

Effective Use of VLEs: Designing for Sustainability

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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 focussing 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.

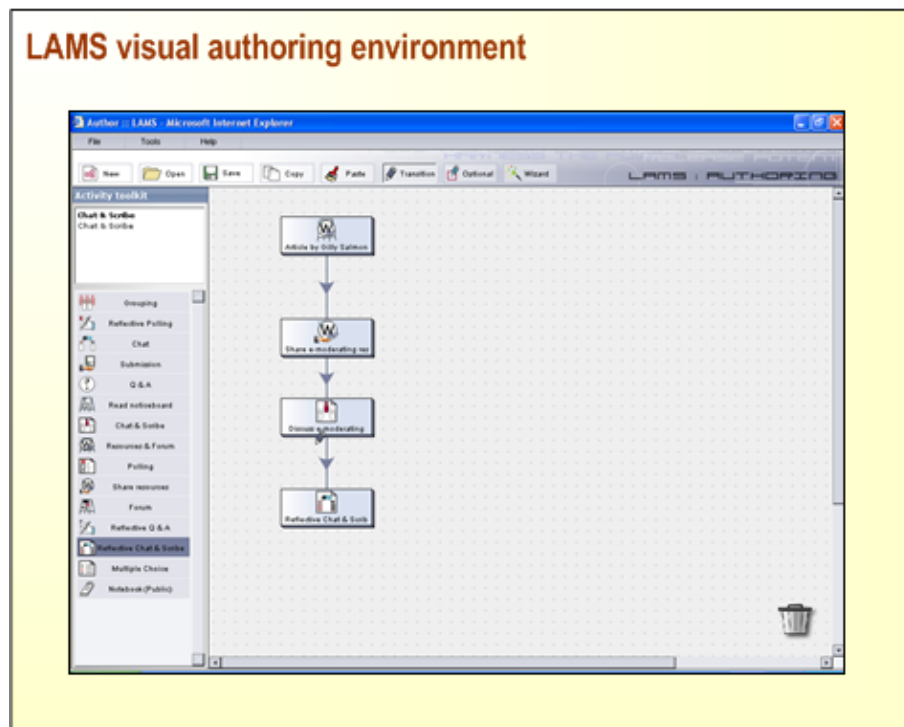
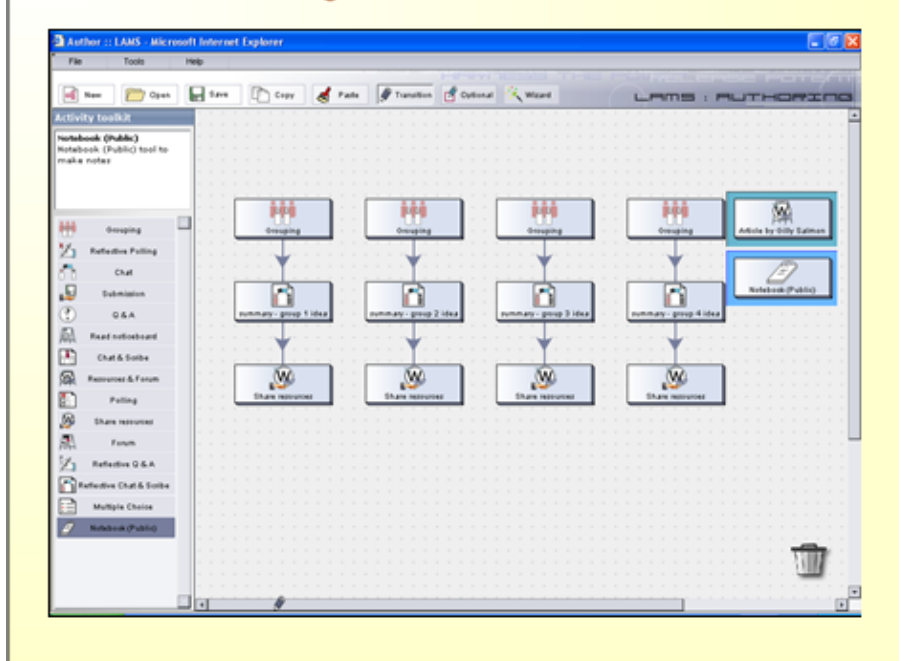


Figure 1a: The LAMS visual authoring environment (used with kind permission from James Dalziel and WebMCQ)

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).

LAMS visual authoring environment



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 likelihood 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.

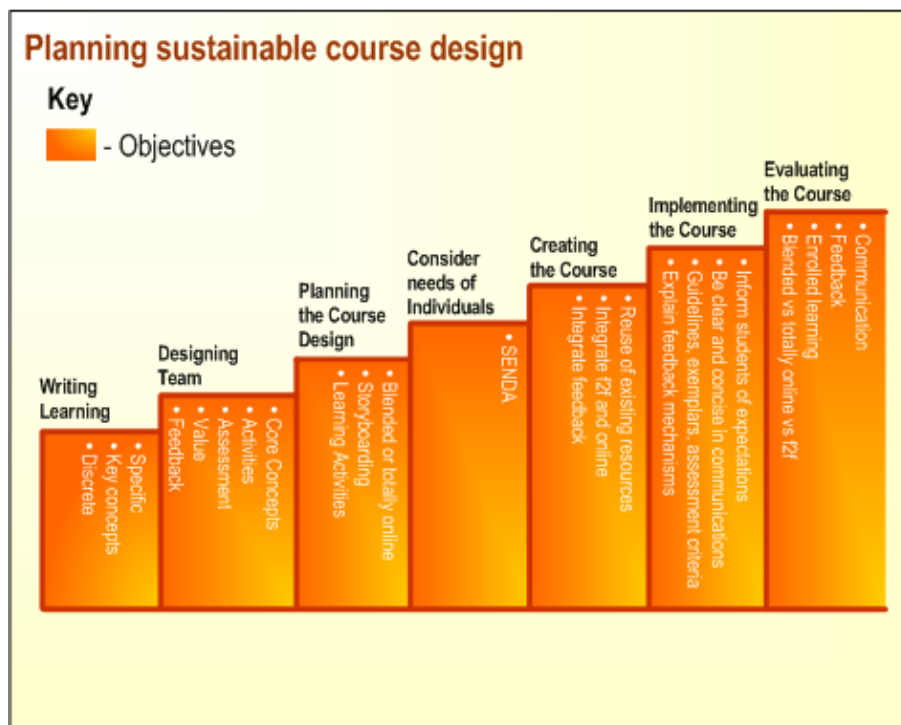
Learner diversity

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

the HE Academy website: <http://www.heacademy.ac.uk/1575.htm>.

The work on E-tivities by Gilly Salmon <http://www.e-tivities.com/home.asp> is also useful.

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.

There is a useful resource to help you at: [NSW Public Schools Website](#)

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

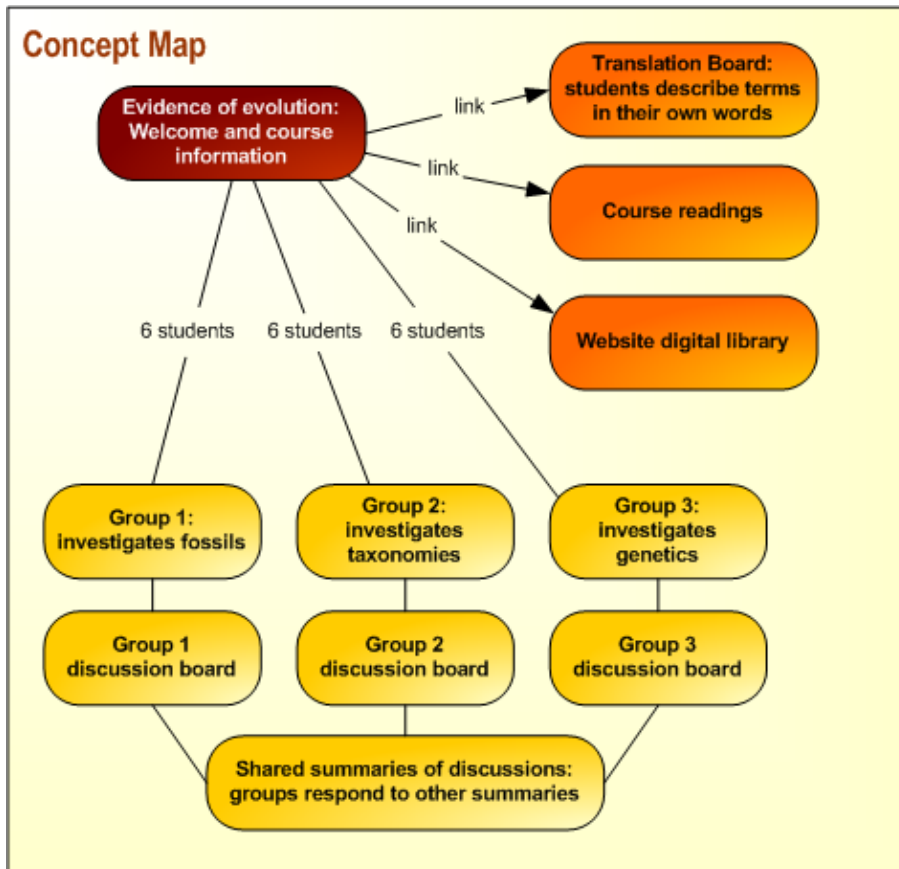
Using this approach, you would begin designing a course by thinking up a number of learning activities for your students – both online and face-to-face. The storyboard can be used to illustrate how these activities link with the learning resources and roles assigned to teachers and students. This involves 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).

	Tutor Activities	Student Activities	Resources	Feedback
--	------------------	--------------------	-----------	----------

FACE-TO-FACE	Divide students into four groups (in class). Introduce students to task 1 (in class);			
ONLINE	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.	'Evolution and Early Development' article Discussion Board for translation	Peer feedback on meanings of terms. Tutor encouragement and feedback when terminology is misunderstood.
FACE TO FACE	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.	Discussion board	Feedback from peers during group discussion
ONLINE	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.		Feedback from student groups to other groups. Overview from tutor – summary of main issues articulated by student groups.

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:

- Littlejohn, A.H. and Higgison, C. (2003), E-learning Guide for Teachers in Higher Education, Learning and Teaching Support Network Publications – [LTSN e-Learning Guide for Teachers](#)
- Littlejohn, A.H., (2003) An incremental approach to staff development in the reuse of learning resources, Chapter 17, Reusing Online Resources: A Sustainable Approach to e-Learning, (Ed. Littlejohn, A.), Kogan Page, London, pp 221–233 ISBN 0749439491
- 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>

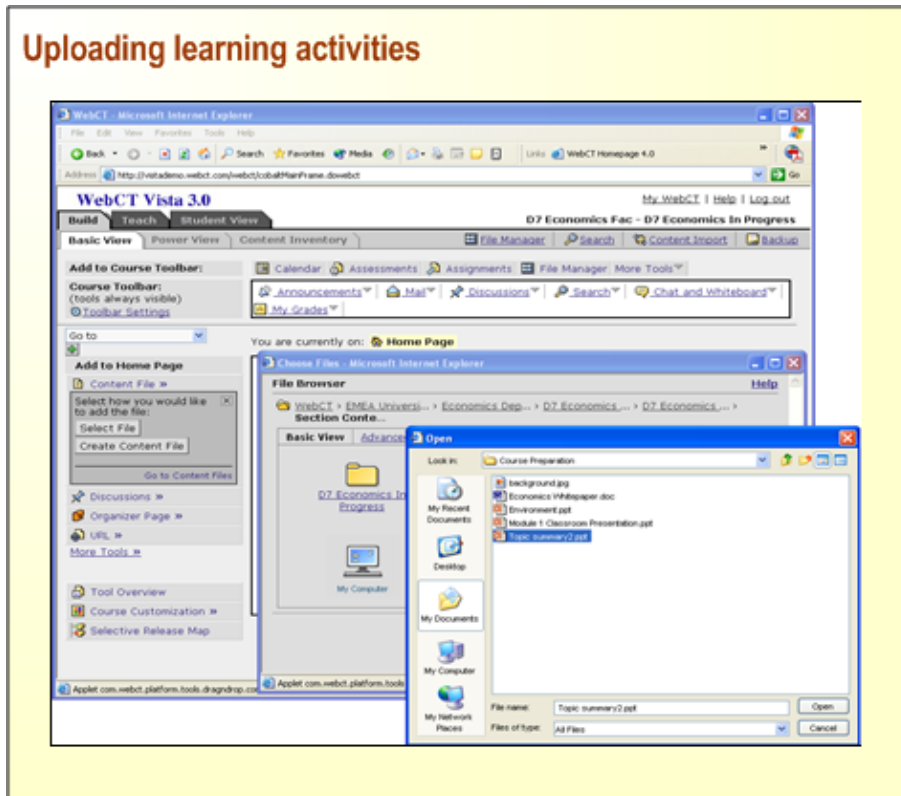
You can find out more about this topic in the section on [Special Educational Needs](#).

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:



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.

Creating a discussion thread

The screenshot shows the 'Create Discussion Topic' form in WebCT Vista 3.0. The form is titled 'D7 Economics Fac - D7 Economics Start'. It includes a 'Basic View' section with 'Discussions' and 'Create Discussion Topic' tabs. The 'Settings' section contains the following fields and options:

- Title:** Module 2 Review of group feedback - Gradable Discussion
- Description:** 1. In your groups, please meet and discuss your scenarios and then post a summary of your thoughts to this discussion topic. 2. Individually please review 2 other group postings and comment. Your comments will form part of this assignment grade.
- Topic is gradable:** (a column is automatically created for this topic in Grade Book)
 - Grade Book column title:** Group review
 - Numeric grade:** Out of 20
 - Alphanumeric grade:**
- Editable posts:** (allow Students to edit their messages in this topic after posting them)
- Locked:** (topic is in read-only mode)
- Anonymous:** (author names are not displayed)

The 'More Options' section includes:

- Category:** Topics can be organized into categories.
 - Do not place topic in category
 - Specify an existing category: - Select -
 - Create a category: Name: Module 2 Discussion, Description: Discussion threads for Module 2

Buttons for 'Save' and 'Cancel' are at the bottom, with a red asterisk indicating required fields.

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).

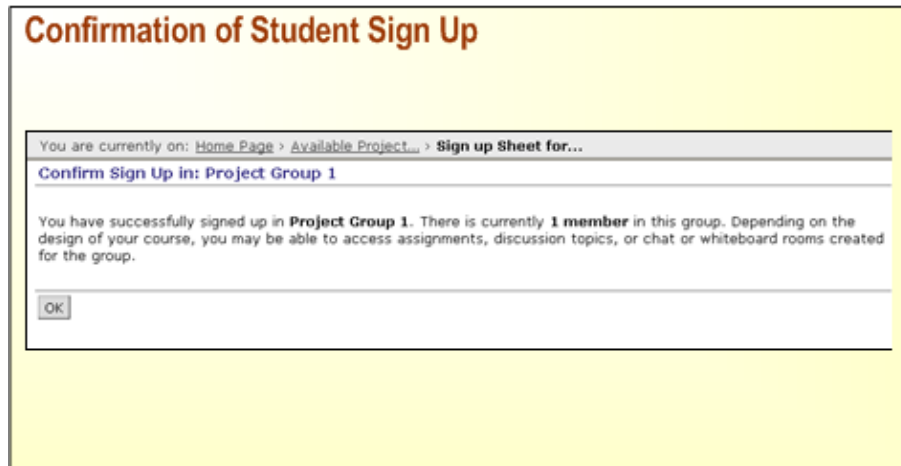
Creation of a Sign Up Sheet

The screenshot shows the 'Edit Sign-Up Sheet' form in WebCT Vista 3.0. The form is titled 'D7 Economics Fac - PBL Example'. It includes a 'Teach' section with 'Course View' and 'Edit Sign-Up Sheet' tabs. The 'Basic Settings' section contains the following fields and options:

- Sign-up sheet title:** Sign up Sheet for Proj
- Sign-up sheet instructions:** Please review the project introduction documents and then use this sign up sheet to enrol for Project Group you would like to work within. Each project has it's own work area and communication.
- Place the sign-up sheet link on:** Available Projects
- This is where the Students will go to choose the group they want to join.**
- Groups:**
 - Groups available on sign-up sheet:**
 1. Project Group 1
 2. Project Group 2
 3. Project Group 3
 4. Project Group 4
 - Create Additional Groups:**

Buttons for 'Save' and 'Cancel' are at the bottom, with a red asterisk indicating required fields.

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:

- Littlejohn, A.H. and Higgison, C. (2003), E-learning Guide for Teachers in Higher Education, Learning and Teaching Support Network Publications
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>
- GEsorce – Geography and Environment <http://www.gesorce.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>
- SCRAN – 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/copyrightcopenhagen.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. 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.

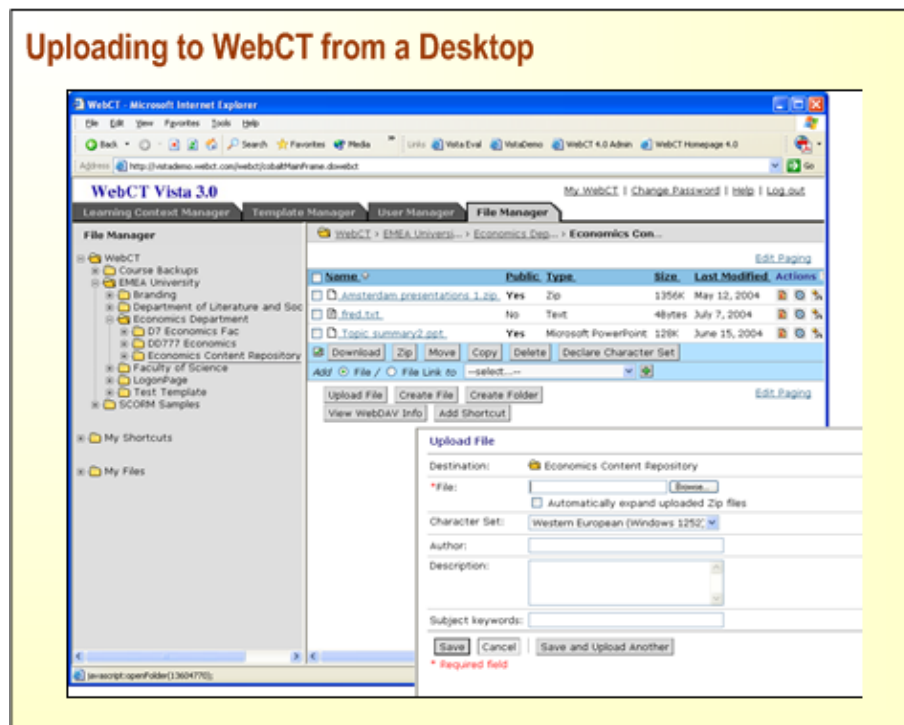
Digital Repositories

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.

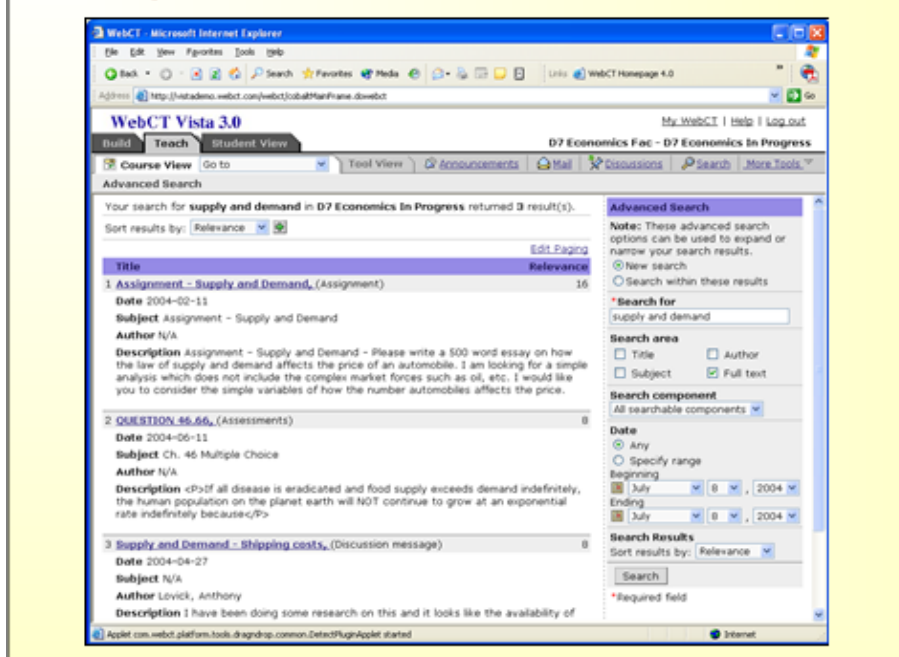
Some VLEs have integrated repositories that allow tutors easily to manage their learning resources. However if you have multiple VLEs in your institution or intend to change your VLE, then a digital repository independant of your VLE would be a good choice. You could upload your resources into a repository 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.



Learning resources contained within the database can quickly and easily be sourced by keying in search terms as shown in the following figure:

Searching for Resources in WebCT



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>) 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

- Casey, J. and McAlpine, M. (2002) Writing and Using Reusable Educational Materials: A Beginner's Guide. Available from [CETIS Educational Content Group Files](#).
- Calverley, G. (2002). Distributed Learning Project Guide: [Creating Reusable Materials](#).
- 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.

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LAMS: Learning Activity Management System

Learning Objectives Using Bloom's Taxonomy

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

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