) particularly in Medicine
• in helping to provide feedback to students on written work (e.g. Electronic Feedback System developed by Phil Denton from Liverpool John Moores University)
• use of Personal Response Systems to assess students' understanding during a class(e.g. JISC funded PRS project at Strathclyde University by D.Nichol and J.Boyle.

Students can be asked to interact with simulations and submit the results and analysis of these results for assessment. Students can create webpages, these can be assessed by their peers or be validated electronically. Computers can create sounds which students have to replicate, for example in music, or in languages, and the computer can gauge the amount of similarity.

Some of these assessment activities can be offline assessment of online delivery and could include the assessment of a presentation on the web or powerpoint for example, as well as the assessment of online skills, including how students use particular software packages such as databases and spreadsheets.

However, most would accept that e−assessment comes into its own with objective testing (examples can be found from the CAA conferences in 2004 and 2005 available from http://www.caaconference.com), where computers do the marking.

While many of the available systems, particularly those which come as 'quiz' facilities with VLEs or are available free of charge are indeed limited, others include a large variety of question types. [see types of questions and choosing a software package]

**Assumption 3: Computerised assessment can only test low level learning outcomes**

Even straightforward multiple−choice questions can, if carefully constructed, test higher order skills. The issue here isn't so much that of technology as creativity. For instance if you are looking at the application of knowledge (a higher order skill according to Blooms taxonomy http://www.le.ac.uk/cc/rjm1/etutor/resources/learningtheories/bloom.html) it is possible to create an ordering question, which might appear easy to a student who has comprehended the topic whereas one who has not will struggle.

**What Do We Need to Consider?**

**Advantages of e−Assessment**

Some of the advantages of e−assessment that you might want to consider are:

• immediate feedback to students,
• allows rehearsal and revision,
• immediate feedback to staff,
• allows evaluation of a course's strengths and weaknesses,
• can be linked to other computer−based or online materials.

These are characteristics of good assessment technique and have links to a strong well evaluated pedagogy, as well as providing support for both staff and students – and of course, online assessment has all the other advantages of remote access and choice of time and place of assessment (although the latter may be limited for summative assessments that require security).

When looking to use e−assessment we can find that grading swiftly is one of its strongest points. Test feedback can be on a question by question basis and with the use of a 'knowledge tracking system' students can follow their progression and self determine their weaknesses (and strengths).
This aspect of tracking progression combined with careful nurturing of student expectations can assist in developing students as autonomous learners.

Will e−assessment actually save time for the average lecturer? If you look at it in the short term then almost certainly not. Look at this as a longer term investment. While in the first year you won't save any time; in the second and third years of that material's life span you can save considerable development and support time. Another issue is that as well as the question setting, feedback also has to be created before students sit the test, something that tutors will have to factor into their busy schedules.

Sim et al (2004: 217) 'The emotional and subjectivity issues that are evident in human centred marking may be removed via automatic marking offered by CAA software'.

Concerns and Issues Associated with e−Assessment

Some of the concerns associated with e−assessment that you might want to consider are:

Time Required

One of the claims most often made for e−assessment is that it saves time. This is perfectly true at the point of delivery – it is possible to process the results for a summative assessment for a class of, for example around 700 students within a couple of hours of the last one logging off, including error checking and results analysis. This has to be balanced against the time, and skill, needed to create the assessment in the first place. This may not be so important for formative assessments which can be discussed with students later (and where failings may actually be of educational interest) but it is obviously vital that an end−of−course assessment should be reliable. The time and expertise for this cannot be underestimated, nor the need for 'shredding and vetting' by colleagues. There are times when an open−ended exercise (whether we call it an essay, project or report) may be more suitable for your purposes. There is of course no reason why this cannot be delivered online, with students uploading written materials into virtual learning environments to be assessed off−line.

Misleading Clues

There is a danger that by picking out particular areas (either deliberately or inadvertently), the quizzes could send misleading clues to students about what is and isn't important. This is exacerbated by the students' tendency to be very strategic and exam−focused when considering how best to spend their study time.' Clarke et al 2004: 253.

Equity and Diversity

Equity and diversity – when computers are involved in the assessment process, there are equity issues for different student groups relating to language status and gender and issues around computer anxiety and exam equivalence. Brosnan (1999: 48−49) suggests that: 'computer anxiety can lead to simplification of conceptual reasoning, heightened polarisation and extremity of judgement and pre−emption of attention, working memory and processing resources. Individuals high in computer anxiety will therefore under−perform in computer−based versions of assessment'. Brosnan (1999) asserts that even those who are using computers effectively will still exhibit computer anxiety and he contends that female students exhibit higher levels of anxiety, and so poorer levels of performance. Ricketts and Wilks (2002) suggest that student performance in tests should be monitored to ensure fairness and consistency when there are any changes in delivery, whether this is a change to CAA or changes in the way that the CAA is presented.
Issues of Equivalence

The issues of equivalence between different forms of assessment are highlighted by Clariana and Wallace (2002) who assert that you cannot necessarily expect that equivalent measures of student learning will be produced from computer-based and paper-based tests, even if you use the same questions. They assume that the 'test mode effect' will diminish when students become as familiar with the medium of the computer as they are with paper, for assessment, and that computer familiarity might be an issue for some groups of students. McDonald (2002) concurs, expressing the belief that inconsistent findings relating to student scores in computer-based and paper-based tests often result from different levels of exposure to changing technologies. It is probably fair to observe generally that students perform differently under different conditions of assessment, and that innovations in CAA simply introduce a new range of variants on this construct theme.

Effect of Using Full Range of Marks

Sim et al (2004: 217) 'CAA, like mathematics and some science subjects, also tends to use the full range of marks therefore the trend towards a higher proportion of First Class Degrees may occur in other subject domains adopting this technique in the future.'

Attracts Greater Scrutiny

While problems with objective testing can occur whether the tests are offered on paper or online, it is the online testing that tends to attract greater scrutiny. Don Mackenzie in Brown et al. (1997: 217) contends that CAA has produced quality and efficiency gains in assessment, but for many there have been marginally lower pass rates than for essay-type assessments. He suggests that this is because there is a larger spread of marks (typically a standard deviation of 15 per cent with a mean of 50 per cent).

Design of Questions

Problems in the use of computers for multiple choice questions could derive from the design of the questions and the skills of the designer (Mackenzie, 2003), rather than from the software or the use of the computer per se, or it could be that some tutors may be reluctant to relinquish traditional modes of assessment (Mackenzie, 2003).

Disparity

Research by Clariana and Wallace (2002) has shown that the use of CAA has a positive impact on the test scores of high attaining pupils, when compared to those from paper-based tests, because they assert that higher-attaining students more quickly adapt to new assessment approaches. Noyes et al. (2004) suggest that lower-performing individuals will be disadvantaged when CAA is used because they assert that a greater workload and additional effort is required to complete a computer-based test.

Change in Working Practices

The savings in time that might be produced by the automated marking in CAA are instead shifted to the design and construction of the assessment activity, (including the level and amount of feedback to be given). Brown et al. (1997) see this as a profound change in working practices for academics. There is also the issue of defining requisite technical skills for students undertaking CAA such as, who should be involved in that training, and when should it take place, especially in the context of overloaded curricula (Weller, 2002). Macdonald and Twining (2002) found that their students only became competent in the use of a particular piece of software while they were completing an assignment that required its use.
Plagiarism

Plagiarism is a concern for many thinking of using CAA (Weller, 2002), but Rovai (2000) and Carroll (2002) suggest that assessment design is the key to deterring plagiarism. O'Hare and Mackenzie (2004) assert that there is a level of imagination and rigour required for the design of assessment online compared to that for more traditional forms of assessment. Weller (2002) suggests that the use of portfolios can help to counter plagiarism, as this places less reliance on single assessment items. The JISC funded Plagiarism Advisory Service gives advice and guidance on plagiarism prevention.

Off–Campus Assessment

Computer software for CAA allows for questions to be presented to students in different orders, with distracters in different orders, and if sufficient questions have been compiled of sufficient integrity then they can sit different tests. All of this allows for students to sit in adjoining desks in computer laboratories that will at other times be used for learning activities. This is fairly straightforward for on–campus students, but could be more problematic for students taking courses at a distance. However, Rovai (2000) suggests that this difficulty can be overcome by using ‘proctored testing' where academics arrange for students to sit online assessments under test conditions in alternative venues.

Reasons for Using e–Assessment

As e–assessment is part of the e–learning strategy of the DfES, it should be part of our College or University Learning and Teaching Strategy. The DfES also recognises the importance of aligning assessment to the needs of pedagogy and subjects in terms of e–assessment methods for specific subjects.

E–Assessment can act as a catalyst for rethinking the whole curriculum, as well as current assessment systems (Ridgway & McCuster, 2003). The Qualifications and Curriculum Authority (QCA) in its ‘The Basic & Key Skills e–assessment Experience’ report is quite clear that e–assessment must not simply invent new technologies which recycle our current, perhaps ineffective, practices.

Bull and McKenna (2004: page 3) suggest a number of reasons that academics may wish to use CAA:

1. To increase the frequency of assessment, thereby:
   • motivating students to learn,
   • encouraging students to practice skills.
2. To broaden the range of knowledge assessed.
3. To increase feedback to students and lecturers.
4. To extend the range of assessment methods.
5. To increase objectivity and consistency.
6. To decrease marking loads.
7. To aid administrative efficiency.

Nichol and Macfarlane–Dick (2005; 2004) identified from the research literature seven principles of good feedback practice that could support learner self–regulation – active control by students of some aspects of their own learning, and Nichol and Milligan (in press) have taken this further to show how e–assessment can support these seven principles by providing:

• timely feedback,
• opportunities for re–assessment and continuous formative assessment to encourage students' self–esteem,
• statistics to help tutors evaluate the effectiveness of the assessment – questions answered very poorly can be re-examined in case poorly specified,
• timely information for tutors to be able to help shape teaching.

They also discuss how each of the principles might be implemented in blended learning contexts.

e-Assessment can be used diagnostically at any point in an academic course. It can be used to show how much students already know when they arrive, or can be used as a means of determining how effective the teaching is during a course, and can be related to content and skills. Drew et al (2002) provide an example of a system of 'Skill Check Questionnaires' which are being used at Sheffield Hallam University providing diagnostic testing for key skills. The computer-based system was private to students, which encouraged them to be honest, which then directed the students to the specific support that they required.

Instant and tailored feedback can be provided for students from e-assessment, providing students with more, and more timely feedback than can be provided by tutors. Boud (1995) emphasises the importance of timely feedback for supporting student learning.

Brosnan (1999) has provided evidence of computer anxiety in students affecting exam performance, and Ricketts and Wilks (2002) concur with some students feeling disadvantaged by online examinations. However, Ricketts and Wilks (2002) have also found that some dyslexic students prefer online examinations, finding them less stressful than other examination types.

e-Assessment provides the potential for students to be provided with more complex scenarios than can be provided in paper-based tests including computer simulations, images and sounds, with which students can interact (James, et al., 2002). Interactive assessment activities are time-intensive to produce in much the same way as interactive learning activities are, and make additional demands on institutional resources and support.

Summative e-assessment requires a larger degree of institutional support than formative or diagnostic assessment. The latter can generally be managed by individual academics or departments, whereas there are additional considerations for summative assessment, which are considered within the sections on policy considerations and choosing the software.

Policy Considerations: What is your institution's position?

You will need institutional support to determine the optimum system for your institution, because otherwise you will have issues related to technical and administrative support and upgrading, and staff and students may have to learn to use a number of different assessment engines and user interfaces. You will need to check on what your institution allows you to do in terms of policy implications and institutional impact.

Sim et al (2004: 222) 'The perceived benefits of CAA of freeing lecturers' time can be illusive if no institutional strategy or support is offered, successful implementation may be left to chance and CAA may be developed in an anarchic fashion. In order to utilize the features within software packages staff training and development is necessary and this may not be feasible without institutional support.'

If you are utilising, or proposing to utilise, e-assessment across major sectors your institution will need to complete an end-to-end analysis of the systems you will use and the experience that the students will receive. E-assessment is now a proven technology, and therefore staff and student users expect secure, reliable and flexible systems that are tailored to their learning and assessment requirements. For those managing these systems, these expectations have to be delivered with the added constraints that systems should be cost effective and sustainable.
Components of e-Assessment

e-Assessment requires the provision of assessment software, server & network infrastructure, student PCs, administrative staff support and questions. To create questions and assessments across disciplines a staff education programme is normally required to ensure the staff have an accurate knowledge of the capabilities and limitations of online assessment. Publishing written policy and procedures ensure that all the assessment stakeholders – students, teaching staff, administrative staff, specialist support staff, external examiners and academic & quality assurance managers, can be clear about the process and can have confidence in the operation of e-assessment.

Policy and Procedures, Roles and Responsibilities

Designing, building and operating an institutional-wide e-assessment system is not a small undertaking. It is likely to involve specialists in e-Learning, educational systems, information systems, academic departments, student IT support, quality assurance specialists and academic management. For people from these groups to work together, agreeing roles and responsibilities within policy and procedure documentation, ensures they can each apply their professional strengths and contribute to a successful institutional e-assessment system.

The University of Dundee Policy and Procedures for Computer-Aided Assessment have been in use since October 2002, although they are regularly revised. These procedures are available for other to utilise as appropriate (with due acknowledgement), but it is recognised that they are also limited in that they are written for the specific software, hardware and staffing configurations at Dundee. Another key resource is the British Standard BS7988:2000 – Code of practice for the use of information technology (IT) in the delivery of assessments. Specific areas of importance are highlighted below.

IT suites and the presentation of invigilated assessments

The physical environment for taking assessments needs to be familiar to students and spacious. Screens should not overlook each other, and frequently a back-to-back arrangement is space efficient and secure. Questions may be presented to students in a random order and also even in a structured assessment, students will move at a different pace through the assessment. Some institutions favour individual screened corrals, but these carry the additional risk of participants being shielded from invigilators observation. The University of Dundee, found the use of screens unnecessary. Colchester Institute report in Case Studies of MLEs in Further Education that 'plans for the introduction of e-assessment are posing real challenges to the institution in estate terms. The computer suites are designed in 'daisy-pod' style to facilitate interaction, not as the face-on single units required by the examination bodies'. This example demonstrates that flexibility of learning space is an important consideration.

Invigilation of examinations should be carried out following the institutions conventional examination procedures.

Open Assessments and Personal Authentication

A common topic for debate with e-assessment is how a tutor can be sure that the student completing the assessment is the correct student on their own. The simple truth is that unless the assessment is delivered under invigilated conditions using secure systems, then you cannot be sure. However, many conventional assessments are taken in an open environment – in course essays for instance, and for low stakes assessments, it is often appropriate to adopt an open strategy requiring the completion of a variety of small assessments. Subsequent invigilated assessments provided a check on the open assessments.
Advanced mechanisms for personal identification are being tested (biometric keyboard use patterns, iris scans etc) and some have proposed the use of webcams to monitor participants. Dundee found the development of such approaches unnecessary.

Reliability of assessments

All institutions will aim for the highest level of reliability for online assessments. This is crucial, especially in the early days of running a large online assessment programme. If the staff and students experience an unreliable system, and then experience it again, they will lose confidence. At the University of Dundee they take particular care when a department is running a high-stakes summative e-assessment for the first time. Learning technologists and IT specialists visit the assessment for the first 15 minutes to ensure the assessment proceeds smoothly.

No system can be 100% reliable. Backup or redundant procedures should be in place to cope with the unexpected. At Dundee the backup procedures involve an entirely independent e-assessment system that is available for deployment within 15 minutes to a group scheduled to receive an assessment. Some institutions have paper copies of assessments available, but often this is not possible because of the expanding use of multimedia, innovative and flexible questions in assessments that cannot be replicated on paper.

VLE or Specialist e-Assessment systems

Software for the delivery of e-assessments is often contained within commercial VLEs or specialist e-assessment providers. An institution’s VLE has the advantage that it is supported, built on a secure servers and familiar to staff and students. Specialist e-assessment systems require additional servers and support and additional tuition for students and staff, but normally offer more flexible and powerful systems.

Experiences of different institutions are varied. A major concern in the use of VLEs for summative e-assessment is that they are large, complex software and often simultaneously accessed by many individuals and groups of students from many different locations. VLE software (in 2005) is still relatively young and some systems are not as reliable or robust as may be reasonably expected. Successful use of VLEs for summative e-assessment delivery can involve timing assessments to the evening or weekends when normal usage is reduced, and specialists are on hand to monitor the systems. At the University of Dundee, the use of specialist e-assessment software (Questionmark Perception) has proved robust, flexible and cost effective. Undoubtedly more complex in system design, we find that the ability to run assessments at any time using robust and redundant systems justifies the additional setup and staff development costs.

Load testing on servers

Developers of e-assessment systems are aware that their systems will be utilised with large numbers of students in a complex networked environment. Designing and deploying systems to meet institutional needs is a complex and specialist task. Load testing is frequently difficult as mimicking the activities of (say) 200 students completing an interactive assessment over a busy network cannot be easily replicated. One important tip is that even the most highly specified system, composed of a load balanced array of the latest servers, may struggle to meet the demand of simultaneous access by large numbers of students. It is good practice to make instructors and students aware of this limitation. At Dundee, assessments are started (and therefore finished) within a window of 2 to 5 minutes that effectively spreads the server load and all participants receive fast responses from the server.
Emerging e-Assessment Techniques

Alongside what is now traditional e-assessment used for the delivery of online tests and examinations, are the developing areas of e-assessment which include online submission and marking, plagiarism detection, ePortfolio assessment and assessment of contributions to asynchronous and synchronous discussions. Developing policies in these fields will involve consultation with academic staff as they evaluate these assessment mechanisms and policies should also take into account accepted practice from published leaders in these fields.

A convention that Dundee aims to develop is that the online submission of student work is acknowledged immediately after the deadline, and that care is taken to ensure that the assessment outline are clear and the mechanism and location for delivery well understood.

A case study of e-assessment at the University of Dundee is available.

Practical Considerations

Practical considerations include having sufficient and sufficiently robust information technology systems available for students who are required to engage in e-assessment, as well as ensuring that students have sufficient access to the facilities. For security reasons it is important that summative assessments are not placed on part of the IT infrastructure where students can find them, and that results are posted securely. However, security is less of an issue when the assessment is purely formative.

Sim et al (2004) provide information about the British standard code of practice governing the use of information technology in the delivery of assessments (BS7988(2002) to which institutions should adhere. This code of practice for the use of information technology in the delivery of assessment recommends that students take a break after 1.5 hours. This has implications for invigilation of examinations.

Choosing a Software Package

The main considerations here will be in terms of cost efficacy, whether proprietary software has to be bought or whether software is available free or bundled with an institutional VLE/MLE. The amount of time required for developing the assessment items, including the programming that might be required will be an important consideration, as will the level of IT support required from the institution and locally within departments. The considerations, cost efficiency, time for development. A key issue will revolve around whether the assessment is to be formative, which can be conducted locally and probably requiring little in the way of backing, or whether it is summative requiring a large degree of institutional support to maintain quality assurance issues.

Security

Many versions of computer software for e-assessment allow for questions to be presented to students in a different order, and can provide the key and distracters in varying. If sufficient questions have been compiled of sufficient integrity then they can sit different tests, and for mathematically underpinned assessments, the programmes also provide the means to create, at little cost, variants of the same questions. All of this allows for students to sit in adjoining desks in computer laboratories that will at other times be used for other learning activities. This is fairly straightforward for on-campus students, but could be more problematic for students taking courses at a distance. However, Rovai (2000) suggests that this difficulty can be overcome by using 'proctored testing' where academics arrange for students to sit online assessments under test conditions in alternative venues. However, Sim et al (2004: 224) believe that:
'If security measures are in place there is no evidence to suggest that the integrity of the examination is more compromised by delivery over the Internet than by paper.'

**Accessibility**

When creating e–assessments that are to be as inclusive as possible, there are a variety of things to bear in mind:

1. **What pedagogical issues are there to consider?**

   1. Design for All (where this can be achieved while not reducing the overall effectiveness of the assessment for other students)

      ◇ Selection of mode of assessment and subsequent assessment design with accessibility in mind
      ◇ Should enrich the experience for all users, not increase accessibility for some by reducing experience for others
      ◇ Is not 'the lowest common denominator'
      ◇ Is not bland and anti–technology
      ◇ Basic principles are easy to apply
      ◇ e–Assessment (as an alternative to paper–based assessments) can benefit those with mobility difficulties, illnesses, mental health issues and so on

2. Think about alternatives of equivalence

   ◇ Not a case of when all else fails, thinking about possible alternatives will improve the whole assessment process
   ◇ Encourages lateral thinking about choice of mode of assessment and content
   ◇ Not 'only' for students with disabilities – all students have preferences, strengths and weaknesses
   ◇ Can be costly and time consuming, particularly in the short term, but can reap dividends later in terms of marking time and administration year after year
   ◇ Make use of student input to the design – nobody knows better what is achievable, what will aid the learning process and what will best improve the assessment experience

3. Validity

   ◇ Alternatives and modifications need to be authorised by the validating body – the exam board, university board or whatever. The degree of difficulty with this varies tremendously between boards, but most will be interested in facilitating the assessment process for the widest possible cohort of students

2. **What are the common mistakes?**

   Often we inadvertently assess things which are not a part of our stated outcomes, but instead are a function of the students' physical or social capabilities – we need to determine our policy on each of these prior to setting the assessment, and to communicate this policy to the students in time for them to make representations if they have issues with any of them:

   ◇ Speed of writing or typing are not normally an outcome of an assessment (except keyboard skills tests etc) – imagine a student with a very slow typing speed in an essay–style exam – what would be the best course of action to allow them to exhibit their knowledge? Sometimes extra time would be appropriate, sometimes the use of another input method such as voice or a scribe, and sometimes a completely different but equivalent mode of assessment
   ◇ We should determine prior to each assessment whether or not we are adding or deducting marks due to spelling and grammar. If this is the case, we need to
consider how we will view the work of dyslexic or blind students (for example, a blind student using voice input software will not know whether the programme has inserted the word 'court' or 'caught' – should we penalise a student for this?

Are we assessing manual dexterity? Should a student be marked down because they cannot pour liquid from one flask into another, despite knowing everything about the chemical reaction involved?

Are we assessing visual acuity? Auditory perception? Short−term memory? Physical endurance?

3. Where can I get further assistance on this subject?

The Teachability project is a resource booklet describing a step−by−step audit process towards making a course or module more inclusive for disabled students, including of course the consideration of assessment.

The Web Content Accessibility Guidelines (WCAG) published by the Web Accessibility Initiative (WAI) are a checklist for making web pages accessible (a full debate about the usefulness of 'pure' accessibility as against usability can also be found on the WAI website). Although they are oriented towards web pages they are extremely pertinent to any online materials and therefore to e−assessment.

4. Is there a simple 'checklist' of considerations I should make?

Not a definitive one, as every student and cohort of students will have different needs and every assessment and institution will necessarily be different. However, there are some considerations which may be considered to affect a greater proportion of students and therefore may merit the most immediate attention (NB This is not an excuse to forget about any other needs your students may have!)

− Navigation – can your assessment be completed without using a mouse? Can check boxes be checked using the keyboard alone? Are drop−down menus accessible using only the keyboard?

− Keyboard dexterity – do users need to be able to press more than one key simultaneously? If text is entered incorrectly or by accident, can the user backtrack and correct their actions? Are there alternatives for users who cannot access drag−and−drop features (NB there is often no need to remove drag−and−drop exercises because some students cannot access them, it is often far more beneficial to create alternatives)

− Audio content – are alternatives, transcripts or subtitles available?

− Language – is the assessment, particularly the instructions and navigation, clear and precise? Have you used 'trick' multiple−choice questions which use similarly spelled words as spoilers, which may confuse dyslexic students?

− Have you examined your images and graphics at high magnification to check they are still legible? Images of text in particular become pixelated at increased magnification, meaning they become illegible to vision impaired students.

− Does the layout make sense to screen reader users? Screen readers progress linearly through a page only if it has been coded to allow this, otherwise they dart about and can be very confusing. Tables in particular can be very difficult for screen reader users to cope with if badly designed. Read aloud your table row by row and see if the question is still achievable without having the table available visually. Do images and graphics have text tags or alternatives for students that cannot see them?

− Be careful with use of colour – do not use colour alone to convey meaning. Be sparing with bright colours – think of magnifier users who may view your pretty little lime green heading sixteen times larger than you imagined!

− Is it possible to give the student control over text size, font, and colour? If not, have you selected options that will be available to as many students as possible (sans−serif font, minimum 12 point font size, 1.5 line spacing etc)

− If you are not sure whether you have succeeded in making your assessment more inclusive and accessible, test it with students – but if you are seeking disabled
students to test your assessment with, please approach them via the student support staff, as they invariably get pulled in a number of directions at once!

Creating and Using e-Assessment

Being aware of the institutional and practical considerations is of course important, but the key issue to be resolved is that of creating the assessment tasks. As has already been mentioned, creating reliable and valid questions is a skilled task, and a lot more work is required from staff before the assessment is presented to students, especially when feedback is to be included for all of the incorrect answers in an objective test.

In common with all assessment, for e-assessment the assessment tasks should be aligned with the intended learning outcomes, so that students are able to display the extent to which they have met the outcomes for the course. Using the verbs from Bloom's taxonomy can help in the design of questions, using these to define the level of learning that are being tested.

Not all questions need to be written from scratch, and in the first instance it may prove useful to use tried and tested questions from other sources. Banks of objective questions are often associated with textbooks in further and higher education, and these can be used with permission from the academic publishers. Some of the subject centres of the Higher Education Academy (http://www.heacademy.ac.uk/474.htm) are developing question banks, using the expertise of academic colleagues in departments across the UK. Examples of question banks are provided in the links section.

Of course departments can choose to write questions themselves. Zakrzewski and Steven (2003) suggest that staff should create their own question banks and that they should generate an extra 10% of questions each year to allow for some questions to be removed or used less frequently. This is especially important as curricula change and develop. Gipps (2003) suggest that for cost effectiveness, staff should create question banks because: ‘the true costs involved mean that CAA is only really feasible for items that can be re-used’ Gipps (2003: 27). Questions should be created collaboratively and tested before being made available to students to alleviate the possibility of writing overly simple questions or questions with subtle nuances that students may inadvertently pick up (Clarke et al., 2004)

The COLA project (Sclater and MacDonald, 2004) developed a Word template to help staff with item creation for multiple choice tests, including metadata to describe the item, developing the methodology that had been used successfully by the e3an project.

McAlpine (2004) has outlined a methodology for determining whether tests that are currently administered on paper could be administered online. Initial results show that the methodology has potential for discriminating between tests that can be easily administered online, and assessment items for which more research is required in terms of the use of “emerging technologies”.

Assessment Questions

Leaving aside the other uses of IT in assessment, and concentrating instead on assessments for which the computer marks the student responses, there are a number of types of objective questions which can be used. There are three main types which include students making a choice (single or multiple) inputting text (words, numbers or formulae) or manipulating information on the screen (marking relevant areas, moving items or drawing graphs or diagrams).

Many tools exist, some of which are available in the resources section.

There are a number of question types for objective test type items, examples of which can be found for many subjects within the question banks listed in the links section. This list is taken from the
Multiple choice questions (MCQs) are the traditional 'choose one from a list' of possible answers.

True/False questions require a student to assess whether a statement is true or not.

Assertion–Reason questions combine elements of MCQ and true–false questions.

Multiple response questions (MRQs) are similar to MCQs, but involve the selection of more than one answer from a list.

Graphical hotspot questions involve selecting an area(s) of the screen, by moving a marker to the required position. Advanced types of hotspot questions include labelling and building questions.

Text/Numerical questions involve the input of text or numbers at the keyboard.

Matching questions involve linking items in one list to items in a second list.

Sore finger questions have been used in language teaching and computer programming, where one word, code or phrase is out of keeping with the rest of a passage (for example a word given in the wrong tense). It could be presented as a 'hot spot' or text input type of question.

Ranking questions require the student to relate items in a column to one another and can be used to test the knowledge of sequences, order of events, level of gradation.

Sequencing questions require the student to position text or graphic objects in a given sequence. These are particularly good for testing methodology.

Field simulation questions offer simulations of real problems or exercises.

Other question types require students to identify and/or manipulate images. Students may be asked to plot a graph, complete a matrix, draw a line or build up an image using parts provided.

For descriptions of each question type and hints on how to improve your skills in developing these types of questions visit the CAA Blueprint, especially appendix A.

There are some particular terms associated with creating objective tests questions that you will need to be aware of:

- Item – the units making an objective test. These may or may not be phrased directly as questions
- Stem – introductory question or incomplete statement with which an item begins
- Response, option – suggested answers to or completion of, the stem
- Key – the correct response
- Distracter – incorrect response (s)

Tips for writing questions (thanks to Bob Matthew of The University of Glasgow for these)

Stems should:

- be as clear and concise as possible
- not contain ambiguities
- contain most of the wording
- not be negative if possible

Responses should:
• be equally likely
• approximately the same length
• internally consistent
• in relative order

The key should be:

• in varied position
• correct

Avoid:

• double negatives
• 'none' or 'all' of the above
• clues

For further information about writing objective test questions the CAA Centre has produced a helpful document ‘Designing effective objective test questions: an introductory workshop’ which can be found at: CAA Centre.

Analysis and Quality Assurance

McKenna and Bull (2000) have provided some important quality assurance recommendations:

• Integrate the scheduling of computer–based tests into the timetabling for end–of–module examinations.
• Ensure the proper moderation of CAA examinations, as for traditional examinations.
• Consider appointing an additional external examiner with expertise in the construction and presentation of CAA.
• Incorporate feedback mechanisms which guide academic staff in the improvement of tests and systems.
• Ensure that staff have been offered and have attended the relevant staff development sessions.
• Develop a procedure which defines and checks that question banks have been supplemented with a percentage of new questions each year.
• Verify that piloting procedures and question analysis (to ensure reliability and validity) have been undertaken.
• Establish an upper limit on the amount of CAA examination per module. (For example, in order to encourage lecturers to offer a balanced assessment profile to students, the use of CAA might be capped at 40 per cent of the total module mark.)
• Agree standards (in terms of screen design, instructions within test, function of buttons) to guarantee consistency in presentation of tests thereby minimising student confusion.
• Integrate a programme of evaluation covering all aspects of the system

Following e–assessment it is important to determine whether the questions have been effective at discriminating between students and determining whether or not the questions have assessed what they were professed to be assessing. There are two measures that should be calculated for objective test questions, and these are often provided automatically by e–assessment software, the facility value and discrimination. The facility value is the fraction of students making a correct response to an item. Discrimination is how well an item discriminates between able and less able students, as measured by performance on the whole test.

Analysis of these statistics is important because alongside the examination results they can help academics determine which questions should be retained, and which should be altered or removed (Zakrzewski and Steven, 2003).
Feedback on the conduct of the test should be sought from the students and peers as well as from the external examiner, and the student performances should be evaluated to provide feedback on the teaching that has been occurring in the course. Johnstone (2003) suggests that a useful indicator is to look at changes in facility values. If the values are lower, then it probably relates to student ability, if the values are the same except for a particular topic then it's more likely to be related to the teaching.

Zakrzewski and Steven (2003) and McKenna and Bull (2000) suggest that effective and robust quality assurance procedures are required to successfully implement e-assessment for summative purposes.

**Interoperability and Reusability**

Many tutors have reservations about the time required to implement e-assessment and of its educational effectiveness. To address these concerns there has been considerable focus on the development and implementation of question banks (Bull and Dalziel, 2003). A question bank is a collection of questions that can be reused and shared across a learning community (usually within a particular subject discipline). Question banks allow users to contribute their own questions as well as reusing questions created by others tutors. This approach is useful for two main reasons. Firstly, there is concern over the effectiveness of CAA. This is because many of the questions are multiple choice and it can be difficult to draft MCQs that test students' understanding of particular concepts (as opposed to questions that jog memory recall) (Bull and McKenna, 1999). This requires both creativity and hard work before a question can be used effectively to measure students' learning (Haladyna, 1997). Therefore, reusing questions that have specifically been drafted to test students' understanding can help with this problem. Secondly, by sharing and reusing questions, tutors can benefit from economies of scale (Littlejohn, 2003).

The problem is how easy is it for you to reuse a question within your own VLE? Will this involve completely rewriting and restructuring the question? Until recently, the answer to this question has been 'yes': the reuse of question tests has simply not been worth the time invested in making a question reusable. Now, however, interoperability standards have been developed and implemented to allow questions to be easily transported from one VLE or e-assessment system to another without losing their structure. One such standard is IMS Question and Test Interoperability (QTI).

QTI is a framework for transferring assessment questions, tests and results from one VLE to another (Sclater and Cross, 2003). QTI has four main areas: the assessment tasks; the results after a test has been taken; the ordering of questions and tasks; and the processing of test scores (taking into account weighting factors, etc). This is useful for three main reasons. Firstly, it allows tutors to develop online assessments using a range of question types. Secondly, tutors can share assessment information across different e-assessment systems. Thirdly students' results can be sent to centralised, institutional student record systems.

A number of these test banks have already been set up. These include:

- **COLA** – a bank of items and assessments for Scottish Further Education (www.coleg.org.uk/ requires membership) and
- **Electronics and Electrical Engineering Assessment Network (e3an)** – a bank of peer-reviewed questions being reused across UK Higher Education
- **Universities Medical Assessment Partnership (UMAP)** – being developed between a consortium of Medical Schools in England

COLA Project Sclater and MacDonald (2004: 208) "The assessments had to work in a range of VLEs and it was expected that the VLEs would accept these item types if they were marked up using the IMS Questions and Test Interoperability v1.2 (QTI) specification (IMS, 2002)"
COLA Project Sclater and MacDonald (2004: 211) "It was necessary to develop a program to convert the items and assessments from the word templates to the QTI format. This task was carried out by the JISC–funded Technologies for Online Interoperable Assessment (TOIA) project which had the necessary expertise in QTI in collaboration with an expert group representing the four main VLEs"

**The Student Perspective**

Students react favourably to e−assessment. Newark and Sherwood College report that 'Staff have noticed that students are reacting increasingly positively to online, on−demand testing. The DfES key skills provision is popular with staff and students alike.' (Case Studies of Managed Learning Environments in Further Education, July 2005)

**Prior Practice**

Issues of prior practice are as important in CAA as they are with any assessment activities, with students being given the chance to have practice in, and learn from, assessment activities for which there will be a summative grade. Brosnan (1999) suggests that students who are confident in the use of computers as well as having had the prior experience of the test will perform better than other students. Zakrzewski and Steven (2003) stress the importance of providing student familiarity with tests prior to them taking tests for real, and students should be encouraged to become familiar with the machines and type of test questions for which they will be assessed (Hay and Bull, 2002). It is important that students are assessed on the subject matter and not on their ability to 'press buttons in the right order' (Thomas and Milligan, 2003).

**Feeding Back to Students**

Feedback to students is an issue of quality assurance and quality enhancement:

'Institutions should ensure that appropriate feedback is provided to students on assessed working a way that promotes learning and facilitates improvement' (QAA Code of Practice for the assurance of academic quality in higher education, section 6 May 2000)

The importance of feedback for student learning cannot be overstated (Gipps, 2003). Improving formative feedback has been shown to raise standards in assessment, a conclusion based on a review of over 250 papers from several countries by Black and Wiliam (1998). They have also shown that the giving of marks has a negative effect, as students ignore feedback comments when marks or grades are given. Clarke et al., (2004) have shown that formative assessment can reinforce the content of lectures and can 'act to cement students' understanding of key concepts and ideas' (Clarke et al., 2004: 259)

There is a lot of advice given about feedback, that it should be timely to be effective, that it should provide constructive information to help with learning, that it should be related to assessment criteria that are clearly understood by the students, and that it should make explicit to students what is required for high−quality work (Black et al 2002; Cowan, 2003; Sadler 1998).

Comments on student work are only useful as feedback if students can use them to help them improve in similar further work, and Black et al (2002: 10) say that: 'to be effective, feedback should cause thinking to take place'.

Feedback should be provided in a timely manner, the longer the gap between the assessment performance and the feedback on that assessment, the more that students are likely to treat the feedback as summative, as they have already moved on to new knowledge and new learning experiences.
The information provided to the student must be of use to them: ‘feedback functioned formatively only if the information fed back to the learner was used by the learner in improving performance’ (Black et al 2002: 14). Feedback should focus on what needs to be done, providing a motivation that improvement is possible, rather than focussing on ability, which can cause damage to self-esteem of low attainers.

For students to be able to make use of the feedback, they have to be able to understand and apply the assessment criteria to their work. Once they can do this, they should be able to start making assessments of their own performance and begin to manage their own learning. Sadler (1989) argued that assessment criteria do not in themselves help in judging performance, but that students have to be helped to interpret the criteria for any piece of assessed work. Involving students in peer assessment, where they actively engage in using the criteria is one way of helping students to understand them, and then apply them in their own work.

Analysis of the feedback that staff give to their students can reveal more about the nature of the assessment task. Black et al., (2002: 9) describe this, when talking about work with teachers in schools: ‘They found that some tasks were useful in revealing pupils' understandings and misunderstandings, but that others focussed mainly on conveying information’. From this analysis, the teachers decided to modify some of the activities, remove some and find others which assessed the outcomes that were intended for their pupils. In the same way staff in higher and further education can analyse their feedback comments to evaluate the assessment tasks that they construct for their students. In addition, they can use an analysis of their feedback comments to provide information about the teaching that has been happening, and the evaluation may show areas of misunderstandings across the student body that require further attention in teaching situations. An example from Liverpool John Moores University is provided in the section overview of e-assessment.

The SENLEF project (Student Enhanced Learning through Effective Feedback) has produced a very useful publication, 'Enhancing student learning though effective formative feedback' outlining why feedback is important and how staff and students can use feedback. The associated case studies provide many ideas that staff can use in improving the formative feedback to their students.

e-Assessment gives staff the capacity to provide feedback to students on their learning in a timely manner. By associating feedback with objective test questions students can readily appreciate where they have misunderstandings, and anecdotal evidence suggests that, when allowed to sit a test multiple times, they will check each of the incorrect answers to find out why they are incorrect and so enhance their learning even further.

Resources and Links

Resource Links

- Castle project
- Question mark
- SCAAN
- CAA Centre
- Medweb
- UK Centre for Legal Education
- Triads
- Bibliography on Computer Aided Assessment and Distance Learning
- IASSESS
- WebMCQ
- hot potatoes
- CETIS
- CAA Centre on objective testing
• Centre for Interactive Assessment Development at the University of Derby
• University of Dundee information about summative assessment
• Information about Computer Aided Assessment at the University of Edinburgh
• Formative assessment in Science Teaching (FAST)
• Electronic feedback system at Liverpool John Moores University
• Links to Sheffield Hallam University web site with case studies
• Links to IMS
• Online assessment and feedback (OLAAF)
• Scottish Centre for Research into Online Learning and Assessment (SCROLLA)
• TechDis/LTSN Forum for Computer–based Assessment and Accessibility
• Information at Robert Gordon University
• Information at The University of Edinburgh
• Information on assessment of English
• Project on Assessment in Scotland – using Information Technology – (PASS–IT) based at Heriot–Watt University
• Technologies for Online Interoperable Assessment (TOIA) an advanced online assessment management system available free of charge to all UK further and higher education institutions and based at the University of Strathclyde
• FERL Focus area on e–assessment

Some Question Banks [all accessed 22nd March 2004]

• Applied social surveys
• Business Education
• Economics
• Engineering
• Foreign languages
• History
• Medicine and Business Studies; Chemistry, Pharmaceutical and Biological Sciences; Mathematics
• Social Policy. Contact bob.rotheram@ntu.ac.uk (National Teaching Fellow)
• Veterinary Science
• Universities Medical Assessment Partnership

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http://www.cshe.unimelb.edu.au/assessinglearning

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