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Evaluating the development of virtual learning environments in higher and further education

Abstract

Discusses some of the reasons why use of Virtual Learning Environments (VLEs) sometimes sticks at an initial stage of implementation. The paper is based on the findings from the JISC-funded JUSTEIS project on the monitoring of user behaviour with electronic information services in further and higher education in the UK. Qualitative analysis of interview data from over 550 students and over 50 academic staff (2001-2003) showed that individualization of learning was important to students. Many staff were unclear about the learning benefits of VLEs, and functions such as peer-peer group support and group learning were rarely used. Concludes that institutional strategies for VLE development need to be focused far more on disciplinary learning needs and priorities.

Introduction

Many higher and further education institutions are implementing Managed or Virtual Learning Environment (MLE/VLE) software, a UK survey in 2002 (Social Informatics Research Unit, 2002) indicating that 70% of institutions were currently engaged in some kind of MLE development activity, and that 83% already used some type of VLE. As part of the UK JISC framework for the Monitoring and Evaluation of User Behaviour, the JUSTEIS project at the University of Wales Aberystwyth (JUSTEIS project, 2004) has (in collaboration with the companion JUBILEE project at the University of Northumbria) investigated how the implementation of VLEs may be affecting students' learning and their use of electronic information services. This paper presents the results of the in-depth analysis of two years of data collection for JUSTEIS (2001-2003) on the use of VLEs, both in-house and commercial. One observation in 2002 was that there seemed to be a 'problem plateau' in the development of MLE/VLEs among the institutions surveyed for JUSTEIS, echoing the observation of the Social Informatics Research Unit survey (conducted in August 2002) (Social Informatics Research Unit, 2003) that MLE development did not seem to be embedded in strategic frameworks. Further investigations in 2003 indicated the scale of the problem, possible reasons why some departments (and institutions) fail to progress, and

some possible solutions. The main objectives of the paper are to examine student perceptions of learning with VLEs, academic staff opinions of the benefits (or not) of VLEs, and views on VLE implementation and development policies.

Background

The recommendations of the Dearing Report (National Committee of Inquiry into Higher Education (chaired by Ron Dearing), 1997) advocated more effective use of communications and information technology, to provide flexibility of time and place for learning. This was an important goal given the need for higher education to cope with the increased student numbers planned. The report also advocated student-centred learning, and decreasing the administrative burden on staff. MLEs offer functions that integrate the student record with the VLE, thus integrating the learning with the record in a structured framework to provide student-centred learning, and streamlining administration. The VLE is, however, the key learning and teaching part of the MLE. A report by JTAP (Britain & Liber, 1999) discusses appropriate frameworks for pedagogical evaluation of VLEs. The report compares a conversational framework (Laurillard, 1993) with a viable systems model (VSM) based on Stafford Beer's work in management cybernetics (Beer, 1981). The research concluded that the conversational framework is suited to examination of the interactions between student and teacher, while the viable systems model is useful for considering the management of groups of learners. The conversational framework envisages the workflow actions as:

- Teacher presents/re-describes conception
- Student presents/re-describes conception
- Teacher sets up micro-world activities
- Student interacts with micro-world activities
- System provides feedback on the action
- Student modifies actions in light of feedback

Using a conversational framework to examine the effectiveness of the VLE requires assessment of the tools available for each of those workflow actions, as well as the ease with which each of those actions can be structured.

The VSM model takes much wider perspective, a course or organizational perspective on the evaluation of VLEs. The communication channels may be viewed as those concerned with resource negotiation, co-ordination and monitoring. The framework for evaluation considers:

- Resource negotiation (how do learners negotiate their learning contracts with the teacher?)
- Co-ordination (can learners collaborate in creating their learning and how is exploitation avoided?)
- Monitoring (how does the teacher monitor whether learning is happening and how can remedial action be taken?
- Individualization (how easily can the student find their own resources and work independently, and can they contribute their discoveries to the group?
- Self-organization (can the learners organize themselves as a group, using the tools or space available?)

- Adaptation (can the teacher adapt the course in light of experience gained during operations)

The VSM model questions may be applied at course level or at organization level, but the types of answers obtained will be different. As Britain and Liber point out in the JTAP report, traditional formal lecturing in any one institution assumes that students following a course can be treated as similar. Styles of learning support which do not make this assumption, such as seminars, tutorials and group project work, are harder to manage with larger student cohorts and fewer staff to resource these forms of teaching.

Scaling up from a VLE to an MLE is likely to be a major organizational change. How that change is to be cultivated will vary, and another JISC report (Boys, 2002) examines the various approaches that may be used:

- Comprehensive (explicitly integrated with other policy and implementation developments)
- Additive (series of sequential components towards joined-up systems
- Parallel (MLE development run in parallel with other initiatives)
- Autonomous (MLE project concentrated in one area of development.

The approach influences the way the problem is conceptualised, the possible solutions debated, the development presented to staff and students, and the implementation managed to demonstrate benefits and reduce barriers. The report recommends that VLE development should involve students from the outset, focus on content and processes, organizational and educational goals, and encourage alternative visions of the future, thus being problem , rather than solution driven.

For JUSTEIS therefore, some areas for further investigation of interest to JISC were:

- student use, and perceptions of the workflow tools in VLEs
- academic staff views of the monitoring functions available in VLEs and MLEs, their perception of the benefits and costs (in time).

Methods

The JUSTEIS project involves surveying a stratified (randomly selected) sample of departments (within five discipline clusters) and institutions. For the 2001/2002 and 2002/2003 cycles, there was an increasing emphasis on further education monitoring, as requested by the JISC Committee for Awareness, Liaison and Training (Table 1). The interview schedule for students and staff was based on a critical incident technique, complemented by use of a critical success factors approach for some questions, and use of a vignette for students. The vignette was tailored to the subject area and provided a check on students' habitual use of printed and electronic information sources.

JUSTEIS activity	2001/2002 total	FE	HE	2002/2003	FE	HE
Students interviewed	322	122	200	239	151	88
Student questionnaires obtained	486	132	354	355	201	154
Participating institutions	30	12	18	26	16	10
Participating departments	53	24	29	31	19	12

Senior library managers interviewed	12			10		
Academic staff interviewed	39	13	26	19	11	8
Library Web sites analysed	50	22	28	50	30	20

Table 1 JUSTEIS sample 2001-2003

The arrangements varied from site to site, but the team of interviewers usually worked with a member of academic staff at the site, who enlisted students for the face to face interviews. General guidance was that as near a random sample as possible should be targeted, and around eight to ten students per department interviewed. Students were given a small incentive for participation (entry in a prize draw). Interviews were transcribed and entered into QSR N6 software for the qualitative data analysis. The main research questions on VLE usage discussed in this paper are:

- How do students view learning with VLEs? (*Do they see VLEs as an extension of the individual teacher-student relationship? Is peer support made more effective?*)

- How do academic staff view VLE benefits or disbenefits? (*Is better monitoring an explicit objective? How important are the different learning styles of students, and how easy is it to adapt in light of experience during teaching the module?*)

- How do both staff and students view the policy issues concerning VLE development? *(Do they think that there should be a standard method for developing and using the VLE? How much variation in practice should be 'acceptable'? How important are the links between the learning and the student record of learning achievement?)*

The finer coding of the data was guided by the questions to be answered.

Results
Results are illustrated by extracts from the interview data, and presented by theme, with the student perspectives presented before staff perspectives.

The VLE as a learning framework
Some students perceived the benefits of the VLE in terms of a learning framework, which was specific to their needs, and was both a safety net and support.

'It's like a, some kind of framework they've put together'

'You can download the information, print off the information before a lecture. Because it's quite complicated stuff so you can have a kind of vague understanding before you go into the lecture which I think is quite handy.'

'I think when you first start the course you're a bit nervous, you know you're grasping at straws everywhere. Bits of snippets of information and I find now I'm just sort of plodding through the work more instead of going into [name of VLE]'

Staff views on VLE development reflected those of students in providing the students with a stronger framework for their studies:

> 'The one site I developed I put the timetable on, that was the first thing, and then I started doing the links from bits of the timetable to bits of information to support the lectures, but that's not done automatically.'

In other interviews, students seemed unclear about the intended functions of the VLE or use of the institutional Intranet and the VLE was possibly just 'more of the same'. Students perceive that lecturers fear that the VLE will replace lecturers, so that lectures (and lecturers) are redundant. Others accept that some lecturers choose to post material prior to the lecture, while others choose to post material afterwards, for some reason associated with those fears.

> 'I think if they put lecture, if they put everybody's lecture notes on, nobody'd bother going to the lectures too, they've got their ploys somehow.'

> 'Depending. Last term, depending the lecture, some lectures post them before and some after...Syllabuses and things like that tended to be posted before.'

Presenting and redescribing information

Some of the VLE functions were viewed by students as 'redescribing of conceptions' (as proposed in the conversational framework) which are generally something they may use if they wish. Such 'redescribing' also serves as 'presentation' for those students who may not be able to attend the lecture. There is little indication of much individualization intended, apart from making the materials accessible at a time convenient to the student, which is a benefit for students combining part-time work with their studies.

> 'I also use it [departmental home page], some of the lecturers put additional lecture notes on the Web. So to back up some of the things they've been talking about in our lectures they put it on the Web so it's accessible here.'

> 'For the statistics we're doing she does put those on the, on the Web site so, yeah, there are, they are there if they're available but I've not accessed them yet.'

> 'There was one thing, there was something last year, I can't remember what it was but you had to do some task on the Internet but normally you don't have tasks to do.'

Renegotiation of the learning contract

Some students perceived their VLE management as an extension of the classroom situation with messages from the tutor making the 'resource negotiation' current, and part of their developing learning contract with the teaching staff.

> 'Yes we have the VLE. Well, that's quite handy actually because I can access that from home as well and they put all the course material on it, any messages from the tutors for lectures, the reading lists are on there and the notes from the lectures…plus week to week the tutors put any information that we might find helpful, which is actually quite helpful.'

Only in these circumstances were students at all likely to state that the VLE was their most vital electronic information service.

> 'The Intranet is the most useful out of everything, it's the college network and the virtual learning environment…because all the information you need is on that really…both [subjects] also have other little bits, like they have "how to improve your marks in essays"…"statistics for the terrified", which is sort of interactive.'

Resource negotiation in some circumstances may not be based on learning needs but on technological limitations. Access to resources off campus resources may be limited.

> 'They tend to, I mean we can't, the [name] drive whatever that stands for, we can't actually access that unless we're on the university network. A lot of lecture notes and things like that go up on there. Some lecturers will email them to us on our university email address which is something I now check regularly.'

Individualization, and roles and responsibilities in the learning contract may become dependent on having the technical tools.

> 'Oh yes they do. They send, unfortunately they keep sending it through on Powerpoint and I don't have Powerpoint…like they say you can used it through the uni but I don't like going on the uni, I think it's because I'm so used to mine I don't really like the change on to another computer.'

In some cases the learning contract is merely a re-negotiation of physical access to resources.

> 'They don't give them [handouts] out. You've got to access it to get the information.'

> 'Before they always gave them in class but they've decided to cut down on photocopying [Interviewer: And you have to pay for the photocopies instead?]…Basically.'

In some instances, teaching staff set out clear guidelines on their expectations of student behaviour, and the VLE should be accessed prior to the face-to-face interaction in class.

> 'That's vital to the course because one unit we have the lecturer has said that all his notes are going to be on the Intranet. Before you come to the lecture print them off so when you come in we go through them together. So you have to do that.'

> 'We have to like it's weekly so we have to do the online reading before we do the lectures.'

In other cases the student decides to do this on their own initiative.

> 'They put the lecture notes on there [shared drive, Intranet]…I tend to download them before the lessons, so that I can read up beforehand. What a sad person I am!'

In another instance one student noted how current research could be accessed via the VLE.

> 'Yes, I think they are well into electronic law and things. I think the [name] actually put the lectures, talks [from a conference] on the [university] site which is quite interesting if you are into that sort of thing.'

Individualization of learning and interactive activities

Benefits of individualization for students

For many students, the main advantage of the VLE was individualization, allowing them to find resources they needed and learn independently. They could practise at their own speed, and in their own time, and those features can be particularly useful for part-time students or those doing placement projects or field work.

'Oh it's really good actually. I went on the other day because I've got a maths exam tomorrow and it's got like the test papers…and it helps you go through using the best ways.'

'We're actually spending one day a week working in the field, and if your other lectures don't coincide with the people you are working with you can post information and it's there available whether you access it at home or here in college.'

Multimedia was particularly useful for illustrating some difficult concepts that are not easy to explain in other ways.

'There's a Web site for our biomechanics module which is extremely good and it has moving parts and stuff like that on it. And it's brilliant…like a book online really…you can see how the limbs interact with each other.'

There was a perceived need for some interaction, not simply re-presentation, but some 'microworld activities' which would allow reflection, or some guidance which would help the individual student with their assessed work.

'At the moment it's [talking of VLE/FE college Web site in early stages of development] still in its youth and it needs somebody like on a regular basis perhaps doing something there to get students to go to it.'

'I go straight into the shared drive for lecture notes, yeah. Because here we do [name] sessions and they do examples for us and solutions. Definitely use those. And we have our own web page as well for one of the courses which is interactive.'

Staff perceptions of monitoring of learning

Some staff noted the benefits of allowing students to monitor their own learning, particularly in subjects where students are doing laboratory work that is assessed regularly.

'There's a way of doing so that just their own mark comes up, and so that's nice that they can get it in dribs and drabs...Then in some cases the marks would be accrued with time and then the cumulative table might be later on, so I usually do it all very privately so they get an idea of how they've done before everyone's finished as it were. '

Staff views on individualization of learning

For some staff the use of the VLE by students was very much on a 'take it or leave it' basis, with an advantage for staff in the time saved in photocopying.

'I put lecture notes on there, student folders...it's just for them to print them out if they want to because it saves us a lot of photocopying. '

In some disciplines the ability to integrate and present materials in a variety of formats was believed to enhance learning.

'Or any bits of information they may need for the lecture, any images to discuss or pieces of text, we do that quite regularly, and also maps, places we are doing fieldwork we can put up.' '

Other staff are concerned that attendance at lectures drops once material is available on the VLE.

'I run a course on plant physiology and I put all the course notes on the Web...and then after I've done my lectures I put my lectures online...before I'd actually put them online I didn't tell them I was going to, because I was worried they wouldn't turn up for the lectures, so I didn't warn them in advance, but before I'd even put them on mine I'd had some requests for copies of my slides...I won't tell them the lectures are online until the last one. I don't think there's a lot of staff do that, so it's not something they expect.'

This is seen as a disadvantage, particularly when lecturers believe that:

'Students don't take the information in as well if they are not writing it down.'

Benefits of interactive activities for students

In other interviews, students talked about the ways in which the VLE made independent learning easier and more effective, and often this was clearly related to coursework intended to assess learning outcomes. Individualisation was working for these students.

'Yes, it comes up with wee exercises every now and again and gives you the basic principles and tests you on them.'

'You do get assessed but I mean nobody else knows about the mark. It's just you, a personal thing.'

'I went into [name of VLE] and I was looking at the, about the next assignment…and I actually did the, there's a program on there that takes you through some of, you had to question and answer…and I was quite pleased with myself because I did quite well and I was quite chuffed.'

Adaptation during delivery

There was little evidence (from the student perspective) of teaching staff making adaptations to the course, in light of circumstances, although one student noted that the VLE ensured that they did not miss out on promised teaching.

'For instance last week one of the lecturers couldn't make one of our lectures so he put it on the Internet [meaning Intranet] for us.'

Although the VLE theoretically can allow adaptation during delivery, for this lecturer the VLE provided the basics, allowing the adaptation during delivery of the module to occur during the lecture slot (thus emphasising that the face-to-face element was more important).

'What we do for most modules is to up the same information that we still put up on noticeboards so things like details of assignments, reading lists, outline of the module, that would always go on for everything, and then we would also put on short summaries of the lectures which would be two pages in length, which are summaries rather than the whole lecture, so we're not, so there's no possible encouragement for people to think "Oh well, the whole lecture's on there, I don't have to bother coming in"...because we do feel that would disadvantage those students, because they're not there to ask questions if there's something they don't understand, or very often what I actually write I then amplify in the lecture itself where particularly, I mean there may be some new issue that has just come up that, or it may be that someone may well ask a question about some new find and then I talk about how that fits into the context of the general issue. '

Some staff would like to hide solutions to problems until students have had a chance to try (and try harder) and at present this was not possible with their VLE.

> 'Somebody puts them [model solutions] up for me every semester. If they've been doing practice problems I would ask for these to be put up at the end of semester because...I want them to be trying hard to do the problem on their own without giving up and looking at the solutions too early. '

Self-organization and group learning

The viable systems model concept of 'self-organization', the space or tools within a VLE to allow students to organize themselves as a group outside the teacher's purview, was not in evidence, apart from the following instance, which also indicated the problems.

> 'For law we had to go on to an area called [name]. You were put into groups of four to five and there were a series of questions which you had to answer and each individual from the group goes in and types in what they think, then you pick a leader from the group and they amalgamate together all the answers and put it on a separate sheet and submit that to the lecturer. The lecturer basically ends up with one sheet of answers from each of his groups and marks it on that basis. The only negative thing about that is that not many people actually did it.'

There were a few (though not many) examples of student co-ordination.

> 'For example CBLs, what we do is that we research a particular topic, each is given a chosen topic and then we all go back research it, do it on our…write it up on the computer, and then we email our project to everyone else, and everybody does the same so then we get everything.'

Self-organization for learning needs to be distinguished from the social club groups, and while news on social activities may encourage some students to access the VLE, such postings may be viewed as social clutter to others.

> 'Sometimes a lecturer will say "I posted it on the Web" and I have said "I'm sorry but some of us don't read it" because a lot of it's to do with rugby matches and parties and stuff like that and unless you're into that scene…you're not going to be looking at it.'

Other students are also mildly curious about the functions that are not apparently used.

> 'Yes I use that a lot, [name] is good for information because they put things up on there about Union events…then there's the VLE…you can access stuff off that…There's an area for discussion on there which I've noticed there is never anything on, not for any of my courses, but whether it will pick up I suppose the first years now who will have had this from the start, by the time they're third year they'll be using it a lot more.'

Some staff mentioned peer support as an objective of the VLE development, but other staff seemed to feel that discussion forums should be 'teacher-led' and had heard mixed reports of the success of discussion forums on the VLE.

> 'I have never used and I'm not sure any of the other staff have used the VLE as like a discussion forum within the class but only because I think it was tried by one or two members of the staff on other courses and it didn't really work, students didn't participate enough.'

For other staff the idea that self-organized learning might be possible within the VLE seems novel, as the VLE is seen as completely separate from face-to-face support for students.

> 'If they can only come into college for classes, then go home and access in their own time the course materials...that's certainly an advantage of the VLE...one good reason for encouraging its use in a support role...We've had discussions about this, we are much more interested in discussion and debate and face to face work either within the class as a whole, or within the student support units, study groups the students have formed. We are not really interested at this stage of running a system where you have just a virtual learning.'

Discussion

Many of the academic staff interviewed were ambivalent over the benefits of the VLE and were unsure how it benefited their working practice. There were time savings in photocopying of handouts, but students queried whether provision of handouts and resource materials on the VLE represented much of an advantage to them, if the burden of printing costs merely shifted from the institution to the students. Lecturers, particularly part-time staff, frequently view their teaching load in terms of contact hours (particularly for lecturing sessions) and this attitude seems to be a barrier to greater use of a VLE, as the value of their teaching contribution is seen in terms of contact hours. For a standard 10 credit (undergraduate level) model in the UK, with 100 learning hours, there would usually be 30-50 hours allotted for independent or group study. For some disciplines the ways of thinking and practice in the subject (Entwistle, 2003) are probably more amenable to the functions offered by VLEs, such as interactive exercises, multiple choice tests. Entwistle also notes that the quality of student learning may be affected principally by 'troublesome knowledge', 'threshold concepts' and 'delayed understanding'. For those promoting VLE software, there may need to be far greater emphasis on how particular VLE functions may help students in their learning of some of the difficult aspects of their subject.

There seems to be a major hurdle in enabling peer-peer support functions in VLEs. The DfES e-learning strategy consultation document suggests (para 57) that learners should have easy access to interactive design tools which enable them 'to be creative and more active in their learning' (Department for Education and Skills (DfES), 2003) The students interviewed who had access to this type of learning material clearly enjoyed and appreciated the ability to monitor their own learning, but there were few examples found in the survey, and these were mostly (though not entirely) concentrated in the biomedical disciplines. Similarly, (Peat & Franklin, 2002) found computer based formative assessment popular with first year biology students at the University of Sydney, and de Lange (de Lange, Suwardy, & Movondo, 2003) found a VLE useful for the same type of purpose with first year accounting students. Other disciplines may have different priorities, and there may need to be far greater emphasis on how VLEs can support learning for the ways of thinking and practice in different disciplines, rather than assuming that there is one way to run a group project or discussion board. Some experimentation may be necessary for students to learn about roles in online discussion (Pilkington & Walker, 2003). Some of these problems in learning how to work collaboratively are reflected in other research on 'communities of practice' (Wenger, 1998) in organisations (Urquhart, Yeoman, & Sharp, 2002) (Urquhart, Yeoman, & Sharp, 2003) . The first stages of development for virtual communities of practice seem

relatively easy to achieve, with provision of resources and directories. Moving to the later stages of engagement, community involvement, is difficult, and if some of the necessary building blocks are not in place, the community may stick at one particular stage and fail to progress.

Conclusions

The JUSTEIS project randomly samples departments throughout the UK for the research, and the sample is not weighted to include departments where best practice has been highlighted, although some instances were identified. Students (and some staff) may be unaware of the VLE development work underway in their institution and the findings may not fully represent some of the underpinning planning that has taken place in some institutions. Both theoretical frameworks for VLE evaluation helped to illuminate some of the reasons why there is a plateau in development of VLEs in many departments, with the Viable Systems Model useful for studying the organisational effects, and the conversational framework useful for examining the student-teacher interactions and individualization of learning. The results confirm other research indicating that VLEs can support formative assessment very well, and students like the individualization of their learning possible through provision of interactive exercises. Institutions need to emphasise those benefits to academic staff, and provide opportunities for academic staff to experiment far more with the group learning tools within many VLEs. For staff attuned to valuing their teaching by contact hours, use of some of the functions within a VLE requires a large shift in their approaches to teaching and learning. Disciplinary differences also need to be considered and institutions need to promote a variety of approaches to VLE development, as well as enabling a shift in attitudes towards student learning that will improve the quality of student learning, as well as ensuring that the benefits of investment in VLEs are realised.

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