

Virtual Learning Environments

Ros O'Leary and Andy Ramsden, University of Bristol
Edited by Dr Peter Davies, University of Staffordshire

1	Introduction	2
1.1	What is a VLE?	2
1.2	Features of VLEs	2
1.3	Why use VLEs in economics teaching?	3
2	Levels of VLE use	5
2.1	Posting course information and existing course materials	6
2.2	Including links to other online materials	7
2.3	Communication between students, lecturers and outside contributors	7
2.4	Providing a 'shell' for computer-assisted learning resources	7
2.5	Summative and self-assessment	10
2.6	Integrating online activities, support and materials with lectures and seminars	10
2.7	Collaborative student projects	11
2.8	Delivering complete online courses with fully integrated activities, e.g. distance learning courses	12
3	VLEs in practice	13
3.1	Getting started as an individual lecturer	13
3.2	Presentation of text, diagrams, pictures and mathematical notation	15
3.3	Maths notation, graphs and diagrams	15
3.4	Including material from other sources	17
3.5	IPR and copyright	17
3.6	Accessibility	17
4	Introducing a VLE into an economics department	19
4.1	Student management of learning	20
4.2	Staff support and training	21
4.3	Student support and training	21
4.4	Longer-term planning	21
	References	22

1 Introduction

1.1 What is a VLE?

Following the emergence of the internet in the early 1990s, many new tools and products have been developed to exploit its benefits fully. Since the mid-1990s the education community software products labelled Virtual Learning Environments (VLEs) have appeared with the aim of supporting learning and teaching activities across the internet. The Joint Information Systems Committee Managed Learning Environment Steering Group has said (JISC, 2001, para. 2) that VLEs refer to ‘the components in which learners and tutors participate in “online” interactions of various kinds, including online learning’.

The internet offers such potential benefits as flexible access and new ways of communicating and assessing for students and lecturers. However, for the lecturer, creating internet resources that are stimulating, appealing, easy to use and educationally sound is time consuming and requires considerable expertise. VLEs allow lecturers to create resources quickly and without the need to develop technical skills. Typically Web-based, VLEs provide an integrated set of internet tools, enable easy upload of materials and offer a consistent look and feel that can be customised by the user. Popular commercial VLEs currently being used in UK HE include Blackboard and WebCT. Such VLEs in UK HE are being used mainly to supplement or support existing programmes as opposed to delivering complete online courses.

1.2 Features of VLEs

The tools and features that comprise a VLE typically include the following:

- *Communication between tutors and students* – e.g. e-mail, discussion board and virtual chat facilities, which support various types of communication: synchronous and asynchronous, one-to-one, one-to-many and many-to-many.
- *Self-assessment and summative assessment* – e.g. multiple-choice assessment with automated marking and immediate feedback.
- *Delivery of learning resources and materials* – e.g. through the provision of lecture notes and supporting materials, images and video clips, links to other Web resources, online discussion and assessment activities.
- *Shared work group areas* – allows designated groups of students to upload and share files as well as communicate with each other.
- *Support for students* – could take the form of communication with tutors or other students, provision of supporting materials such as course information and Frequently Asked Questions (FAQs).
- *Management and tracking of students* – e.g. usernames and passwords to ensure that only registered students can access the course; analysis of assessment undertaken by students or their use of materials within the VLE.
- *Student tools* – e.g. individual student webpages, ‘drop boxes’ for the upload of coursework, electronic diaries and calendars.

- *Consistent and customisable look and feel* – a standard user interface that is easy for students to understand and use. Courses can be individualised with colours, graphics and logos, but the essential mode of use remains constant.
- *Navigation structure* – structured delivery of information supported by a standard navigation toolbar. Most VLE software assumes that students will work their way through linear sequences of instructional material. Others are more flexible and will accommodate alternative information structures, e.g. multi-path case studies.

1.3 Why use VLEs in economics teaching?

‘Every learner can, at his or her own choice of time and place, access a world of multimedia material ... immediately the learner is unlocked from the shackles of fixed and rigid schedules, from physical limitations ...and is released into an information world which reacts to his or her own pace of learning.’

Benjamin, 1994, p. 49

Economics courses in higher education, in common with other subjects, have witnessed many changes in recent years, including bigger class sizes, less resources and an increasingly diverse set of students (Reynolds, 2000). In addition to catering for overseas students from an increasing range of countries, economics courses are more likely than previously to be enrolling students who are mature, studying part time or possessing qualifications other than traditional A-levels. These students all have differing backgrounds, skill sets and preferences for the way they learn. Additionally, students increasingly expect to use new and current technologies in their studies. In this changing educational landscape, VLEs can offer economics students and lecturers some support with flexible and widening access to materials and resources. This has particular advantages for students who are studying on a part-time basis.

Engaging and motivating economics students can also be a challenge. VLEs can help pull together up-to-date, interesting and interactive electronic resources as well as additional supporting materials – for example, for maths and study skills. VLEs can open up opportunities for new ways of learning and communicating, and can support collaborative learning and independent learning. For example, some economics lecturers have found, particularly with first-year students, that the VLE can help establish a community more quickly and ‘integrate’ students into the institution. However, the advantages of using VLEs need to be weighed against the disadvantages and these are summarised in Table 1.

Table 1 Advantages and disadvantages of using VLEs in teaching economics	
Advantages	Disadvantages
<p>Easy online delivery of materials. VLEs provide a 'shell' for a course or programme, allowing you to:</p> <ul style="list-style-type: none"> • publish existing documents and presentations easily; • link to online sources of data, news services, records and publications; • link to online resources such as simulations and tutorials. 	<ul style="list-style-type: none"> • VLEs can become a 'dumping ground' for materials not designed to be delivered online. • If materials are not integrated or linked in any way to face-to-face teaching, they may not be used properly, or at all. • Issues of copyright and IPR of materials need to be considered.
<p>They are easy to use for both students and lecturers.</p>	<ul style="list-style-type: none"> • VLEs may be relatively easy to use, but generally the software is still in its infancy. You could be frustrated by limitations of presenting or integrating materials. • You also have to bear in mind that standards which will allow you to take content from one VLE to another are still emerging.
<p>They widen student access on and off campus to learning materials and resources. Students should be able to access these resources at any time, in any place.</p>	<ul style="list-style-type: none"> • On- and off-campus access to hardware, networks and printing facilities can be problematic for both students and lecturers, and raises issues of equality. • Disability legislation and accessibility to online materials also need to be considered.
<p>They offer the potential of supporting large groups of students. Economies of scale can be gained, for example, by producing one set of online materials that can be used and updated each year, and assessing students online (Pollock <i>et al.</i>, 2000, para. 1).</p>	<p>Populating a VLE with material and assessment questions is a front-loaded activity and requires considerable effort and time in the short run.</p>
<p>They offer flexible support for lecturers, who do not need to be in a fixed time or place to support and communicate with students.</p>	<p>Lecturers need to plan online support carefully to avoid overload.</p>
<p>They offer new ways of learning and teaching, such as collaborative projects involving students at a distance. They can also support active and independent learning, where students are actively involved with studying ideas, solving problems and applying what they learn (Silberman, 1996, p. ix), whilst taking a greater responsibility for their own learning.</p>	<p>Such independent learning still needs to be guided and supported. Appropriate training and ongoing support is still needed for both students and lecturers.</p>

2.1 Posting course information and existing course materials

A straightforward and convenient way for lecturers to ensure that students have access whenever they want to course handbooks, reading lists, lecture slides, handouts, assignment details and marks is to make these available through a VLE. Materials can be periodically uploaded into the VLE, which acts as a course archive.

Figure 2 illustrates how an economics lecturer uses a VLE to make material available. The use of a well-designed folder structure allows material to be organised for all students or specific groups. For instance, information for all students is available (first-term essays), and instructions for presentations have been organised by student group (John, Paul, George and Ringo).

The use of the VLE also shifts the cost of paper-based distribution to the student. Students will normally download materials and view them offline. Student access to the VLE and adequate printing facilities are important success factors. However, simply using the VLE as an electronic filing cabinet may not enhance ‘the students’ total learning experience’ (Ramsay, 2000, p. 70). Ramsay evaluates the effectiveness of a website used to support a second-year undergraduate course in economics. He highlights the need to be selective in what is included within a VLE course and be clear about the aim of including the material.

VLEs also have ‘noticeboard’ or announcement facilities. Whenever students log into the VLE they will automatically receive the latest announcements. This makes communicating course administrative arrangements more flexible, especially for part-time and working students.

TOP TIPS

The use of VLEs for announcements will be effective only if all students regularly use and log on to the VLE. If this is not the case, use the e-mail facility in the VLE to e-mail different groups of students. The students will then receive the e-mails in their normal e-mail inboxes.

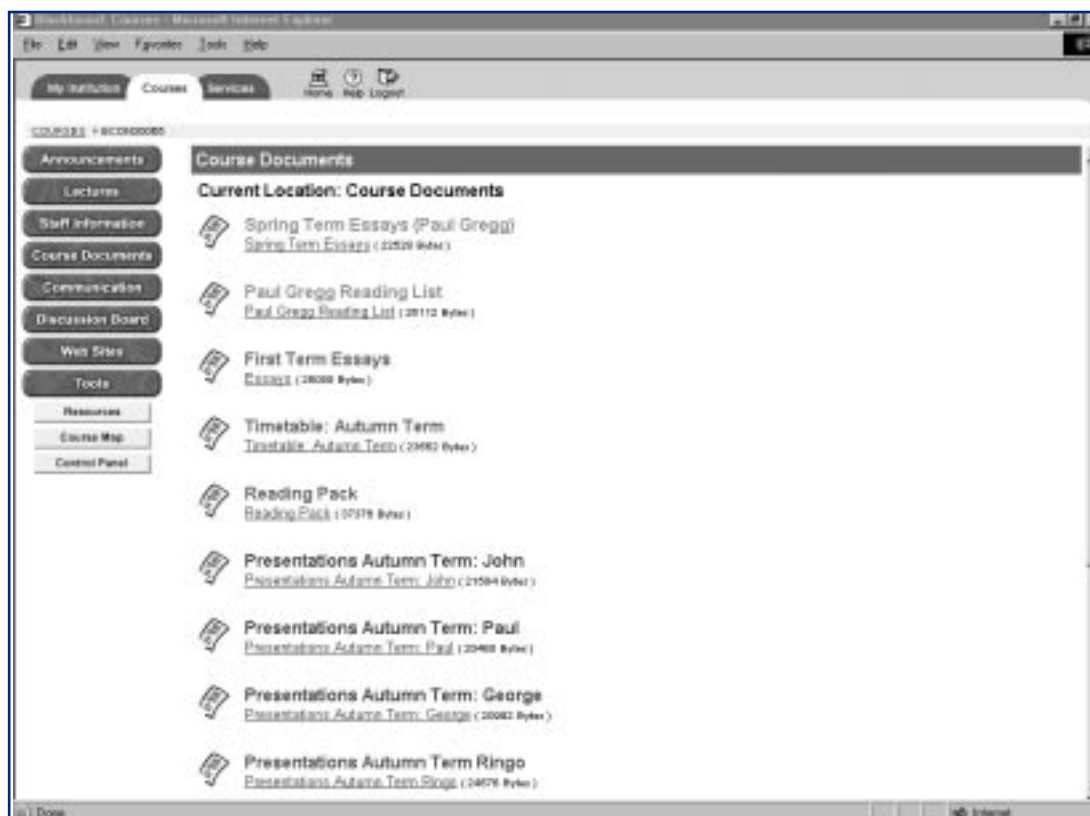


Figure 2 An example of posting up course information and materials

2.2 Including links to other online materials

TOP TIPS

Introduce students to the free online tutorial Internet Economist <http://www.economics.ltsn.ac.uk/interneteconomist/> to ensure they have the tools and techniques to search the internet and can effectively critique economics Web resources when they find them. Internet Economist also introduces users to some of the main Web resources relevant to economists. These include primary resources, news services, software, economics data, job notices, gateways and library catalogues, research, contacts and learning and teaching materials. Use the 'Links to resources' section of the Economics LTSN website at <http://www.economics.ltsn.ac.uk/links.htm> to explore Web resources relevant to economics and suitable for teaching. These resources are broken down by specific topic areas.

Given the wealth of up-to-date material and data on the Web relevant to economics, this facility is particularly useful in encouraging students to tap into current material, read around their subject and develop research skills. Lecturers can post links to enable students to prepare for lectures and tutorials, and to support students' research into topics connected to project work and essays. Students can also post links on certain topics or assigned sources either via the lecturer, or on to their own webpages within the VLE, or via a discussion board. This is an excellent way of encouraging students' research skills and creating new resources that can be used elsewhere.

2.3 Communication between students, lecturers and outside contributors

Communication tools usually include noticeboards, discussion boards with the facility to share files, virtual chat and e-mail. Setting up a discussion board for a whole course can cut down on the total number of questions from individual students. Answers to one student's question are posted to the discussion board for all to see. This has the potential to encourage peer support, although it is important to set ground rules and to consider how to moderate the board.

TOP TIPS

Through the discussion board, set a series of short stimulus questions for students - for instance, 'In which of the following industries is collusion likely to occur: bricks, beer, magazines, crisps, washing powder, or blank video tapes? Explain your answer.'

Using discussion boards for particular topics can encourage students to reflect more on their contributions as well as providing an electronic record of contributions. Figure 3 is an extract from a discussion by two students in the third year of their economics degree. Note the number of times each message has been read (there are 126 students on this course), suggesting that other students are also using this record of a discussion as a resource.

However, student motivation to use a discussion board is not necessarily high (Salmon, 2001). Methods to increase participation include embedding a discussion board into activities or course, linking discussion board postings to assessment and limiting the lifespan of a discussion board activity.

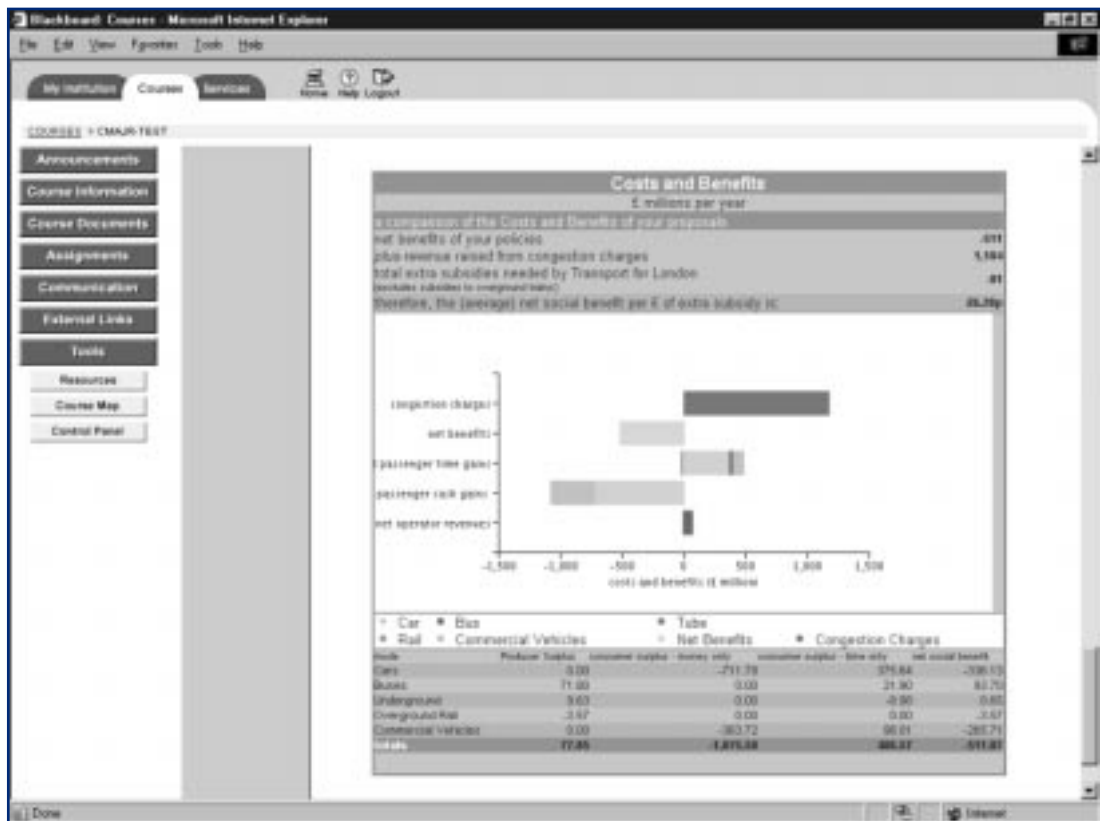
2.4 Providing a 'shell' for computer-assisted learning resources

A whole range of interactive economics material, simulations and models exist freely on the Web. A benefit of VLEs is that they allow you to embed computer-assisted learning programs such as simulations or interactive tutorials into the course site, which provides a ready-made structure for the materials. These can be supplemented with online quizzes and other supporting material.

For example, set students an assignment to identify the most appropriate policy to reduce the negative externalities caused by road congestion. You can incorporate a transport model for London developed by the Institute of Fiscal Studies in association with Biz/ed through the

<p>Current Forum: Economic and Monetary Union Read 52 times Date: Tue Apr 23 2002 11:37 am Author: Student A Subject: IS-LM and interest parity condition</p> <p>Am very confused.</p> <p>The IS-LM diagrams we went thro in lectures for open economy implied, for example, that an increase in money demand would create a budget surplus raising the interest rate above the international rate, and thus lead to a currency appreciation shifting the IS curve to bring back to LR equilibrium.</p> <p>HOWEVER! The interest parity condition states that in an open economy, an interest rate above the world parity should lead speculators to expect a currency DEPRECIATION, not appreciation. How exactly can these 2 things be reconciled?</p>
<p>Current Forum: Economic and Monetary Union Read 46 times Date: Tue Apr 23 2002 7:15 pm Author: Student B Subject: Re: IS-LM and interest parity condition</p> <p>in an open economy, an interest rate above the world parity > should lead speculators to expect a currency DEPRECIATION, > not appreciation.</p> <p>I think...</p> <p>The key point here is that the change leads speculators to EXPECT a currency depreciation which results in them buying that currency NOW, which causes its price to rise, now.</p>
<p>Current Forum: Economic and Monetary Union Read 46 times Date: Wed Apr 24 2002 10:20 am Author: Student A Subject: Re: IS-LM and interest parity condition</p> <p>That doesn't make sense though, if you expect something to fall in value, of course you stop buying it, and sell the currency you already hold in order to guard from losing value on that too. No? I thought that was something of an 'unwritten law' of speculation, if you expect something to happen, then your actions will make it happen. If I'm wrong this may be where I'm confused....?!</p>
<p>Current Forum: Economic and Monetary Union Read 46 times Date: Wed Apr 24 2002 11:48 am Author: Student B Subject: Re: IS-LM and interest parity condition</p> <p>Hmm, sorry, I think I misunderstood your question – it's more involved than I realised – so: I don't know! (That'll show me for trying to be all clever!)</p>
<p>Current Forum: Economic and Monetary Union Read 39 times Date: Thu Apr 25 2002 12:49 pm Author: Student A Subject: Re: IS-LM and interest parity condition</p> <p>Think I've got it, and you were sort of right, I think. I was confusing expected and current ERs. My problem is reconciled by the fact that if, for example, the Dollar ER rises above the German ER, TODAY the American ER will appreciate (thus shifting the IS curve and returning the US to the equilibrium rate of return).</p> <p>This is because the interest parity condition states however that this appreciation TODAY will involve a greater depreciation (than before the ER change) in the American ER, or appreciation in the German ER, over the next year assuming that the EXPECTED ER in a year's time remains constant. This will effectively equalise the rate of return on assets held in the US and in Germany. Got this from the Krugman text book so it better be right!</p>

Figure 3 A discussion board being used in a third-year economics course



Source: 'The Virtual Learning Arcade, externalities: road congestion', <http://www.bized.ac.uk/virtual/vla/>

Figure 4 Example of incorporating computer-assisted learning resources

Virtual Arcade, <http://www.bized.ac.uk/virtual/vla> (see Figure 4). Ask them to run the road congestion model with their own variables, justify their decisions and evaluate their results, posting up their analyses on a discussion board.

Resources that illustrate the potential for incorporating freely available computer-assisted learning for economics in a VLE are:

- *Prisoners' Dilemma*. This 9-minute video introduces the prisoners' dilemma using slides and commentary. It is in ASX streaming format, which requires Windows Media Player. Netscape may have difficulties in reading the video stream, even if you have Media Player installed. <http://www.unn.ac.uk/~egkh1/mchoice/mchoice.htm>
- *Interactive Graphs*. A suite of interactive tools where you type numbers into a model and/or move a point on an axis and see the results on a graph and numerically. Topics include consumer behaviour, production isoquants, price elasticity, the Solow growth model and the spending multiplier. <http://www.digitaleconomist.com/>
- *Audio/Visual Lectures*. These audio/visual lectures, dating from 1997, are delivered through a combination of PowerPoint slides and RealAudio. Topics include economic growth, the business cycle and non-equilibrium economics. <http://www.biz.uiowa.edu/class/6E002/audio/index.html>
- *The Virtual Economy*. A detailed model of the UK economy, based on the HM Treasury model, which puts you in the position of Chancellor, showing you the macro- and microeconomic consequences of your budgets. Users can choose to alter a limited number of variables, or the full set. As well as very professional design and presentation, the site offers background material on macroeconomic theory. <http://www.bized.ac.uk/virtual/>

- *Assessing national welfare.* The focus of this interactive site is the comparison between GDP and welfare. It allows the user to select and balance several factors to produce a customised indicator. Java is used to plot a graph of this indicator over the second half of the twentieth century, with a plot of GDP for comparison. This page is part of the 'Measuring progress' section of the site, which has some background material and illustrative examples. http://www.foe.co.uk/campaigns/sustainable_development/progress/make-own.html

TOP TIPS

Use the 'Interactive materials' section of the Economics LTSN website at <http://www.economics.ltsn.ac.uk/links/interact.htm> to find a selection of simulations and online tutorials that you can integrate into your VLE.

2.5 Summative and self-assessment

VLEs allow the creation of question databanks that can then be used to generate self-assessment quizzes and end-of-term exams. The standard types of question include multiple choice, multiple answer, true/false, matching and ranking. Figure 5 presents a sample question from a self-assessment test on the business cycle. This example illustrates how images can be incorporated into test questions. It is also possible to set essay questions and arrange for students' answers to be automatically sent electronically to the tutor for marking.

VLEs incorporate the facility to feed back on responses and direct students to links and other resources. Regular and meaningful feedback is recognised as improving student motivation as well as providing students with information about how they can improve; Laurillard (1993, pp. 61–8) argues that feedback is essential if the learner is to succeed. All test results in VLEs are automatically analysed by student, by test and by question, and can be easily exported to Excel for further analysis. This is very helpful for diagnostic purposes and can save time in the long run when used with large groups of students (Pollock *et al.*, 2000). Pollock *et al.* also conclude that writing questions suitable for higher-order learning is a time-consuming activity that requires considerable skill.

TOP TIPS

A good way of getting students involved and encouraging their own self-directed learning is the use of self-assessment with feedback. For instance, try setting regular quizzes that are linked to set texts to encourage students to engage with the learning materials. Visit Economics LTSN's question bank resource at: <http://www.economics.ltsn.ac.uk/qnbank.htm>. In return for submitting some of your own questions, you can that get access to a whole databank of questions categorised by level, subject and question type, which you will be free to use or customise for your own assessment. You can also find here a comprehensive database of online economics tests and exams.

2.6 Integrating online activities, support and materials with lectures and seminars

Lectures can be followed up through online tutorials that end with self-assessment, perhaps with an emphasis on topics that students find problematic. Additional support to address problems could be provided via a discussion board. For example, set an assignment integrated into your seminar programme. Ask each student to make a macroeconomic assessment of a particular country, sharing their initial plans prior to a seminar, to be discussed at the seminar. Following feedback from peers and you, the students can then go on to create an electronic resource to complete the assessment, which can be presented at a follow-up seminar. Students could be asked to evaluate others' resources.



Figure 5 An example of using a VLE for assessment

2.7 Collaborative student projects

The tutor can use a VLE to set up a task and to answer students' questions about this task. Students may then use communications tools to work on the task together, share files and post their own pages. Usually there is also a facility to put students into groups with access to their own discussion board and virtual or real-time chat facilities. This opens up the potential for collaborative projects and communications between different groups of learners.

TOP TIPS

Use the discussion board to run a role-play activity. For example, split students into five groups: developing countries, the USA, the EU, environmental groups and the WTO. Ask them to prepare a press release within their group in response to a change in US steel tariffs. Ask them to attach this press release and supporting resources to a whole-group discussion board. You can follow this up with a verbal report from each group in a seminar. Figure 6 is an example of this exercise. In this case it has been run as a real-time activity and as an icebreaker and introduction to working in this way online.

Clements and Smalley (2000) attempted to facilitate student-centred learning through the development of group-to-group and student-to-student interaction using a VLE. Although their general findings were positive, they concluded that it was important to retain opportunities for face-to-face interaction between the tutor and students and between the students. They also inferred from their experience that variations in the design of VLE activities had a significant impact on their effectiveness.

<p>Current Forum: USA Read 11 times Date: Tue Jul 2 2002 12:41 pm Author: Student 1 Subject: justification for high tariffs It is necessary at this time, given the problems with the domestic economy, that we protect our industrial production. Do we need to find some justification for this or can we simply rely on our enormous strength and power in the world economy? (Remember these discussions are internal and must not be leaked!)</p>
<p>Current Forum: USA Read 10 times Date: Tue Jul 2 2002 12:43 pm Author: Student 3 Subject: Re: Retaliation What do we do if the rest of the world retaliates? What is the probability that Europe will join in tit-for-tat?</p>
<p>Current Forum: USA Read 6 times Date: Tue Jul 2 2002 12:45 pm Author: Student 4 Subject: Re: Retaliation Who cares? We're richer than they are.</p>
<p>Current Forum: USA Read 5 times Date: Tue Jul 2 2002 12:48 pm Author: Student 1 Subject: Re: Retaliation We may be richer than they are, but can we really afford to alienate our European allies? Also can we afford to actually damage their economies?</p>
<p>Current Forum: USA Read 5 times Date: Tue Jul 2 2002 12:48 pm Author: Student 2 Subject: Re: Retaliation We can withdraw military aid; threaten to flood the world with cheap food; cause instability in the Middle East and cause oil prices to rise in Europe ...</p>

Figure 6 Using group discussion boards for a collaborative project

2.8 Delivering complete online courses with fully integrated activities, e.g. distance learning courses

A VLE can be used to present all course materials and as the sole medium for communication between tutor and students, self-assessment, monitoring of progress, and submission and return of assignments. Communication and feedback are integrated with content delivery through the activities posted on the VLE. The argument for using a VLE in this comprehensive fashion is that it gives more control to learners and that this will, in turn, enhance learning:

One of the advantages of learning online is that, by putting students in control, it places the onus on them to actively engage in tasks. They must do the searching, make the decisions, interact with the multimedia, contribute to the conferences and solve problems. Such things should not be done for them when they operate in the online environment.

Lander, 1997, para. 6

Making students feel part of a community in a completely online course will be important to its success. Ice-breaking activities can be used to allow students to get to know each other in small groups. For example, you could ask them to introduce themselves briefly via a discussion board,

TOP TIPS

Make students' involvement in the course active. Get them communicating with each other, creating resources and assessment, and evaluating.

explaining their reasons for choosing the course and their particular interest in economics. They can discuss and agree ground rules for using the VLE, particularly the discussion board. A useful approach for communicating effectively via VLEs is outlined by Salmon (2001). Salmon defines e-moderators as the generation of educators who work with learners online and provides a user's guide to working effectively in an online environment and the skill set that the educator is likely to need.

3 VLEs in practice

This section deals with some practicalities of getting started with VLEs. This includes a case study of getting started as an individual lecturer together with issues of presenting material, copyright and accessibility.

3.1 Getting started as an individual lecturer

If you are relatively new to this area, you may wish to consider the following practical tips to help you get started:

- *Find out what support and resources* are available to you in your institution and economics department and communicate your plans in order to benefit from existing practice or expertise. You may also wish to contact Economics LTSN for further advice.
- *Explore other people's courses* to get a better feel for the potential of using a VLE. You may need to request guest access. See the 'Showcase' section on Economics LTSN website: <http://www.economics.ltsn.ac.uk/showcase/welcome.htm>.
- *Start with a small, manageable project.* This could be just posting up some materials or resources or developing one online activity.

Plan your VLE activity or resource, including:

- *The aim* of your activity and the intended learning outcomes for your students.
- *How the activity will integrate* into the rest of the course, e.g. how it links to other activities or face-to-face sessions.
- *How students will be directed* through the activity, e.g. a linear set of elements within an activity or an open research-based task.
- *The timescale of the activity.* What time period and how many learning hours?
- *Assessment.* How will students be motivated to do the activity? Will it be assessed? If so, how?

- *Evaluation.* How will you know whether your activity has been successful and effective? You need to plan for evaluation. See the LTDI Evaluation *Cookbook* (1999).
- *Test out your course as a student.* Arrange to enrol yourself or a colleague as a test student on your course. This is extremely useful for experimenting with the technology and ironing out any glitches before exposing the course to your students.

Case study: Using WebCT in teaching economics Guglielmo Volpe, University of North London

WebCT is a popular commercial software product that supports learning and teaching on the internet. I've been using it for 2 years now. During this time my practice has evolved from a passive, simple way of distributing course materials and course administration, to a more active one of providing various computer-assisted learning resources and self-assessment tests for my students. Recently I have started using WebCT for conducting virtual tutorials. I post questions and problems on the Web and students send me their individual answers. Students were very positive about it. Many of our students are part-time workers, so they are not always able to attend the face-to-face seminars. The freedom to participate at their own time in the virtual tutorial is very helpful to them. Students have spoken highly of the opportunity for creating their own sites and the possibility of communicating among themselves and with the teaching team, which WebCT provides them. That means that in the future it could also be used as a platform for students' group work.

I have been using WebCT for all my courses: Introduction to Macroeconomics in year 1, Business Economics in year 2 and Economic Growth in year 3. Lecture notes, seminar problems (with solutions) and past exam papers are available for downloading on all modules. The Macroeconomics module allows students to access multiple-choice questions to test their level of knowledge. Links to helpful websites are available on all three websites. The virtual seminar is used in particular by the Business Economics and Economic Growth students to submit their case studies analysis. I am considering scrapping the seminar hour in the final-year module and supporting students only via the virtual seminar. This will give me and the students greater flexibility in the management of our time.

The use of WebCT has benefited all the students, but I think first-year students found it most useful. They were impressed by its possibilities and tried to use it more often than other students. It has also helped them to get better integrated into university life by being able to interact with other students on the module even if (due to work or other commitments) they can spend less time at university. The students appreciate the lecturer's effort and develop a feeling of gratitude for being looked after and cared for in a professional way.

Unfortunately I wasn't able to use WebCT for conducting exams. Though its facilities allow students to submit their work online, university regulations make it impossible, as all the work must be personally delivered to the assessment unit. Besides, posting students' end-of-semester results also contravenes university exam regulations.

My personal experience with WebCT has been positive. However, if you are planning to use it you must be aware of some costs you will experience. You will need to dedicate time to learn the various features available in WebCT, to keep the site regularly updated and to check on a regular basis whether students have posted any queries or work. In general, your way of interacting with students will change and will require some adjustment on your part. However, you will soon come to realise that the benefits will outweigh the costs.

TOP TIPS

Keep the course relevant: on a monthly basis, in an appropriate place, upload a page of links to online news items from The Economist (<http://www.economist.com>), or the Financial Times (<http://www.FT.com>) and add relevant questions.

Find out students' views: if the VLE you use has a survey tool, develop a set of online surveys that can explore students' views on your online course, and create an online version of your end-of-year module assessment questionnaire.

3.2 Presentation of text, diagrams, pictures and mathematical notation

Most VLEs allow you to upload different file formats (such as HTML files, Word documents, PowerPoint slide shows, and image and multimedia files). Generally VLEs are Web-based applications that require a Web browser to access them. Therefore, the degree of accessibility is greatest with HTML documents, as the user can manipulate the presentation through the Web browser and accessibility is improved through assistive technologies. Consequently, TechDis (2002a) give the same guidelines to accessing learning materials in a VLE as for designing webpages (W3C Web Accessibility Initiative). Figure 7 provides advice on presenting material within a VLE to increase readability and accessibility in most file formats.

<p>Text</p> <ul style="list-style-type: none"> • Avoid large blocks of text. • Avoid large blocks of italics, underlining or capitals. • Avoid blinking or animated text. • It is good practice to provide a text only version. 	<p>Multimedia files</p> <ul style="list-style-type: none"> • Always provide an alternative format. • Provide a text transcript of key information.
<p>Colour</p> <ul style="list-style-type: none"> • Use a solid background colour. • Have sufficient contrast between the text and background. • Do not use colours on their own to convey meaning. 	<p>Document structure</p> <ul style="list-style-type: none"> • Use the document structure/style provided. For instance, in Microsoft Word use the Heading tags, or in HTML use H1, H2, etc., instead of using specific font sizes.
<p>Links</p> <ul style="list-style-type: none"> • Try to avoid a large number of links – keep to fewer than ten per page. • Separate lists of links with some punctuation. • Make links meaningful to read – don't simply write 'click here'. • Don't have links as only coloured images – include a text alternative. 	<p>Document layout</p> <ul style="list-style-type: none"> • It is good practice to adopt sound usability standards throughout your learning materials – for instance, consistent design, clear navigation and if you are providing a text-only version, a clear link at the start of your material.
<p>Images</p> <ul style="list-style-type: none"> • Use them discerningly. • Include an alt tag or text description. • Include a long description if the image/graph is important to achieve a desired learning outcome. 	<p>PowerPoint slide shows</p> <ul style="list-style-type: none"> • Provide an alternative HTML version or copy the content from the outline view and edit this in the HTML editor. • Make sure that there are text descriptions of images.

Figure 7 Guidance on presentation in a VLE

3.3 Maths notation, graphs and diagrams

The dependency of most VLEs on Web browsers means it can be difficult to incorporate mathematical notation, graphs and charts that are essential to economics learning and teaching.

Mathematical notation

The complexity of the equation and the context in which it will be used will determine the best method of including it within the VLE. The three main techniques available to incorporate maths notation into a VLE are:

- mark up with HTML code;
- write the equation in another package, save it as an image file and upload;
- save as a Word document/PDF and upload (Poulter 2001).

These options are described in Figure 8.

HTML

Mark-up in HTML may be appropriate for the inclusion of an equation of simple structure and may be used in free text or as part of a computer-assisted assessment question. For instance, a Cobb–Douglas equation ($Q = f(K^\mu L^{1-\mu})$) can be marked up in HTML as:

```
<p>Q=&#131;(K<sup><fontface="symbol">m</font></sup>L<sup>1-  
<fontface="symbol">m</font></sup></p>
```

Image file

If you are including more complicated structures in the text or as part of a question, such as in a definition of the equi-marginal principle:

$$\frac{MU_n}{P_n}$$

then a more effective approach compared to HTML mark-up is to create the equation using a dedicated software program and then save the equation as an image (in gif or jpg format). You can then import the image into the VLE. There are good Web sources of existing mathematical notation in gif format that you can use and build the required mathematical notation: see <http://www.economics.ltsn.ac.uk/advice/htmlmaths.htm>

Word document/PDF

If you are developing a very complicated set of mathematical notations that include text, tables or images and it needs to remain properly formatted – for instance, if you want to include the proof of a maximum-profit output level – then the most appropriate approach is to create the complete document in Microsoft Word or as a PDF file and upload into the VLE.

Figure 8 Options for incorporating mathematical notation into a VLE

At present, problems with these methods, particularly with image files and Word documents/PDFs, create difficulties for the accessibility of files. However, future developments are likely to reduce the problems, as more complex mathematical notation can be marked up in HTML using the mathematical Markup Language (MathML). The difficulty at the moment is that the standards are only starting to be developed, and not all current Web browser technology is able to display MathML. Some VLE vendors have developed plug-ins that will allow mathematical notation and equations to be displayed in the VLE. This is evident with the release of a Maths Equation Editor as a Blackboard Building Block.

Charts and diagrams

VLEs are suited to the presentation of charts and diagrams, such as UK unemployment figures since 1979 or an IS/LM/BP model. It is relatively straightforward to create a chart or an image using a piece of specialised software, save the chart or diagram as an image file (gif or jpg) and then upload it into the VLE. Many VLEs will allow you to embed multimedia elements into your pages. These will increase the level of interaction between the student and the learning material. Examples include drag-and-drop supply and demand diagrams created in Macromedia Flash or Java Applets. You could reproduce similar interactive material through the use of a spreadsheet. For example, you could enhance a student's understanding of the consumption function through creating an Excel worksheet that includes the raw data, a plot of the raw data and input boxes for the autonomous consumption (AC) and the marginal propensity to

consume (*MPC*) value. When you access the file through a VLE (e.g. Blackboard) it will allow the student to enter different values for the *AC* and *MPC* and observe the outcomes.

3.4 Including material from other sources

A VLE is a means of delivering electronic content on and off campus to registered or unregistered users. This electronic content varies in type, from Word documents, PDFs and image files to interactive learning objects, audio files and animation. However, the general principle holds that if you are using any material in your course that is developed by a third party, you need permission from the author or publisher.

The following examples illustrate situations where you need permission and those where, if you meet certain conditions, you can use the resource without written permission. For instance, if you wished to use an extract from Sloman's *Economics* (Sloman, 2000), you would need permission from the publisher, in this case Pearson Education Ltd. However, if you wish to use material from the Economics LTSN website as part of an online tutorial, you are free to do so without written permission, as long as you meet the criteria set out in the copyright statement – that is, your use is educational and non-profit making and you acknowledge material appropriately.

It is wise to seek advice from a relevant person in your institution to clarify the requirements on copyright clearance. You may find that your institution has paid for copyright clearance on specific publications, journals and electronic journals. When you include third-party material in your VLE course, it is good practice to acknowledge the source appropriately and if possible include a disclaimer statement. This statement should make reference to the efforts you have made to clear copyright, apologise if some work is not been cleared and include your contact details.

3.5 IPR and copyright

The implications of intellectual property rights (IPR) for the VLE course developer will depend on the source of the material. An individual who writes original material for a VLE owns the intellectual property rights unless this is deemed a normal function of their employment, in which case the IPR will belong to the employer. This general rule was established by both the 1977 Patents Act and the 1988 Copyright Act. The holder of the IPR has exclusive rights to exploit the product commercially for a limited period. The rights can be sold, licensed or otherwise disposed of by the rights holder.

There are different types of intellectual property and protection methods. The most appropriate for an online course is generally copyright. Copyright exists to encourage the production of original artistic, literary and musical works. The copyright system rewards artistic expression by allowing the creator to benefit commercially from the work. It is worth contacting the relevant department concerning IPR to confirm this situation and see if you need to include any copyright statement. You should also be aware that, if you change institutions and wish to use the same teaching material that was developed previously, you may not be able to do this. However, many institutions will take this issue on a case-by-case basis.

3.6 Accessibility

The Special Educational Needs and Disability Act (2001) came into effect in September 2002. This legislation reinforces the need to design educational material (including VLEs) that is accessible by all. It is important that VLE courses provide an inclusive learning environment. A wide range of disabilities, including visually impairment, blindness, colour visual difficulties,

dyslexia, cognitive-perceptual difficulties, hearing impairment, deafness, mobility difficulties and mental health difficulties, have the potential for reducing accessibility to a VLE.

In principle, the issues arising in the preparation of paper-based material transfer into the VLE. The claim of vendors of VLEs is that these accessibility issues are the responsibility of the content developer. 'Blackboard is a delivery system of content, it passes along content but doesn't change the format of the content it delivers. If Institutions choose to deliver in a format that is inaccessible then all the efforts of Blackboard and the assistive technology companies is lost' (quoted in Doyle, 2001).

After you have developed your learning material, you may wish to gauge the degree to which it is accessible. If the material is in HTML, the following checklist from TechDis (2002b) is applicable:

- Validate your material. There are a number of Web-based tools that can provide valuable information on potential accessibility problems. Available validators include Bobby from the Centre for Applied Special Technology (CAST) and the W3C HTML Validator.
- View the material in a text browser.
- Browse your site through a speech browser.
- View the material under alternative conditions – for instance, turn off the graphics on your Web browser or try to navigate without using the mouse.

If using a commercial VLE, you can identify how your particular VLE rates in terms of accessibility by viewing its website. A good summary with appropriate links is supplied by TechDis (2002a).

Where is the VLE being accessed?

Accessibility is greatly influenced by the speed of the user's internet connection and this will be influenced by the location at which the VLE is being accessed. The lower the speed, the longer the waiting times for the material and the more likely that the material will become inaccessible. It might, for instance, take 40 minutes to download a PowerPoint slide show. For this reason it is wise to include word-processed text as an alternative to PowerPoint presentations. If the intended audience for your VLE course is likely to access the material on campus, then the accessibility is likely to be high. In other words, files will instantaneously appear because the institution is likely to have the appropriate IT infrastructure. However, if the VLE is being accessed off campus – for instance, at home, in the workplace or abroad – the internet connection may depend on low-specification technology (56K modems, etc.) and the level of accessibility will be low.

The question of where your audience will access the VLE and what type of material you wish to distribute will have a strong influence on the content. Generally, you will need to design material that has a relatively small file size but which still meets the desired learning objectives. Alternatively, you may seek different methods of delivering the material. For instance, Blackboard allows the user to access offline content. Therefore, it may be more efficient to distribute larger multimedia-style material on a CD and combine this with supporting online material.

4 Introducing a VLE into an economics department

Case study: Using Blackboard across an economics department

Kate Boardman and Tony Antoniou, University of Durham

Prior to the implementation of Blackboard, the Department of Economics and Finance at the University of Durham was already using C&IT. A large amount of teaching material was maintained on internal webpages, and e-mail lists were commonly used to communicate with students. One member of staff routinely updated the intranet on behalf of the other academics. After discussions within the department, it was decided that resources for all modules would be provided via Blackboard for the academic year 2000/1. The impact (and expected advantages) of using the learning environment would then be evaluated after a year's use. As a result, all 35 modules offered within the department have a course area in Blackboard, and students were directed to the learning environment from the beginning of the year.

The diversity of features used within Blackboard by the different modules is evident from an evaluation questionnaire. In May 2001, 15 members of staff in Economics answered an evaluation questionnaire. Two-thirds of the respondents had completed basic training, and all had used the basic features and facilities to add module handbooks, course information, lecture materials and essay/assignment details. Almost all used the communication features, announcements and e-mail. Some staff added staff information, interactive bibliographies and some external links.

Most staff appear convinced of the overall ease of use of Blackboard, and its ability to save time and enhance their teaching in the longer term.

The problems that were encountered can be interpreted as concerning the speed of adoption. For instance, the time available for training during term was a potential problem. Although most staff members have attended at least one basic training session, not all have enrolled on more advanced training courses. In addition, the review of features used showed in the initial period the exclusion of discussion boards, online assessment or surveys, and electronic submission via the digital drop box.

The development model included the head of department taking a key role through providing a 'good practice' course that other staff members could use when developing their courses. This included basic skills, such as guides for students on how to reduce printing costs and hints on how to use learning environments to present different types of seminar and lecture material. In addition, all academic staff and library representatives contributed to special courses at the first and second year level, which supported key skill training, enhanced core competences and developing research skills.

During April 2001, students were given an evaluation questionnaire about their use of Blackboard and what effect they thought it had on their learning. 131 economics students responded. Many of the questions were specific to the software, and the way it is being used locally, but the following statistics may be of wider interest:

- 93 per cent of students professed themselves confident in using the learning environment after fewer than five visits.
- 76 per cent of students claimed to having accessed the VLE from home during university vacation.

- 46 per cent of students said they logged on to the VLE at least several times a week.
- 51 per cent of students said that using the VLE had made a very good or excellent contribution to their learning.

The results from the students in both economics and finance and across the campus are overwhelmingly positive; but suggest that students' expectations have been raised rapidly by the provision they have received this year.

Conclusions from the case study

The above case study of the experiences of the Department of Economics and Finance at the University of Durham illustrates some key findings that are likely to hold true for other departments and are useful to bear in mind:

- The staff found the VLE easy to use and the students approved of its use to support face-to-face courses.
- Teaching material that was originally created elsewhere by the author was moved to the Blackboard course.
- A large number of innovative uses of the VLE were employed, from content delivery to communication tools.
- Staff had gained enough confidence from the experience to want to develop their courses further in forthcoming academic years.

Other factors in motivating departments to consider implementation of VLEs include the following:

- *Supporting common ways of working for students.* For instance, students who start on a first-year undergraduate course often have different ways of working. The use of the VLE can support a common way of working as well as adding variety through the addition of an online dimension for the student in their learning.
- *Maintaining coherence and standards across programmes and the department.* Consistency in the use of technology can reduce inefficiency caused by staff and students having to continually learn new systems to access learning material. Staff can gain and share both technological and pedagogical expertise, and may find it easier supporting or teaching on courses developed by other department members.
- *Reducing duplication of common and core materials.* The reduction of duplication can be achieved through creating links between courses. For instance, the department could create courses that contained information on the student handbook, health and safety, departmental notices or examination regulations. Each individual academic course would link into these generic courses as opposed to duplicating the material within them. This model could be further developed with the sharing of material, self-paced key skills exercises or question banks that may be applicable to more than one course.

The remainder of this section briefly reviews some important factors to take into account when rolling out VLE support for all courses within a department.

4.1 Student management of learning

The inclusion of all courses within the department and the appropriate use of the features of a VLE, such as e-mail, tasks, calendar and announcement facilities, can improve student awareness of course administration by delivering information and material in a concise format

to one place. Simplifying this process can empower students to prioritise their workload and increase their degree of self-directed learning.

4.2 Staff support and training

The use of a VLE to support face-to-face teaching may be a significant cultural shift within a department, and will raise difficult questions with respect to the practice in, and conceptions of, learning and teaching. Therefore, the departmental adoption of the VLE will need senior management support and some degree of involvement from all staff.

Staff training and recognition of the opportunity cost of this training time will be important. The training should cover both the technological aspects of how to use the VLE and the pedagogical aspects of good practice in delivering online learning that is mapped to the curriculum learning objectives. The department and staff also need to be clear about legal requirements, such as IPR and copyright (see section 3.5).

4.3 Student support and training

It is important to remember that students are important stakeholders in the use of VLE-supported courses. The case study from the University of Durham suggests that the students were happy with the VLE courses as complements to face-to-face teaching, and used the VLE regularly and from different locations. However, there are some key concerns for students: for instance, initial training in the use of the VLE, potential costs of printing and accessibility. The last two points are covered in other sections. In the initial period the students will need training or advice on accessing the course, especially first-year students who will be new to the system. This will increase the burden on staff at the start of term and to improve efficiency it may be worth designating certain staff to this role. It is important to remember the likely different proficiency and attitude to information technology.

4.4 Longer-term planning

The department might pilot the use of a VLE with a specific cohort such as all first-year students. In this case, these first-year students will expect further use of VLEs in subsequent years. As a department you will also need to be aware of the issues of keeping VLE material year on year and 'recycling' courses.

References

Benjamin, A. (1994) 'Affordable, restructured education: a solution through information technology', *RSA Journal*, May.

Clements, M. and Smalley, M. (2000) 'Opportunities to enhance the student learning experience using a Virtual Learning Environment', in P. Davies, S. Hodgkinson and P. Reynolds (eds), *Innovative Approaches to Learning and Teaching in Economics and Business Higher Education*, Staffordshire University Press, Stoke on Trent.

Cook, J. (1999) *Virtual Learning Environments: Making the Web Easy to Use for Teachers and Learners*, University of Bristol. Available from: <http://www.ltss.bris.ac.uk/guides.htm>.

Davies, P., Hodgkinson, S. and Reynolds, P. (2000) (eds) *Innovative Approaches to Learning and Teaching in Economics and Business Higher Education*, Staffordshire University Press, Stoke on Trent.

Doyle, C. (2001) *Making Your Module Accessible in Blackboard 5.5*, University of Wales Institute. Available from: http://www.uwic.ac.uk/ltsu/5min_guide_module_accessible.htm.

Joint Information Systems Committee Managed Learning Environment Steering Group (2001) *Briefing Paper No. 1: MLEs and VLEs Explained*, JISC. Available from: <http://www.jisc.ac.uk/mle/rep/briefings/bp1.html>.

Lander, D. (1997) *Online Teaching: Educational Considerations*, Royal Melbourne Institute of Technology. Available from: <http://homepages.eu.rmit.edu.au/resdl/teaching3.html>.

Laurillard, D. (1993) *Rethinking University Teaching*, Routledge, London.

Learning Technology Dissemination Initiative (1999) *Evaluation Cookbook*, LTDI. Available from: <http://www.icbl.hw.ac.uk/ltidi/ltidi-pub.htm>.

Mason, R. (1998) 'Models of online courses', *ALN Magazine*, vol. 2, no. 2. Available from: http://www.aln.org/alnweb/magazine/vol2_issue2/Masonfinal.htm.

Pollock, M. J., Whittington, C. D. and Doughty, G. F. (2000) 'Evaluating the costs and benefits of changing to computer-assisted assessment', paper presented at the Fourth International Computer Assisted Assessment Conference, Loughborough University, June. Online proceedings: <http://www.caaconference.com/>.

Poulter, M. (2001) *Designing for Disabled Users: Principles and Pitfalls of Web Site Accessibility*, University of Bristol, LTSS Interact 22. Available from: <http://www.ltss.bris.ac.uk/interact22/in22p10.htm>.

Ramsay, J. (2000) 'Learning from the Web', in P. Davies, S. Hodgkinson and P. Reynolds (eds), *Innovative Approaches to Learning and Teaching in Economics and Business Higher Education*, Staffordshire University Press, Stoke on Trent.

Reynolds, P. (2000) 'Introduction', in P. Davies, S. Hodgkinson and P. Reynolds (eds), *Innovative Approaches to Learning and Teaching in Economics and Business Higher Education*, Staffordshire University Press, Stoke on Trent.

Salmon, G. (2001) *E-Moderating: The Key to Teaching and Learning Online*, Kogan Page, London.

Silberman, M. (1996). *Active Learning: 101 Strategies to Teach any Subject*, Allyn and Bacon, Needham Heights, MA.

Slovan, J. (2000) *Economics*, 4th edn, Pearson Education, London.

TechDis (2002a) Cann, C., Ball, S. and Sutherland, A., *Towards Accessible Virtual Learning Environments*, TechDis. Available from: <http://www.techdis.ac.uk/resources/VLE001.html>.

TechDis (2002b), originally by Sloan, D., *How to Judge a Website's Accessibility Level*, TechDis. Available from: <http://www.techdis.ac.uk/resources/dsloan01.html>.

Websites

Blackboard: <http://www.blackboard.com/>

WebCT: <http://www.webct.com/>

Validators: Bobby from the Centre for Applied Special Technology (CAST):
<http://www.cast.org/bobby>

W3C HTML Validator: <http://validator.w3.org/>

Useful e-mail discussion groups can be found at: <http://www.jiscmail.ac.uk/>, including:

Blackboard-Usergroup@Jiscmail.ac.uk

Webct-Uk@Jiscmail.ac.uk

Jisc-MLE@Jiscmail.ac.uk

LTSN centres: <http://www.ltsn.ac.uk/>

LTSN Economics: <http://www.economics.ltsn.ac.uk>

Biz/ed: <http://www.bized.ac.uk>

Acknowledgements

The authors wish to acknowledge the Association of Learning Technology and the Learning and Teaching Support Network Generic Centre for the use of the Virtual Learning Environments guide written by Ros O'Leary:

<http://www.ltsn.ac.uk/genericcentre/projects/elearning/docs/VLEL.pdf>