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**Institute for Learning and Research Technology**  
**JTAP 623 - The Role of Virtual Learning**  
**Environments in UK Medical Education**  
**Final Report**

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**Document Notes**

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# 1. Executive Summary

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## 1.1 Introduction

### 1.1.1 Introduction

This is the final report for the project titled "The Role of Virtual Learning Environments in UK Medical Education", funded as JTAP-623. It presents data collected from 21 medical schools around the UK.

### 1.1.2 Background

Over the last six years, Virtual Learning Environments have started to be used in UK Medical Education in response to curriculum changes which have resulted in the blurring of the preclinical/divide and a need to manage learners who now spend an increased proportion of their study time based away from the host institution.

Virtual Learning Environments (VLEs) are defined as web based systems for integrating a range of on-line tools for learning, including content authoring and management, hosting course materials and support materials and student self-assessment. The more recent term Virtual and Managed Learning Environment (VMLE) has been used here to incorporate the notion of integrating the VLE with other data systems including student records and library catalogues.

### 1.1.3 Project Aims

Before its winding up in 1999, the CTI Centre for Medicine identified a need for a project looking at how these systems were being implemented and the lessons to be learned from experience so far.

The aims of the project are to:

- undertake a study to report on the current VMLE systems implemented within UK medical schools and how they are being used
- document the success and failures of VMLE implementation within institutions
- address the issues surrounding the sharing of materials between VMLEs
- make a series of recommendations for those seeking to initiate such a system, or for those looking to develop existing systems

### 1.1.4 Methods

Data were collected by:

1. Visits to key staff at six UK medical schools developing and using VMLEs. These were: Birmingham; Cambridge; University of Wales College of Medicine (UWCM), Cardiff; Edinburgh; Newcastle; Nottingham
2. Observation and analysis of the six VMLEs
3. An email questionnaire to the remaining 18 medical schools where no interviews had taken place; 15 responses were received.
4. Combining the interview responses to the questionnaire data for quantitative analysis

## 1.2 Results

### 1.2.1 The Survey

This section presents results collated from the questionnaire and from the interviews. Altogether 21 institutions are represented in the survey.

#### 1.2.1.1 Development and implementation

- Seventeen out of 21 institutions have implemented a VMLE, and the remainder are either in the process of implementation or are considering doing it.
- Fifteen institutions are developing systems either wholly in-house or in conjunction with other institutions. Of the remainder, 5 are using commercial systems either on their own or combined with in-house systems. One institution had yet to choose a system at the time of writing.

- According to the questionnaires, development of the VMLEs has mainly been driven by either the Faculty centrally or by individual teaching staff. However the interviews suggest that at some institutions the VMLE may have resulted more from the enthusiasm of individual IT developers and educational technologists.
- The main reasons mentioned for adoption of a VMLE were to facilitate students learning at a distance, to manage curriculum change and complexity, and to handle increased student numbers.

### 1.2.1.2 What do the systems do?

The main functions fulfilled by the VMLEs are:

1. **Automated administration:** A means of automating administrative functions such as registration for optional course modules, timetabling, and delivery of administrative documentation
2. **Resource Management:** Making resources easy to find by providing Indexing and Searching features, and by presenting information from various points of view
3. **One way communication:** Communication from staff to selected groups of students and to individuals. This often includes information about students and where they are in the curriculum.
4. **Two way communication:** Communication between staff and students, and among students, realised through tools such as email, discussion boards and chat facilities
5. **Integrated learning materials:** Providing teaching and self-assessment materials that are integrated fully into the course, tied either to learning outcomes or to specific teaching sessions
6. **Resources Gateway:** Providing a gateway for 3<sup>rd</sup> party learning resources such as CAL tutorials, may be including reviews of resources to direct users to what is most appropriate
7. **"Virtual filing cabinet":** that provides academic staff or their assistants with the tools to upload resources into specific areas of the system
8. **Course Information:** Providing information about the course and what it contains at each point, what is expected from students, and instructions for attending clinical placements
9. **Personalised environment:** A personalised learning and information environment where each user sees the information and resources that are most directly relevant to them individually

Section 3.2 of the full report provides an analysis of the extent to which each of the six VMLEs in the interviews emphasises each of these functions.

### 1.2.1.3 Features of the systems

Of the range of features offered by these systems:

- Almost all the systems provide support for teaching materials, self-assessment facilities and administrative information
- Most of the systems also provide communications tools, and tools for staff to upload materials
- Some of the less commonly supported features are automated timetabling, summative assessment and indexing of content

Appendix E gives a detailed breakdown of the features of the systems at the six interview institutions.

### 1.2.1.4 Data integration

This aspect of VMLEs is not yet very well developed at many institutions. Only 10 of the institutions have integration with student information systems whether directly or using a copy of the data, while 8 systems are able to query the institutional library catalogue. Obstacles to integration cited include difficulties with harmonising data, and political obstacles within the institution. It also does not seem to be a developmental priority at all institutions.

## 1.2.2 Interviews

This section of the report summarises the main findings from the interviews that are additional to the results collated from the questionnaire and the interviews.

### 1.2.2.1 Development

#### 1.2.2.1.1 How have the systems been developed?

All of the six interview institutions have small teams within the faculty developing their own bespoke system, although Nottingham has used the Newcastle VMLE as the basis for theirs.

None of the six institutions have used any component of a commercial VMLE system. These have been avoided mainly because: a) at the time when development of several of the medical VMLEs started such systems did not exist; b) they are not sufficiently flexible to reflect the complexity and multi-layered nature of the medical curriculum c) they offer limited facilities for integrating with other institutional information systems.

At several institutions technologies are being used to build the VMLEs that will enable easy transfer of system components and content between systems. These are:

1. the Zope object-oriented web application server, which enables a modular framework to be developed that can be easily transferred between different systems. Microsoft's Active Server Pages are also being used in this way.
2. XML (Extensible markup language) which stores content in a form that enables easy conversion between many different formats and applications.
3. Medical Subject Headings (MeSH) Indexing

#### 1.2.2.1.2 How have they been populated?

At some institutions authors (academics, administrators) are encouraged to add their own content, but at others the development team take responsibility for doing this. Most sites have developed tools for authors to add their own content, and some sites have created a template to help authors get materials into the appropriate format. However, the template is not always followed satisfactorily and in many cases developers expect that authors will still need help and advice with this.

#### 1.2.2.1.3 Assessment

Self-assessment is seen as a key function of all the VMLEs, principally for revision purposes. All the systems use MCQs with True/False options for each stem, but they do not offer some of the more sophisticated question types available with some commercial Computerised Assessment systems. Very little use has so far been made of the systems for summative assessment, mainly because of security concerns and logistical difficulties.

#### 1.2.2.2 *How they are organised*

Most of the systems follow the structure of the local curriculum, and present content within a "study guide" or "subject booklet" provided for each of its elements. However some sites provide more direct access to materials by allowing searches on specific topics, learning outcomes, MeSH headings, and learning events (lectures etc). Some systems also include vertical themes (eg ethics and clinical skills) in the organisational structure.

#### 1.2.2.3 *Effects of the systems on learning and teaching*

So far little empirical evidence has been collected to answer this question, although some impressions were provided by the interviewees. There is little evidence as yet to suggest much change in practice; the VMLEs tend to be seen as a way of doing the same things more conveniently rather than enhancing educational opportunities. However there are some examples of innovative teaching being enabled through the VMLEs. Moreover, developers are optimistic that usage will become more appropriate and more adventurous as experience of the potential grows, and that the systems will encourage students to be more independent learners.

#### 1.2.2.4 *Level of use*

Consistent quantitative data about exact levels of usage has been hard to obtain. The impression is that all the systems are being used, but that there is great variation between curriculum areas and types of users.

Generally later cohorts of students (now in Years 1 -3) are using the system more than the previous groups of users (Years 4 - 5). Peaks of usage have been noticed shortly before exams. One of the most heavily used features is self-assessment.

Staff usage also varies widely between subjects and there is no consistent pattern of which disciplines are the heaviest users. Pre-clinical teachers are the heaviest users at most but not all institutions. Factors affecting staff usage seem to be the availability of support and training, a perception of time saving and developers' ability to communicate with widely scattered teaching staff.

### *1.2.2.5 Evaluation*

At most institutions there has been only informal evaluation of the systems, usually through feedback from staff and students at meetings, during training sessions and as part of overall course feedback. The key outcome is that students want materials in printed form and strongly dislike having to print out materials themselves that were previously distributed to them on paper. On the plus side students have identified a number of particularly popular applications for their VMLE, including:

- Self-assessment
- Online Library search and electronic book reserve
- Student peer marking of assignments
- Choosing preferences for an Options course online
- Timetabled online sessions integrated with other types of teaching

### *1.2.2.6 Training and Induction*

Almost all the six institutions provide some training to students. Training for staff is more uneven, with some sites relying on informal support rather than training, partly due to lack of resources. Future training needs for both staff and students are a) a greater awareness of the system, and b) how to use the system appropriately from a learning and teaching perspective.

### *1.2.2.7 Future developments*

The main developments planned by the six institutions are:

- Personalisation of the VMLE so that different users are presented with the resources that are most relevant to them, including the integration of Personal Academic Record systems and intelligent tutoring.
- Expansion of self-assessment facilities to include more question types and the ability to test practical skills as well as theoretical knowledge
- Increased used of search and indexing facilities
- Further moves to share resources between institutions
- Development of the technology to deliver resources to a range of platforms including portable and palmtop computers, possibly using wireless networks
- Publicising the systems internally and demonstrating examples of successful use

## **1.2.3 Obstacles and problems identified by the survey**

### *1.2.3.1 Resources*

- Lack of resources for development
- As VMLEs absorb ever more resources for support they leave less for further development
- Lack of IT facilities and lack of time both for teaching staff to author materials and for training

### *1.2.3.2 Communication and training*

- Communicating with large numbers of often widely geographically dispersed staff and students
- Staff are not aware of or interested in using the system
- Students need reminding to use the system
- Staff may not use the system appropriately from a pedagogical point of view

### *1.2.3.3 Other problems*

- IPR and copyright concerns
- Lack of support from within the faculty

## **1.3 Conclusions**

### **1.3.1 System development**

- Involvement at faculty level is important in driving VMLE uptake among staff
- Bespoke VMLE developments are more suitable for the needs of the medical curriculum than currently available commercial systems
- Commercial systems are unsuited to representing the complexity and interlinking of the medical curriculum

- There is now a substantial body of expertise in VMLE development and implementation working across the UK medical education sector
- The advantages of bespoke systems over commercial VMLEs is likely to persist at least for the immediate future
- A one-size-fits-all system developed for medical education, whether commercial or bespoke, is not appropriate due to profound differences in medical curricula at different medical schools
- Technologies such as Zope, XML, IMS and the use of the MeSH Indexing system offer potential for sharing of system components and resources across the sector
- There are likely to be objections to sharing resources between institutions from managers and some academics
- Support, training and incentives for academics may be necessary to ensure that systems are populated with appropriate content across the curriculum

### 1.3.2 The systems and their content

- Course information and administrative documentation is displayed more prominently on the systems than materials for learning and teaching, in many cases making the latter hard to find
- Contents are displayed in two forms: as HTML pages integral to the structure of the site, and as "native format" documents displayed as links embedded into the HTML pages. The relative status and function of these two types of resources is not always clear

### 1.3.3 How they are used

- The systems tend to be used far more for course administration and course information than they are for online learning and teaching activities
- There are some examples of effective and innovative teaching activities
- Learning materials are more likely to be used if they are integrated into the structure of the teaching rather than provided as optional extras
- Using the systems as an alternative to providing printed material is unpopular with students
- Portable computer facilities such as Personal Digital Assistants used with wireless networks may in the long term provide a viable alternative to many printed documents

### 1.3.4 Training

- There is a greater need for training in appropriate use of the system than in hands-on skills
- VMLE development teams are not necessarily the most appropriate providers of training

### 1.3.5 Data integration

- This is seen as important by many developers, but so far only a minority of systems have achieved significant integration with other information systems
- The main obstacles are political and managerial rather than technical

## 1.4 Key Recommendations

**System developers** should:

- work closely with medical educators about the content and organisation of the systems and the training of users
- work with medical educators to create VMLE systems which foreground relevant learning materials at least as much as administrative functions and course background information
- work closely with national strategy groups (i.e. Learning and Teaching Support Network Subject Centre for Medicine, Dentistry and Veterinary Medicine) to develop (or create) networks to:
  - a) Maximise collaboration and communication between developers at different institutions
  - b) Ensure gradual but universal adoption of emerging technology and other standards, probably including XML, IMS (Instructional Management Systems) and MeSH indexing
  - c) Undertake further research and investigation into the delivery of the VMLE onto Personal Digital Assistants and equivalent devices

**The national strategy groups**, medical faculties and medical educationalists should collaborate to undertake research including:

- a) the effective use of VMLEs from a learning and teaching perspective
- b) the potential of Personal Digital Assistants for mobile delivery of VMLE content

**Medical Faculties** should:

- provide strategic direction and support, to enable system developers and medical educators to develop and promote the use of VMLEs
- continue to encourage bespoke developments rather than adopt present commercial solutions
- ensure that VMLEs are provided with dedicated and long-term funding, principally for staffing and support of the systems
- provide adequate incentives and rewards to encourage staff developing resources for the VMLE
- consider carefully the implications before replacing paper distribution materials with exclusively online provision
- promote collaboration between senior faculty and institution decision makers to overcome political and managerial obstacles to the integration of data systems

**Medical educationalists** should:

- become more involved in the development of the systems and training of users

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## **2. Introduction**

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### **2.1 Introduction**

This document represents the final report for the project titled "The Role of Virtual Learning Environments in UK Medical Education", funded as JTAP-623 in 1998. The project was taken over for completion by Julian Cook of the Institute for Learning and Research Technology in January 2001.

### **2.2 Background**

At the time the proposal for this project was first written in 1998, all UK medical schools were in the early stages of implementing new medical curricula, in response to recommendations made by the General Medical Council (GMC, 1993). In almost all cases, traditional discipline oriented teaching was being replaced by integrated interdisciplinary courses of study, eliminating the rigid clinical /pre-clinical divide. One outcome of these new integrated curricula was a redressing of the balance between hospital-based and community-based education, resulting in a greater proportion of medical undergraduate teaching and learning occurring in district general hospital, general practice and other community facilities. This transfer of teaching, in turn, required the development of new solutions to the challenge of facilitating and managing the teaching and learning for students who now spend increasing proportions of their time in centres remote from the host university medical school.

In addition, it had been estimated that when university academic and clinical staff, NHS hospital doctors, GPs and public health physician were taken in to account, approximately 1,600 staff would be involved in the delivery of a typical medical degree program (Jordan and Hammond, 1995). Ensuring that the resulting materials delivered to the undergraduate is to a consistent standard, a theme central to the Dearing Report (NCIE, 1997), was a problem exacerbated by the new student demographic profile.

### **2.3 The role of VLEs in Medical Education**

During the years just prior to the writing of the proposal for this project, various factors had converged to make Web-based delivery to students of material not only possible and desirable but also, to an increasing extent, necessary. These included the adoption of HTML as the de factor standard for remotely accessed material, the existing infrastructure within HE which enables delivery to the student desktop, the appearance of authoring software which offers a reduced learning curve but increased productivity, and a general move towards Independent Student Learning driven by issues ranging from pedagogical to fiscal.

As such, many Medical Schools had started implementing Web-based systems that incorporated curriculum management facilities, CAL delivery systems, student support and feedback facilities, student-student conferencing and student-tutor conferencing. This time saw the beginning of a proliferation of such systems, and an increasing demand for information on the design and production of new systems. In institutions where these environments had been implemented there was provocation of debate about the collaborative opportunities afforded; issues pertaining to the development and delivery of question and image sets, and the associated copyright issues; the evolution of different mechanisms for content authoring and content management; and the development of frameworks in which student can access course materials, support materials an self-assessment systems - surely the truest definition of a virtual learning environment (see Smyth et al., 1996 et al., 1997).

In light of these developments, there was believed to be a pressing need for an overarching study of such systems already in place and the accompanying literature, and the development of a set of recommendation for those seeking to implement such system in the future.

### **2.4 Proposal**

As part of its operating remit, the CTI Centre for Medicine was already actively involved with cataloguing and reporting on the role and implementation of Communications & Information

Technologies (C&IT) within UK medical schools, and disseminating this information to the wider educational community. Although the CTI Centres were subsequently replaced by the Learning and Teaching Support Network (LTSN) subject centres, much of the knowledge and expertise of the CTI Centre for Medicine remained available within the Institute for Learning and Research Technology (ILRT). One of the greatest areas of interest amongst senior staff within the UK sector, was the design and implementation of Virtual Learning Environments (VLEs) similar to that outlined in Section 2.2.

By building on the work of the CTI Centre for Medicine, and by forging links with the new LTSN subject centre (LTSN-01) based at Newcastle, the ILRT was well placed to call on those already running such a VLE.

The purpose of this study was to report on the current systems implemented within UK medical schools, and make a series of recommendations for those seeking to initiate such a system, or for those looking to develop existing systems. In addition, the report seeks to address the issues surrounding the sharing of software and materials between VLEs and document the success and failures of VLE implementations within institutions.

During the time between the writing of the original proposal in 1998 and the commencement of the project in January 2001, both the technology and its implementation in medical education moved on rapidly. By January 2001 there were a very wide range of VLEs available, both off the shelf and as a result of bespoke development at various UK medical schools. There is now an increasing tendency across the HE sector as a whole to see VLEs as part of an integrated set of information systems including student information and course information (functions that combine with a VLE to constitute a Managed Learning Environment (MLE)), so that it would now seem more appropriate to call the systems as a whole Virtual and Managed Learning Environments (VMLEs). As a result of these developments it was considered appropriate to make some changes to the original aims of the project.

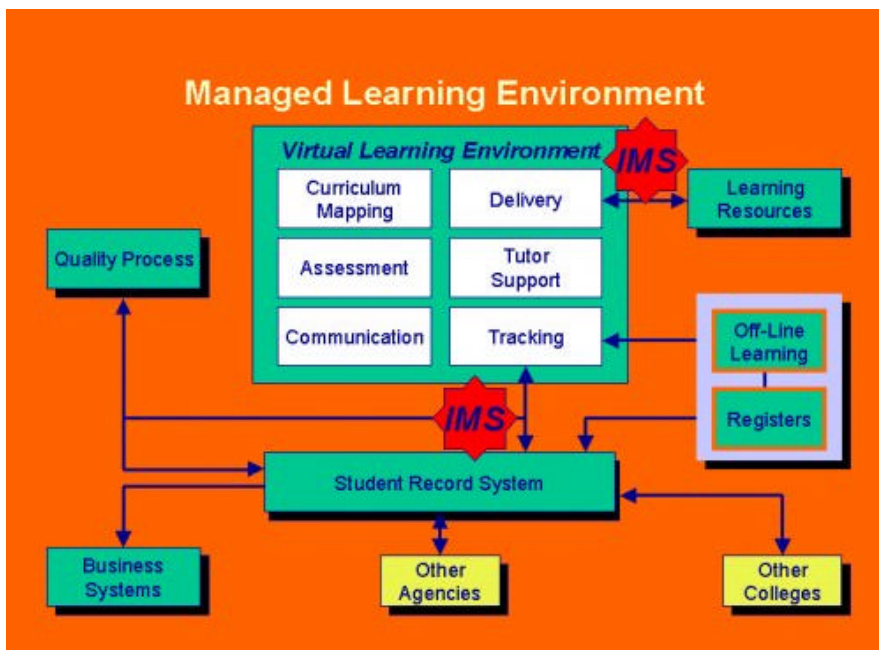


Figure 1 - A model of MLEs and their relationship to VLEs (from Everett 2001)

There was now also sufficient experience of using both off-the-shelf and bespoke systems to draw some conclusions about the relative advantages and disadvantages of each approach, as well as of some of the specific issues such as interoperability of systems and integration with institutional information systems.

## 2.5 Aims

The aims of the project as defined in January 2001 were therefore to:

- undertake a study to report on the current systems implemented within UK medical schools and how they are being used
- document the success and failures of VMLE implementation within institutions
- address the issues surrounding the sharing of materials between VMLEs
- make a series of recommendations for those seeking to initiate such a system, or for those looking to develop existing systems

## 2.6 Issues to be addressed

In order to realise the aims the following core set of questions were identified:

### **Adoption and development**

What are the drivers to the adoption of VMLEs?

Have commercial off-the-shelf systems been adopted or have bespoke solutions been developed?

What are the pros and cons of each approach?

How have these systems been developed and implemented?

What issues have arisen from that process?

What scope is there for harmonisation between different systems, either internally and between institutions?

### **The resulting systems**

What do the systems do?

What are they intended to be used for?

How does the structure of the VMLE correspond to the structure of the curriculum?

### **How they are used**

How long have Faculties been using VMLEs? How has usage changed over that period?

How much and how are the systems used, and by whom?

### **Outcomes**

What effect does the implementation of the VMLE have on patterns of learning and teaching within the faculty?

What are academic staff's and students attitudes and responses to the implementation?

What obstacles have been experienced to VMLE use?

### **Next steps**

What future developments are foreseen/planned?

## 2.7 Outputs

It was planned that the following should be delivered as a result of the project:

1. Case studies of six UK medical schools describing their VMLE implementation in the light of the above questions
2. A summary of the case studies bringing together the themes identified in the case studies and giving an overview of the issues.
3. A survey of all remaining UK medical schools in an attempt to generalise the key points emerging from the case studies
4. A set of conclusions and recommendations emerging from the case studies and the survey

## 2.8 Method

Data for this study were gathered and analysed in the following ways:

- 1) Six medical schools were visited and semi-structured interviews were held with key development staff at each site, following a prepared set of questions. Each visit took place over several hours. The interviews were recorded either in a notebook or on a laptop computer.

Interviews were turned into a series of case studies. Short reports on these are available in Appendix A, and the full versions of the interviews are available in Appendix B

- 2) Passwords were obtained for the six VMLEs at the Institutions above and the systems were analysed from the point of view of their features, content and organisation.
- 3) Issues arising from the interviews and the analysis of the VMLEs were used to develop a short questionnaire, which was distributed by email to 18 medical schools where no interviews had taken place; a total of 15 responses were received.
- 4) Responses from the interviews were incorporated into the results from the questionnaire to give a snapshot picture of the situation at 21 UK medical schools.

### 3. Summary of interviews

This section represents a synthesis and summary of the interviews carried out at six medical schools between February and April 2001. The sites were selected on recommendation from the LTSN-01. They represent a selection of the institutions that were known to have some of the most advanced VMLE implementations, and offered a spread of geographical location and type of medical curriculum. The following table indicates the job titles of the staff who were interviewed, the institutions at which the interviews took place, and the name of the VMLE at each institution.

Title	Unit or Section	Institution	Name of VMLE
Senior Lecturer	Medical Education Unit	University of Birmingham Medical School	Electronic Curriculum
Educational Resources Manager	Clinical and Biomedical Computing Unit	The Clinical School, Addenbrooke's Hospital, Cambridge	ERWeb (Electronic Resources Web)
Head of Unit	Learning Technology Unit	University of Wales College of Medicine (UWCM), Cardiff	ASPIRE
1. Section Director 2. Special Projects Manager	Learning Technology Section (LTS) of the Faculty Group of Medicine & Veterinary Medicine	University of Edinburgh	EEMeC (Edinburgh Electronic Medical Curriculum)
1. Director 2. Senior Project Officer	Faculty of Medicine Computing Centre	Newcastle University	Stud-e Guides (NLE - Networked Learning Environment)
1. Senior Lecturer in Medical Education 2. Project Officer	Medical School	Queen's Medical Centre, University of Nottingham	Mediguide (NLE - Networked Learning Environment)

Figure 1 - Details of the six institutions where interviews took place

This section also includes data from the author's own analysis of the VMLEs in question. For each interview there is a brief summary in Appendix C.

### 3.1 History and development

#### 3.1.1 Developmental stage

The experiences described in the following account show a great deal of variety, which may at least in part be due to the fact that the institutions involved are at very different stages in the development of their systems.

The following table indicates how long each system has been in what stage of implementation has been reached:

Institution	Development started	Current VMLE Implementation
Birmingham	1998	Full across all 5 yrs of UG curriculum
Cambridge	1997	Years 4 and 5 of UG curriculum
UWCM	1999	Pilot with a few academics
Edinburgh	1999	1st 4 yrs of UG curriculum
Newcastle	1996	Full across all 5 yrs of UG curriculum
Nottingham	2000	Full across all 5 yrs of UG curriculum

### 3.1.2 What are the drivers for the development of the VLEs?

The answers to this question in the six interviews show more variation than the answers to the same question from the questionnaires (see Section 4.2). This may be at least in part because it was the system developers that were interviewed rather than those involved directly in providing medical education. These interviewees may have stressed the involvement of learning technology units, whereas those who responded to the questionnaire seem to put more emphasis on the role of the central faculty decision makers.

At three of the six sites interviewed (Birmingham, Edinburgh, Newcastle) a significant part of the impetus has been top-down, coming from central faculty decision makers. At the other three sites (Cambridge, UWCM, Nottingham) the initiative has been more bottom-up, arising from the vision of individual learning technology developers.

A variety of reasons were given by the interviewees for developing their systems:

- The system started life as a way of keeping a definitive record of the structure of the curriculum, which has then evolved into a more ambitious project (Birmingham, Newcastle).
- The VMLE is a way of managing an increasingly complex course involving large numbers of teachers, many of whom are based at other sites (Newcastle).
- Changes in the curriculum made it an opportune time to implement a system of this kind (Edinburgh).
- A system of this kind is seen as advantage in the competition between medical schools to persuade hospital trusts to offer clinical placements to their students (Newcastle).
- Development has come about because learning technologists working in the faculty could see the opportunities offered by the technology and wanted to realise these (UWCM).
- The system is a way of bringing together various components which have been under separate development for several years (Cambridge, Newcastle, Birmingham).

### 3.1.3 Who develops the systems?

Four out of the six institutions interviewed (UWCM, Cambridge, Edinburgh, Newcastle) have a specialist unit with the faculty/college for developing learning technology resources. The size of these units varies from three people (UWCM) to a team of twelve (Newcastle). Most of the teams working on the VMLEs are small, varying between one and three people. In some cases these people work exclusively on the VMLE, whereas others work on a range of projects.

At the remaining medical schools the VMLE systems are either the creation of a medical education specialist who has a long standing interest in the use of technology to assist learning (Birmingham), or the output of a developer employed individually within the faculty (Nottingham).

In addition to learning technologists, at Birmingham and Newcastle there are educational developers who have a key role in developing and populating the systems, and in helping academic staff to add their resources.

### 3.1.4 What have been the starting points for development?

There have been a number of different development paths taken at the different institutions:

- the system started with a needs analysis to identify the best learning resources to provide access to (Cambridge)
- the VMLE started out as an online map of the curriculum to which learning resources have subsequently been attached (Birmingham, Newcastle)
- the VMLE started as an offline electronic guide to the curriculum which was then put onto the Web (Newcastle)
- the VMLE has been adapted from the system originally created at Newcastle (Nottingham)<sup>1</sup>

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<sup>1</sup> Sheffield have also adopted and adapted the Newcastle system

- the system has been rolled out in its complete form, a year at a time (Edinburgh)

### **3.1.5 Who populates the systems?**

The approaches to populating the systems with content fall broadly into three categories:

- 1) Users are encouraged to do as much as possible of this themselves using tools provided as part of the system (Birmingham and UWCM).
- 2) Even though authors can and do add materials themselves, in many cases the system developers have a key role in populating the VMLE. This is done either by adding content themselves, hiring a student to do it, or by creating a template that course administrators can use to prepare the materials in the appropriate format (Newcastle, Nottingham and Edinburgh).
- 3) It is considered more effective for the development team to populate the system with content as they can then ensure that this is appropriate both in terms of document format and pedagogic approach. No facilities are provided for authors to add their own content autonomously (Cambridge).

### **3.1.6 Why do they not use commercial VMLEs?**

None of the sites that were visited have used a commercial system and most have not considered doing so. The systems have either been completely developed at that institution or adapted from a system created at another institution.

The main reasons given for not using commercial systems are that:

- When they started developing their own system there were no commercial equivalents on the market
- Commercial systems are not sufficiently flexible to handle the complexities of the medical curriculum
- The bespoke VMLEs created at these institutions are seen as supporting an integrated programme of study rather than a set of discrete modules which is the approach offered by most commercial systems
- Commercial systems direct you towards a particular approach to learning and teaching which may not be appropriate
- For some sites it is important to be able to integrate with other data systems such as student records and to provide a single login for all systems, which is difficult or impossible with most commercial systems
- Developers are inclined to develop a system that is completely homegrown rather than incorporate some commercial elements such as Computer Assisted Assessment features into their VMLE, as this would prevent them from being able to market a complete system to other institutions

Author's note: many commercial systems are developing the kind of features identified as important by the developers at these sites, but there is inevitably a delay in implementation which means they constantly lag behind the expectations of these institutions, who may be developing the same features at the same time as their commercial counterparts.

### **3.1.7 Are any other VLEs being used?**

None of the six sites interviewed are using any other VMLE within the faculty, although at Birmingham, Newcastle and Edinburgh there have been institution-wide decisions to adopt commercial systems (WebCT and Blackboard). Newcastle has recently started running its degree course in collaboration with Durham University, who will be offering the first two years of a Medical Degree to be completed at Newcastle. Durham plan to use the commercial system, Blackboard for this.

### **3.1.8 What are the costs?**

#### *3.1.8.1 Equipment*

Almost all of the systems at the interview sites are using software that is available at low or no direct cost. The costs consist mainly of provision and maintenance of a suitable server, and associated development and maintenance costs. The costs of the server ranges from £4,000 for a machine considered suitable at Edinburgh, up to £28,000 for the machine used at Nottingham.

### 3.1.8.2 Staff

The staff effort in developing the systems is hard to quantify exactly as most of the developers also work on other projects. However generally there is one full-time developer and one or two other core team members, so an estimate would be 1-2 full time posts. Birmingham and Newcastle also have educational developers employed by the faculty who help to populate the systems. A report produced at Sheffield Hallam University on the costs of networked learning confirms that VMLE implementation will involve staff costs that are often hidden and uncoded (Bacsich and Ash 2000).

### 3.1.9 What technologies are used?

It is not the aim of this report to provide a detailed technical description of these systems, but it may be appropriate to make a few general comments that relate to the ability to share both system components and content between different systems.

Three of the six interview sites (UWCM, Newcastle, Nottingham) are using an object-oriented web application development system called Zope (see: [www.zope.org](http://www.zope.org)). The reasons given for this choice are that its modular nature makes development much quicker, that it enables a framework of tools to be created, and makes it easy to create connections between databases and has helped to increase the dynamic use of databases. It has also made it easier to adapt the system created by Newcastle to fit the curriculum structure and approach at Nottingham (and other sites that use this system, such as Sheffield).

These sites, plus also Birmingham, all store site content as XML (Extensible Markup Language) objects, which makes it easy to transfer content between systems and to render it in a range of formats readable by different software applications and platforms.

The ASP (Active Server Pages) technology used at Edinburgh also allows Object Oriented Programming and database handling.

## 3.2 Overall description of the VMLEs and their functions

### 3.2.1 What do the systems do?

This section sets out to describe and categorise the VMLEs in the study in terms of the key functions that they perform. For the purposes of this report, the term function refers to the kind of activities and benefits offered by the system and how it is intended to be used. This notion should be seen as distinct from both the tools or features of the system that allow these activities, (such a document upload tool or a tool that allows creation of MCQs with confidence ratings) and from the content held on the system (such as a page of lecture notes or a bank of MCQs). Functions arise from the interaction of features and content. Below is a list of nine major functions provided to a greater or lesser extent by these systems:

1. **Automated administration:** A means of automating administrative functions such as registration for optional course modules, timetabling, and delivery of administrative documentation
2. **Resource Management:** Making resources easy to find by providing Indexing and Searching features, and by organising and presenting information from various points of view
3. **One-way communication:** Communication from staff to selected groups of students and to individuals. This often includes information about students and where they are in the curriculum.
4. **Two-way communication:** Communication between staff and students, and among students, realised through tools such as email, discussion boards and chat facilities
5. **Integrated learning materials:** Providing teaching and self-assessment materials that are integrated fully into the course, tied either to learning outcomes or to specific teaching sessions
6. **Resources Gateway:** Providing a gateway for 3<sup>rd</sup> party learning resources such as CAL tutorials, perhaps including reviews of resources to point users to what is most appropriate
7. **"Virtual filing cabinet":** that provides academic staff or their assistants with the tools to upload resources into specific areas of the system
8. **Course Information:** Providing information about the course and what it contains at each point, what is expected from students, and instructions for attending clinical placements
9. **Personalised environment:** A personalised learning and information environment where each user sees the information and resources that are most directly relevant to them individually

Figure 3 below shows the main functions of each of the systems according to the function list above. Please note that this table is somewhat impressionistic; the absence of a tick in a given box does not indicate that the system does not fulfil this function at all, only that it is not its main emphasis or particular strength.

	Birm	Camb	UWCM	Edin	N'castle	Notts
1. Automated administration	✓			✓	✓	✓
2. Resource Management	✓				✓	✓
3. One way communication		✓			✓	
4. Two way communication	✓		✓	✓		
5. Integrated materials	✓			✓	✓	✓
6. Resources Gateway		✓	✓	✓		
7. "Virtual filing cabinet"			✓	✓	✓	✓
8. Course Information	✓		✓	✓	✓	✓
9. Personalised environment		✓	✓		✓	

Figure 3 - Main functions of the six VMLEs analysed in depth

Each system tends to have strengths in particular types of features and types of content, reflecting the key functions of the system as a whole. The functions should therefore be seen as broad categories and not a detailed reflection of the features and types of content available from the different systems. For a more detailed breakdown of the features offered by each system, see the table in Appendix E. For a full taxonomy of the types of content, see Appendix D.

### 3.2.2 What do they NOT do?

Generally speaking, the systems examined in this study emphasise the administration of learning and the distribution of learning materials, rather than the facilitation of learning activities online, with the exception of self-assessment facilities and in some cases of discussion boards and chat rooms. Most of the commercial VMLEs offer features to facilitate online learning that were not offered in any (or hardly any) of the systems in this study at the time of writing. Some examples of these features include:

- A digital dropbox that enables students to submit assignments and other documents online, or to share documents with other students (NB A student to student document sharing facility is now available with the Nottingham NLE)
- Ability for students to create their own homepage giving other users information about him/her, including a simple template for making this easy (NB This feature is available with the Edinburgh VMLE)
- As yet none of the systems offer the level of personalisation whereby each user has his or her own homepage that lists the courses each individual is taking. However this may not be appropriate as the medical curriculum, even when nominally modular, consists almost exclusively of mandatory elements so all students in a given year will be doing the same courses
- Learning Units or Learning Pathways - some systems offer a means of creating series of linked web pages which take the learner along a sequential path through the materials.
- Tracking of users to enable tutors and administrators to see which students have looked at a particular page or taken a particular quiz

There are also a number of assessment features common to VLEs that are not available through these systems. See Section 3.2.4 on self-assessment for details of these.

### 3.2.3 How is the content presented?

All of these sites present content in two different ways:

1. Web pages rendered in HTML. Most of the administrative and course background information is presented in this format.
2. As files in native format of a range of common applications that require the relevant software to be running on the client PC. These include MS Word documents, Excel, .pdf documents and others. In general these tend to be:
  - Teaching materials such as lecture notes or worksheets
  - Administrative documentation such as expenses claim forms that have hitherto been distributed on paper

Material that has been uploaded by their authors rather than documentation that has been built into the structure of the system by the developers

### 3.2.4 What self-assessment facilities are offered?

Self-assessment facilities appear to be seen as a core part of all these systems: self-assessment tests are available on the systems at all the six institutions interviewed, and at all the institutions that responded to the questionnaire. They therefore merit a separate subsection in this report.

In a number of centres (UWCM, Birmingham, Newcastle) the self-assessment features have existed as a separate system that predates the VMLE. There are variety of ways in which self-assessment is incorporated into the VMLE:

- Individual tests and questions are released at a time that coincides with the course module they correspond to (Birmingham, Cambridge and Edinburgh)
- Assessment questions are presented to the student in the context of the current work they are studying (Newcastle)
- MCQs are presented in relatively amorphous and unintegrated banks of questions (Nottingham, Birmingham)
- Students are advised to see self-assessment as a self-diagnostic starting point for exploring the VMLE (Nottingham)

Many of the systems contain a mixture of interactive and non-interactive self-assessment tests. Many of the latter are MCQs but there are also short case studies and short essay questions. The interactive tests all include MCQ questions, which the student can answer true or false for each option. Other features offered by various systems include:

- the option of giving a Don't Know answer
- a global mark for the test
- negative marking for wrong answers
- a confidence rating
- a high positive score for a confident right answer, and a high negative score for a confident wrong answer

See Appendix E for details of the features that each system offers.

The interactive self-assessment facilities offered by the VMLEs in the study are tightly focussed on perceived local needs, and there are number of features common to many commercial computer assisted systems that they do not provide. These include:

- Most of the systems in the study only allow a very limited range of questions types, normally only simple multi-option Multiple Choice Questions. They do not offer other popular question types such as Hotspot questions, text matching, ranking, matching or interpretive exercise questions. However Nottingham has developed a more sophisticated assessment system that incorporates many of these question types
- They do not allow students' scores to be recorded and sent to the tutor for diagnostic purposes
- The ability to create question pools from which questions can be selected either manually or automatically at random and combined into tests
- Only the Birmingham MCQ system has a proper categorisation system for questions

### **3.2.5 Is there any element of summative assessment?**

Of the six sites interviewed very few have used or even intend to use the VMLE for summative assessment. Several of the sites are opposed to online summative assessment because the technology is not robust enough and there are a number of logistical and security issues.

{See Section 5.1.2: Commercial vs Bespoke systems}

However there are some exceptions to this:

- One Pathology department has carried out one of its examinations online, although this has led to problems with perceived unfairness. Future exams will return to a paper and optical mark reader format (Cambridge)
- A Physiology Department has driven forward the implementation of a summative test despite misgivings from the system developers (Newcastle)
- One institution does carry out many of its assessments by computer but uses a stand-alone system separate from the VMLE, which requires the invigilator to upload the results to the server individually from each student machine (Birmingham)

## **3.3 Embedding the VMLEs into the curriculum**

### **3.3.1 How do the VMLEs reflect the curriculum structure?**

As described below, the structure of the VMLEs at most sites reflects quite closely the structure of the curriculum at each site. The VMLEs are described as an "electronic analogue of the curriculum". Although the terminology varies from site to site (modules, units, elements, subjects) the essential method of division is fairly similar. Where there is more variation between the different schools is in how each of these is delivered in terms of pedagogical practice, and therefore in the role of the VMLE in supporting learning.

There is some variety in the extent to which these systems cover the entire curriculum. In Edinburgh the system has been rolled out a year at a time, starting from year one. 2001-2002 will be the first time the system has been available for the fourth year. ERWeb in Cambridge is only available for students in the 4th and 5th years of the course. At UWCM ASPIRE covers all courses run by the College of Medicine, including nursing, midwifery and professions allied to medicine courses, whereas the coverage of the remaining five systems is confined to undergraduate medicine.

### **3.3.2 How is the content organised?**

#### **As part of a Course handbook**

For most of these systems (Birmingham, UWCM, Edinburgh, Newcastle, Nottingham), the primary unit of organisation is the course handbook containing information for students about the content of the course and what is expected from students. This is divided into separate guides for each part of the course (variously known as study guides, subject panel booklets, module booklets etc).

Teaching materials such as lecture notes, images and worksheets are accessed from within these and hung onto their structure. In some cases this means that teaching materials tend to be somewhat hidden several levels lower than the more administrative information.

#### **Direct access to teaching materials**

However the systems also use a variety of ways to allow more direct access to teaching materials and enable the contents to be sliced across several points of view:

- Recently added materials are displayed on the home page for each user as Latest Resources (Newcastle)
- The contents of the site is indexed and can be searched by MeSH headings (Birmingham).
- Searches can produce a list of the available resources on a particular topic (Newcastle, Nottingham)
- Searches can produce a list of all resources associated with a particular learning outcome (Birmingham)
- Teaching materials are associated with individual teaching events, such as lectures or tutorials (Birmingham, Edinburgh, Newcastle, Nottingham)

### **By site function**

Cambridge is noticeably different in this respect in that the ERWeb system is not built around a curriculum handbook, but takes as its fundamental means of division the different functions (such as communications tools, links to external resources) that are available through the site. There are separate areas directly linked from the home page for communication, for personalised web links and for lists of learning resources organised under medical specialties.

### **By vertical themes**

Two of the sites (Nottingham and Edinburgh) also have vertical themes built into the curriculum. Both of these systems allow the course to be explored along the vertical themes. EEMeC in Edinburgh also displays a hotlinked logo alongside horizontal components where there is a link to a vertical theme.

### **3.3.3 In what ways is the VLE affecting the practices of learners and teachers?**

The evidence obtained from the six sites for significant changes in learning and teaching practice is so far rather limited. In most cases (particularly Nottingham and UWCM) this is because the systems have not been in operation for long enough to assess their effects, in others because no systematic evaluation has yet been carried out. As mentioned before the six sites interviewed are at quite different stages in their development and this influences how much data is available.

The impression at a number of sites is that most medical educators, even where they use the VMLE to host their teaching material, are not changing their teaching practice significantly as a result. In many cases they simply use the system as a repository for their existing teaching material, and try to reproduce face-to-face teaching in an online environment without modifying their teaching methods to suit the medium. For many the VMLE is seen as a way of reducing workload but not as a potential means of supporting improvements in teaching and learning practice.

Nevertheless the developers believe that the VMLEs have provided a number of benefits for teaching, for example:

- It is easy for teachers to check what their students have and haven't covered on previous parts of the course to ensure consistent coverage and avoid duplication
- Innovative teaching methods have been facilitated, for example where students have used online facilities to write collaborative essays
- Resources can be more efficiently used and recycled across different course elements and years, for example in Newcastle where case studies need only be uploaded once but can be studied at different times from various clinical perspectives
- Staff can communicate with students outside of formal teaching time

There is also optimism among the VMLE developers about the effects on students. They believe that:

- Learning and teaching has become more independent of time and place
- Learners are becoming more independent
- Students can get more and more timely feedback
- The easy and reliable availability of relevant information may encourage medical students to adopt learning strategies which are focussed less on information absorption and more on problem-solving. They may learn to approach information management in a way that is more appropriate to professional practice and to lifelong learning

One of the key sticking points in the use of these systems is whether courses should be run, or course materials provided, exclusively online. Some teaching sessions are being delivered that depend on CAL materials, and there are a small number of totally online modules either planned or already being delivered, including induction for students to the VMLE (Birmingham) and to enable distance delivery (Nottingham). However there is some scepticism about moving learning entirely online unless the benefits to students are very clear (Cambridge). Exclusively online access would not be convenient for example for students on clinical placements who do a lot of their studying and administration while in the car travelling between locations.

Another related issue which has been mentioned frequently is whether it is necessary, once an electronic archive of materials is available, to continue distributing documents on paper. At several

centres students have complained when lecturers suspended paper distribution of lecture notes, and the faculty Office have had to intervene to put an end to this practice. The objection was largely because of the cost of printing, which is often much more expensive for students to do on campus than it is to make illegal photocopies from a textbook at the local newsagent. Moreover some institutions allow students free printing up to a certain quota, and exclusively online distribution forces them to exceed this and thus incur charges.

### 3.4 How the VMLEs are being used

#### 3.4.1 How are the VMLEs being used, and to what extent?

Meaningful and comparable data about the level of usage of the different systems is rather scant, partly because different sites keep records in different ways and at different levels of detail. However there is some comparable information about the level of student use of the systems.

##### 3.4.1.1 Levels of Student use

	Birm	Camb	UWCM	Edin	N'castle	Notts
No. of students	750	246	n/a	n/a	993	1000
No. of students who have used the system	n/a	236	n/a	880	601	650
Years using most heavily	3rd, 4th, 5th	4th & 5th yrs only	n/a	1st, 2nd	1,2,3	1st, 2nd
No. of hits per year	n/a	200,000	n/a	n/a	n/a	4.1m
No. of sessions per year	n/a	18,000	n/a	n/a	n/a	n/a
No. of hits per day	50,000	n/a	n/a	n/a	n/a	9,000
Pages viewed per day	n/a	n/a	n/a	1000+	n/a	3,500

Figure 4 - Usage statistics for the six systems

##### 3.4.1.2 Patterns of student use

Here are some of the key findings from the different institutions:

- There are clear peaks in usage during the period before examinations (Cambridge and Nottingham)
- The VMLE is used "hugely" for self-assessment and increasingly for other resources (Newcastle)
- Students on the more junior years of the course (who have come later to the system) tend to use it more and more deeply, for example by using the discussion board to communicate with each other (Edinburgh)
- There is no identifiable pattern as to which parts of the system are most popular (Cambridge).
- Systems are used more where there is a real need to do so, for example to overcome the isolation of students on clinical placement, which has driven usage of both the study guides and the communications facilities (Newcastle)

##### 3.4.1.3 Levels of staff use

Unfortunately there is data available from only three institutions:

- At UWCM there are 5 clinicians using ASPIRE regularly and 10 more using it spasmodically. (However it is important to note that ASPIRE is still only a pilot service and not yet fully implemented)
- At Edinburgh 70% of year 1 and 2 teaching staff are creating materials for EEMeC, with around 150 active staff accounts
- At Newcastle there are some 40 or so very active teaching staff uploading course resources for the NLE. In addition, there are about 70+ teaching staff involved in creating and uploading the source materials.

#### *3.4.1.4 Patterns of staff use*

At all the six sites, the coverage of resources made available by staff is very uneven across the different parts of the curriculum, although one site reports that all specialties have used the system at least for reviews of resources and communication (Cambridge). There is no consistency between the six sites as to which specialties use the systems most heavily.

Where there is some consistency is in an evident split between the earlier (still in some centres thought of as preclinical) and later (clinical) parts of the course in terms of how much the system is used (Nottingham, Edinburgh and Birmingham). Two of these find that the preclinical parts of the course enjoy far higher population rates than the clinical years (Nottingham and Edinburgh), whereas at the third it is the reverse (Birmingham).

#### *3.4.1.5 Factors influencing staff use*

Where there is a relatively high level of staff use in the clinical years (Birmingham) there is also support available to clinical teaching staff through the educational developers based in the three main teaching trusts associated with this medical school. At institutions that do not have this type of support, enthusiasm for the VMLE within a particular department generally seems to result from the activity of individuals rather from the department as a whole.

One of the main incentives for staff to populate and use these systems is the potential time saving. The perception of the tutors in the clinical years at Birmingham is that the VMLE can save them time, (although it is hard to assess how much the local support that is available contributes to this belief). By contrast, tutors who have to add materials themselves may see this as another chore eating into their already overcrowded schedule. One of the interviewees suggests that one way to persuade clinical teaching staff to start using these systems is to demonstrate how they can save time on administrative activities, thus paving the way later for usage more directly connected with teaching and learning.

However for some sites a significant difficulty has been communication with staff in order to raise their awareness of the VMLE and what it can do, particularly clinical teaching staff based at remote hospitals. This is partly because it is difficult to keep track of so many people, but also because some may not be keen to receive unsolicited communications about the VMLE. At some sites there is also a continued problem of access to suitable computers and internet connections. For example 25% of the clinical tutors who teach Edinburgh students still do not have sole access to an internet connected PC, an issue also highlighted in Conole (2001).

### **3.5 Evaluation**

#### **3.5.1 Evaluation methods**

Very few of the sites involved have carried out formal evaluation of their systems, due to lack of resources and the complexity and evolving nature of the VMLEs. Most rely mainly on informal comments from users. However at Cambridge and Edinburgh formal evaluation has been carried out in the form of questionnaires and focus groups of users. Nottingham has also tried an online questionnaire. Edinburgh has also involved student reps in developing the system and keeps in regular touch with the faculty's Medical Teaching Organisation. Other common ways of collecting feedback from students are as part of their overall course feedback, and during initial sessions training them on the system. Developers at some of the sites also have regular informal contact with students through the IT skills and others courses that they run. Server logs of usage are also kept to monitor which parts of the systems are most popular.

#### **3.5.2 Issues arising from evaluations**

##### *3.5.2.1 Students*

A major issue emerging from the evaluations with students that have been carried out is their preference for printing materials out from the VMLE and their dislike at having to pay additional printing costs (Cambridge, Newcastle and Nottingham). Where attempts have been made to replace paper materials with exclusively online delivery this has led to strong resistance from students. If this approach is to be pursued then Faculties/Universities may in the long term need to consider how they structure charges for student printing.

It has also been found to be important to make it both easy and economical for students to print resources, by for example setting up the system so that documents can be viewed in applications that allow only a part of a document to be printed. Students at Nottingham have expressed a dislike of .pdf documents because they offer limited printing options, even though they are convenient for staff and developers because they compress very well (informal data from the developer at Sheffield also suggests that staff and students have very different needs in terms of what information and how it is presented).

Other uses of online information that have been popular with students include:

- Self-assessment (Newcastle)
- Library search and electronic book reserve (Edinburgh)
- Student peer marking of assignments (Edinburgh)
- Choosing preferences for an Options course online (Edinburgh, Newcastle)
- Timetabled online sessions integrated with other types of teaching (Cambridge)

Another issue identified has been the need to present lists of materials in an appropriate form. Where these are too long students get confused and don't know what to look at, but where they are very short students get the impression that the subject is not properly covered and seek elsewhere (Cambridge).

Experience also confirms the results of other evaluations that computer-based materials will be used if they are integrated into the structure of the course (Timmis et al. 1997) rather than just offered as an optional extra, or if they provide information that is difficult or impossible to access in any other way. An example of the latter is detailed timetable information which allows each individual's timetable to be collated and viewed in a way that is not possible in paper form (Cambridge).

### 3.5.2.2 Staff

Staff reaction to the VMLEs was generally seen as positive, although some teaching staff have expressed concern that if lecture notes are available online then students won't attend lectures (Nottingham). Experience suggests that the main criterion that staff use when assessing a VMLE and its individual features is whether it will be useful for students, and if so they will put up with a certain amount of crankiness in the system (Newcastle). There is also a belief that staff will respond well if they have a sense of ownership of the system (Nottingham). For this reason it may be important to give teaching staff the means to populate the system with their own materials as early as possible (Nottingham). However other centres believe that staff don't necessarily appreciate the best ways of using a VMLE and so creation of its content should be left to the development team (Cambridge).

One factor that has prevented some authors from placing their materials online is the fear that others will steal them and claim them as their own. There is also the issue of whether it is the author or the institution who has the ownership of materials placed online, which remains unclear, coupled with the fear in departments that departing staff may take their materials with them, thus stripping the VMLE of valuable content. These concerns are resulting in changes in staff contracts at some institutions towards stricter control of Intellectual Property Rights by the institutions (Newcastle, Nottingham).

## 3.6 Training and Induction

The amount of training provided to both staff and students varies widely across the six systems.

### 3.6.1 Students

Students at four institutions all receive training in the system as part of their initial induction (Cambridge, Edinburgh, Newcastle and Nottingham). The form of the training varies from a one hour lecture (Nottingham) to a hands-on session provided once-a-year to update students with changes to the system (Edinburgh).

There is an awareness at some centres that hands-on training may not be enough, and that it is also important to train the student in how to get the best out of the system from a learning perspective. However, providing this is not always straightforward; there is uncertainty about who should provide this type of training and how it would fit into the curriculum (Cambridge), and it is felt that students do not receive enough of this kind of guidance from lecturers (Nottingham). It is expected that lecturers

will provide this to an extent but on the whole they do no more than announce to students that materials are available on the system (Nottingham).

### 3.6.2 Staff

It is not generally seen as necessary to provide intensive staff training in the mechanics of the systems, as they are designed to be easy to use, and training activities can eat away at the time available for further developing the system (UWCM, Cambridge, Nottingham and Newcastle and Edinburgh). Most staff training therefore tends to be on an informal ad hoc basis, building up personal relationships with individual staff users.

What is considered more important is to encourage use by raising staff awareness of a) the existence of the VMLEs and b) how they can be used effectively. The former has been done largely through publicity campaigns and through presentations at high level meetings. The latter has been addressed at one school by the educational facilitators working with the hospital based teachers (Birmingham). They have recently started to convene educational fora to discuss educational issues in general, but including the use of the VMLE. They also run a training-the-teachers course that combines general educational theory with the use of IT in learning and teaching.

Other sites are restricted by a lack of staff fulfilling this kind of multidisciplinary role, and do not believe that offering training in pedagogy falls within the remit and perceived realm of expertise of a learning technology unit. Birmingham also run some workshops for university staff through the Staff Development unit, although these are considered insufficient and oversubscribed.

### 3.7 Integration with other University Data systems

One of the key potential benefits of a Managed Learning Environment, rather than a Virtual Learning Environment, is that it brings together data from various sources, enabling data to be held in one place only and avoiding duplication of effort in tasks such as student enrolment, exam marking and record keeping, and providing library information such as reading lists. The VMLEs in this study show a considerable variation in the extent to which they are integrated with other information systems in the faculty and in the University and notable gaps in the degree of integration.

The table below shows which information systems the six VMLEs integrate with:

	Birm	Camb	UWCM	Edin	Newc	Notts
Directly queries centrally held student information			✓			
Queries a copy of centrally held student information	✓	✓		✓	✓	
Queries the library catalogue			✓	✓	✓	✓
Exam results recorded through system onto the central student database	✓					
Queries external resources (eg Omni, PubMed)	✓					
Integrated with other University student information services				✓		

Figure 5 - Data integration in the six VMLEs in the study.

The main factors that inhibit integration are:

- Difficulty in harmonising the data held on the different systems
- Security concerns
- Political difficulties in cooperating with other data providers
- Differences between the information needs of the medical faculty and those of the rest of the University (for example the frequency of examinations)
- A reluctance on the part of the VMLE developers to work directly with the original data, as this might imply a responsibility on their part for keeping it up to date.

## **3.8 Lessons learned and future developments**

### **3.8.1 What have been the obstacles to VMLE use?**

The main obstacles to effective use of the VMLEs mentioned by the six sites interviewed fall into four main categories:

#### *3.8.1.1 Resourcing*

- There have been problems providing access to suitable computers. This is mainly a problem at hospitals and other clinical training sites, where for example students may only have access through a computer in the Library during restricted opening hours (Birmingham, Cambridge, Nottingham and Edinburgh).
- There has been a shortage of resources to provide user training (Cambridge)
- Once a VMLE is up and running as a service, the demands of keeping it going can divert resources from further developments, requiring ever increasing numbers of staff to maintain momentum (Newcastle and Cambridge).
- Clinical academics lack the time to populate the system with resources, especially where teaching is a much lower priority than treating patients (Nottingham and UWCM).
- Lack of time is also a problem that can be faced by preclinical tutors, who feel pressured by the demands of the Research Assessment Exercise to devote themselves to research rather than to teaching (Birmingham).

#### *3.8.1.2 Communication and training*

- Communicating with both staff and students is felt to be a problem, exacerbated by difficulties with keeping email lists up to date, by the sheer number of clinical tutors and by the lack of IT facilities in some cases (Nottingham and Edinburgh).
- Students do not always use the system unless they are regularly reminded to do so (Birmingham).
- Staff may tend to use the system inappropriately, which can be off-putting to students. This requires direct intervention from the system developers to avoid this (Cambridge).

#### *3.8.1.3 Content ownership*

- There have been efforts to share content between institutions, but there has been resistance to this from a high level, even though people on the ground are very keen for this to happen (Birmingham, UWCM, Nottingham, Newcastle)
- Some teachers are reluctant to place their materials online due to concerns about piracy and Intellectual Property Rights (Newcastle).

#### *3.8.1.4 Internal politics*

- The university centrally has seen what has been developed in the medical faculty, and have expected that this will be provided for free to the rest of the university (Cambridge and Newcastle).
- There has been a lack of awareness of the potential of the technology among senior management, and a corresponding lack of support for development (UWCM)
- The faculty has tended not to recognise the full pedagogical potential of the VMLE, perceiving its value principally as an administrative system and expecting the main development to be in that direction (UWCM).

Note that none of the six sites said that the technology presented any significant problems.

### **3.8.2 What are the main success factors identified?**

The following is a collation of all the suggestions and recommendations made by the developers and implementers of the six systems involved in the case studies:

#### *3.8.2.1 Getting started*

- Understand the institutional curriculum and the local needs before starting development, and create a system that responds to them
- Use a bespoke system developed locally, thus avoiding the prescriptive path laid down by most ready made systems

- Talk to other people who have developed and implemented these systems

### 3.8.2.2 *Institutional relationships*

- Get support for the VMLE from the Institution centrally at as high a level as possible
- Understand that the issues involved in implementing a VMLE are managerial, not technological
- Make all those involved aware that implementing a VMLE will change the educational processes and practices in the institution
- Get educationalists and technologists working together

### 3.8.2.3 *Rolling out the system*

- Implement the system little by little - attempt evolution rather than revolution and bring people on board gradually.
- Carry out continual evaluation to ensure development is meeting the identified needs
- Make an immediate start rolling out what's available now rather than waiting til the system is perfect
- But take a longer term perspective to ensure that the systems will be relevant well into the future and that they take advantage of the best of the available technology

### 3.8.2.4 *Running the VMLE*

- Provide dedicated resources for services such as support and training, thus freeing up development staff to continue working on the system
- Integrate the VMLE with as many other information systems as possible
- Even when using a system developed at another institution, host resources on a local server to avoid network bottlenecks,
- Use third-party content where available and appropriate
- Enable authors to populate the system as much as possible rather than trying to add all the content themselves

### 3.8.2.5 *Getting users involved*

- Evangelise and communicate with users
- Involve staff in the development and give them a sense of ownership, by allowing them to populate the system with their own material
- Involve students in development and give them a sense of ownership of the system by seeking their feedback and acting on it

## 3.8.3 **What future developments are foreseen/planned in the light of experience so far?**

Please note that the following were described as intended future developments in the spring 2001. By the time of publication many of these are likely to be in place. Developments for the future fall into a number of key areas:

### 3.8.3.1 *Personalisation of systems*

- This is probably the major development planned to varying degrees by all the six interview sites
- There will be separate portals for teaching staff, management and students so that each group sees an interface that is most relevant to them. This will include a personalised timetable and tools such as My Calculator, My Calendar (Newcastle).
- VMLEs will integrate with a Personal Academic Record System (PARS) or equivalent, which provides in electronic form a formal record of academic achievements as well as a reflective record of personal development and academic and additional skills (Newcastle, Edinburgh, UWCM).
- An online learning portfolio management system will be implemented where an individual can amass evidence of learning activities successfully carried out (Edinburgh).
- The system will intelligently analyse a user's learning style and recommend further suitable resources. This would be modelled on the approach used by companies such as Amazon.com

which tell you that readers who bought book 'A' also bought books 'B' and 'C' and CD-ROM 'D' (Cambridge).

- Users will be able to set individual pathways through the materials so they can specify for example what they want to see and in what order (Cambridge).
- In the longer term the VMLE will become a personalised information environment, not just for a single course, or even for all an individual's educational needs, but as a means of integrating all their information requirements at all stages in their life (UWCM).

### 3.8.3.2 Assessment

- MCQ systems will be developed to incorporate a wider range of question types (Nottingham)
- A pretest facility will be built into online tutorials, which will enable a baseline score to be established so that the educational effectiveness of resources can be evaluated. This will also give the student an indication of whether they actually need to take a particular tutorial (Cambridge).
- There are moves towards incorporating wider forms of self-assessment to include practical clinical skills. This will take the form of virtual OSCE (Objective Structured Clinical Examination) program that takes the student through the OSCE process (Edinburgh).

### 3.8.3.3 Other new features

- Increased incorporation of video resources into the systems. This is already provided in limited quantities by several systems on an experimental basis (Birmingham, Cambridge, Edinburgh, Newcastle, Nottingham).
- Author uploading facilities are to be provided by all the six institutions interviewed, despite some misgivings about allowing academics to populate the system themselves (Cambridge).
- Separate interfaces are being created for authoring different types of materials such as tutorials and MCQs (UWCM).
- MeSH headings will be incorporated for indexing and classification of resources (Edinburgh)
- The existing use of MeSH headings will be enhanced by the development of pull down list of headings, enabling users to select headings without having to know them previously or to refer to a MeSH catalogue (Birmingham).

### 3.8.3.4 Flexibility/Interchangability

#### 3.8.3.4.1 Sharing content between institutions

- Developers at different institutions have experimented with querying each other's database of questions so that for example one institution can present questions from another school but using the look and feel of the their own system (Birmingham and Newcastle).
- There is collaboration taking place with BIOME and related resources towards integrating their RDN 'feeds' into the VMLE (Newcastle).
- VMLEs not already using XML, the emerging standard for systems of this type, will start to do so. This will allow conversion of materials into any format on any platform (Edinburgh)
- Work is ongoing to integrate IMS standards into the VMLE (Newcastle).

#### 3.8.3.4.2 Disseminating the system code

- Systems will be made available as open source so that other institutions can use components of it. (UWCM)
- Systems will be made more modular which will enable other institutions to adopt parts of it. (Cambridge)

#### 3.8.3.4.3 Deliver resources to a wide range of platforms

- Experiments will be carried out into using Wireless Application Protocol (WAP) and other wireless technologies
- Developers will also experiment with delivering the VMLE to Personal Digital Assistants and WAP mobile phones (UWCM, Newcastle and Nottingham)
- This will enable the content of VMLE to be used on the move, and may help to address some of the limitations of computer delivered learning (Cambridge)

### *3.8.3.5 Promotion and Training*

- Initiatives are widely planned to further promote the VMLEs to their institutions at all levels
- Training and staff development events will be run where enthusiastic teaching staff present examples of how they have used the VMLE (Edinburgh)
- Contacts with senior medical educators will be developed to get more influence within the medical faculty (UWCM and Nottingham).

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## 4. Questionnaire Results

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### 4.1 Introduction

The following section presents the results of a survey carried out among UK medical schools to assess the level of use of Virtual and Managed Learning Environments within that sector, to discover the drivers and purposes behind this, and to identify the obstacles and issues that have emerged.

The data derives from two sources:

- 1) Interviews carried out with staff at six UK medical schools between February and April 2001
- 2) Questionnaires distributed with the help of the LTSN-01 in June 2001 by email to 18 remaining schools; 15 responses were received. The questions were derived from the themes identified in the interviews, and emphasised questions that could be answered in a short multiple choice questionnaire.

Appendix A contains the full answers to the questionnaire and the text of the questionnaire itself appears in Appendix B

Interviews were carried out at the following schools:

Birmingham	Edinburgh
Cambridge	Newcastle
University of Wales College of Medicine	Nottingham

Questionnaire responses were received from the following schools:

Aberdeen	Oxford
Bristol	Queen Mary College, London
Dundee	Queen's, Belfast
Guys, Kings and St Thomas', London	Sheffield
Leeds	Southampton
Leicester	St Andrews
Liverpool	St George's, London
Manchester	

The aims of the survey are to:

1. present the issues and opinions raised by the interviewees in a quantifiable form
2. assess the extent to which the trends and issues identified during the interviews were generalisable across the whole sector
3. assess the level of VMLE usage across the whole sector

## 4.2 Results

### 4.2.1 Question 1: Where do the Medical Schools currently stand in respect of VMLEs?

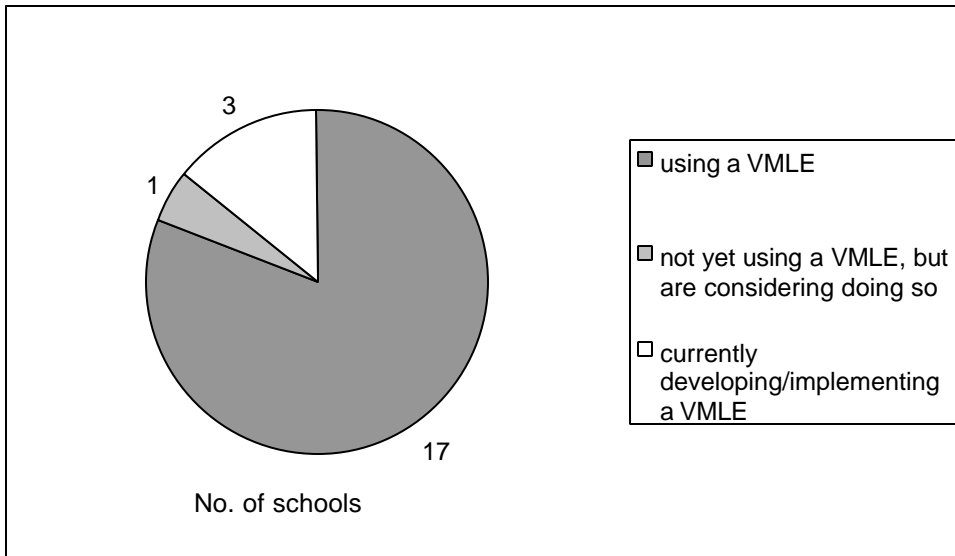


Figure 6

### 4.2.2 Question 2: Are the Schools using Commercially available systems, developing their own in-house, or using systems created at other HE Institutions?

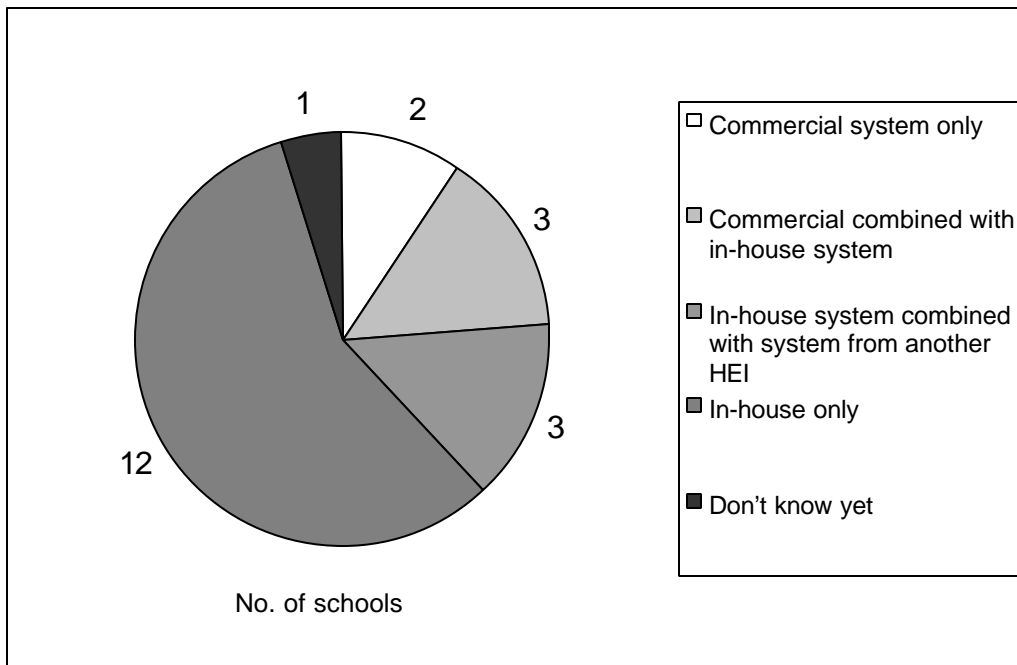


Figure 7

### 4.2.3 Question 3: How long have the Schools been using their VMLE?

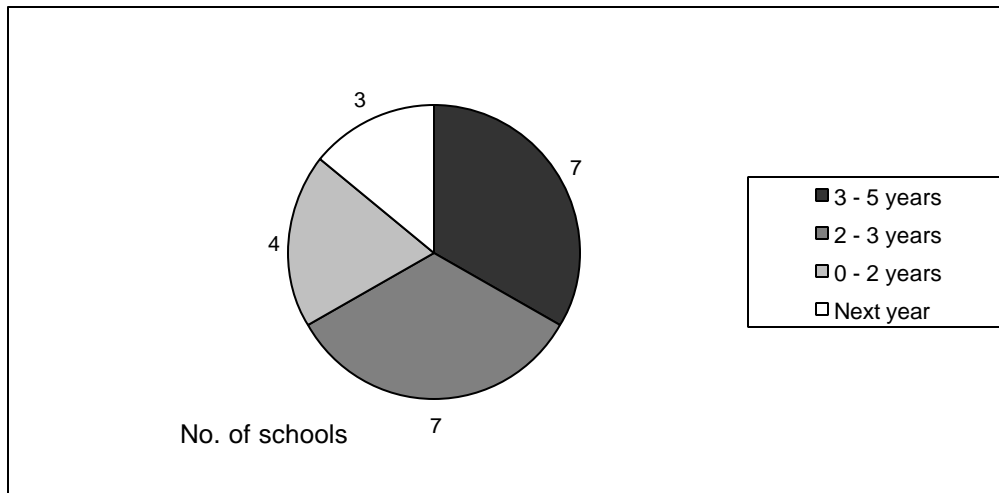


Figure 8

### 4.2.4 Question 4: For those schools not intending to use a VMLE, what are their reasons for this decision?

This question did not apply to any of the respondents

#### 4.2.5 Question 5: Who has driven the development or adoption of the VMLE?

In this question respondents were asked to indicate all that applied from the following:

- The university (VC or other senior decision makers)
- The medical faculty (Deans or other senior decision makers)
- Computer based learning subdivision in the medical faculty
- Enthusiastic individual IT developer(s)
- Enthusiastic teaching staff
- Students
- Other

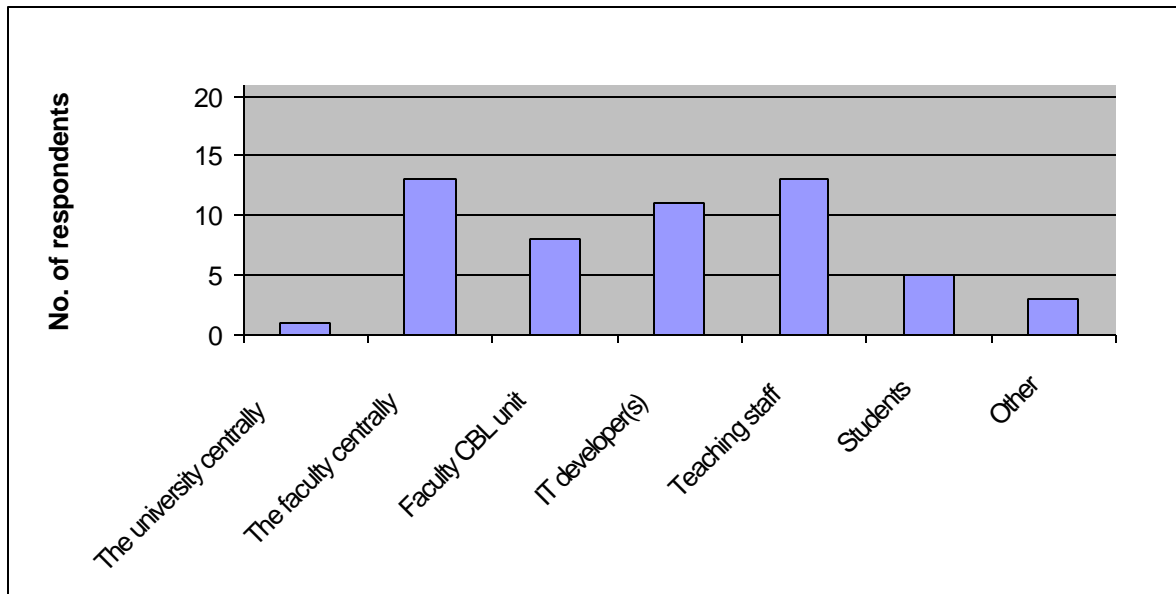


Figure 9

"Other" answers were:

- a Senior Lecturer in Medical Education
- the Head of a Learning Resources Unit
- the Chair of a Technology in Support of Learning Committee with strong support from Deans

#### 4.2.6 Question 6: What are the main reasons given for having a VMLE?

Respondents were asked to select three from the following:

- Support students studying at a distance from the institution
- Managing large numbers of teachers
- Accommodating increased student numbers
- Managing changes in the curriculum (problem-based, case studies etc)
- Managing varied intakes of students (accelerated entry, part-time students etc)
- Managing complexity of the curriculum
- Technology is available
- Demand from staff/students
- Need to keep up with the rest of the sector
- Other

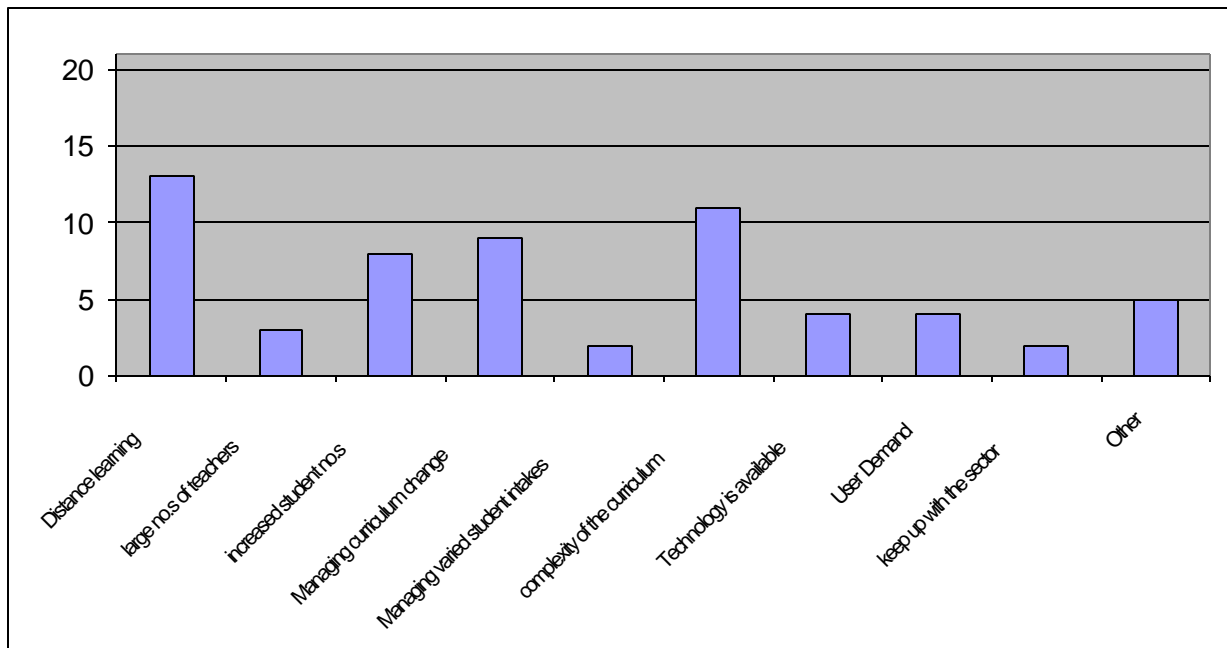


Figure 10

"Other" answers were:

- A need to support learners in a more structured way
- Achieving vertical and horizontal integration of learning resource across the curriculum
- It is an interesting project

#### 4.2.7 Question 7: What are the key functions delivered by the VMLEs?

Respondents were asked to select two from the following:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Information about course (study guides, curriculum structure etc)
- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, Computer Based Learning tutorials, quizzes etc)
- Other

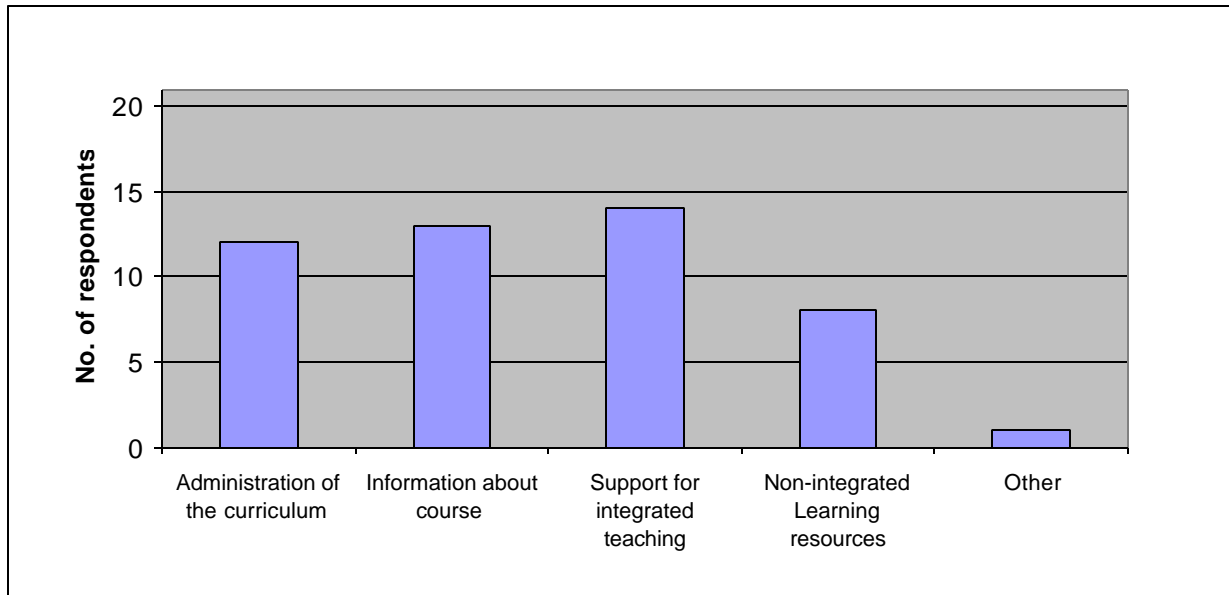


Figure 11

"Other" answers were:

- assist curriculum design and revision

#### 4.2.8 Question 8: What key features are or will be provided by the VMLEs at these institutions?

Respondents were asked to select as many of the following that apply at their institution:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- A dynamic timetable that can be modified online
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Facilities for summative assessment
- Course administration information
- Study guides
- Indexing (eg through MeSH headings)

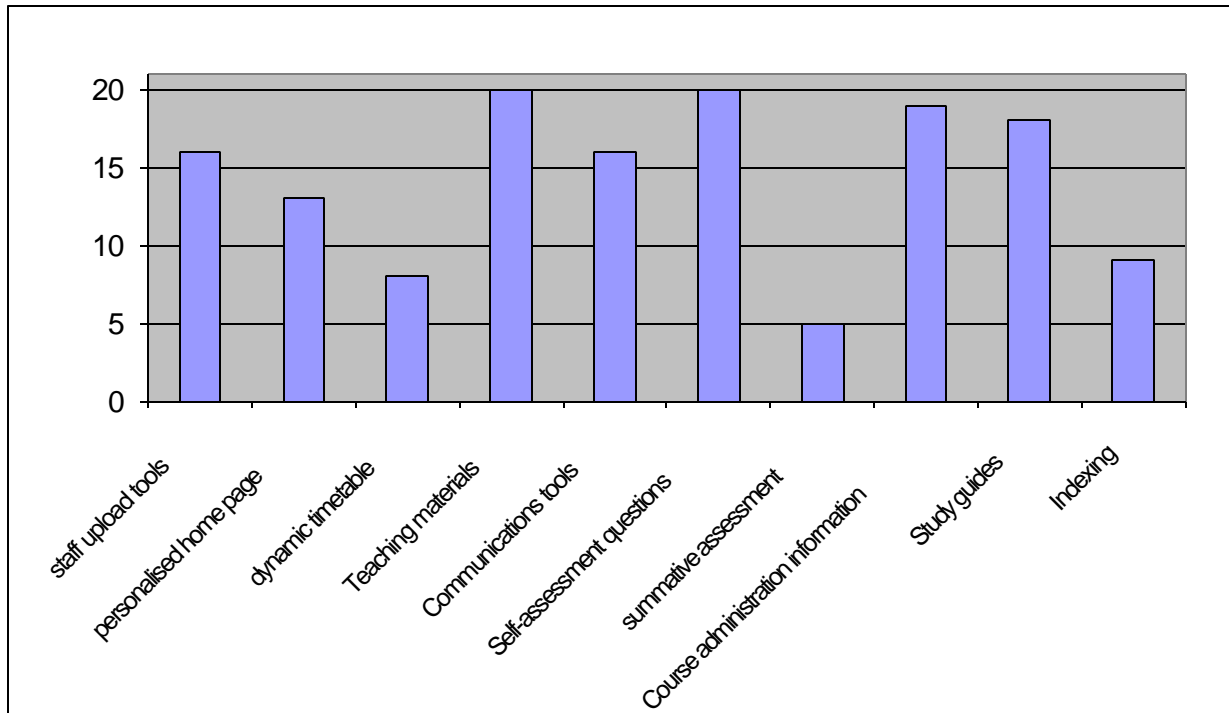


Figure 12

#### 4.2.9 Question 9: To what extent do these systems integrate with other institutional information systems?

Respondents were asked to select as many of the following that apply in their institution:

- The question is not applicable to this institution (where the institution does not have other systems to integrate with)
- Our system directly queries centrally held student information
- Our system queries a copy of centrally held student information
- Student information has to be entered separately onto the system
- Our system can query the library catalogue
- Exam results can be recorded through our system onto the central student database
- Other type of data integration

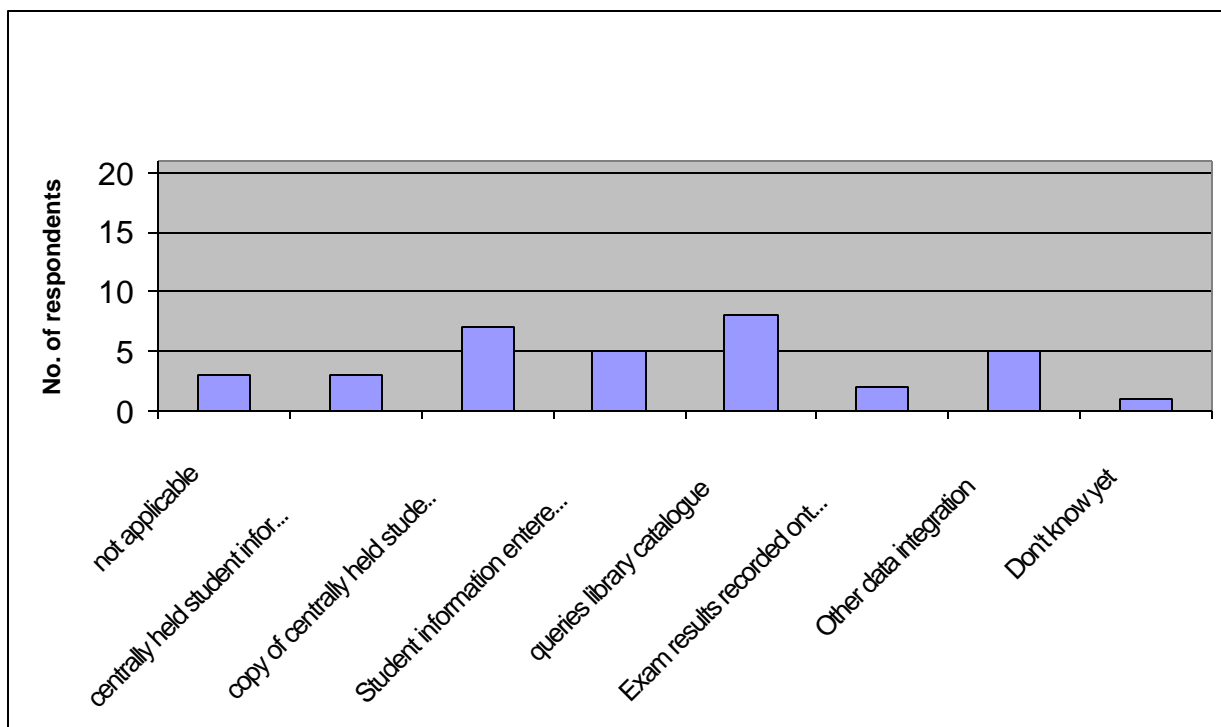


Figure 13

"Other" answers were:

- At present exploring greater degrees of integration with a university-wide VMLE
- On-line course selection and allocation, and other registry material; however very limited access to main College student record system for security/political reasons. This may improve in the near future.
- Integrated with the College web site
- Dynamic links to external resources, gateways and publications databases such as OMNI and PubMed.
- Links to University student portal

#### 4.2.10 Which are the main problems and obstacles experienced to a significant extent with respect to VMLE implementation

Respondents were asked to select all that apply from the following:

- Lack of interest/awareness by staff
- Lack of resources for development
- Lack of support from faculty/departments
- Inappropriate use by staff
- Students not opposed but not in the habit of using it
- Opposition from students
- Lack of IT facilities/network connections
- Developers' time taken up with providing a service so no further development
- Difficulties/Delays in choosing suitable system
- Other

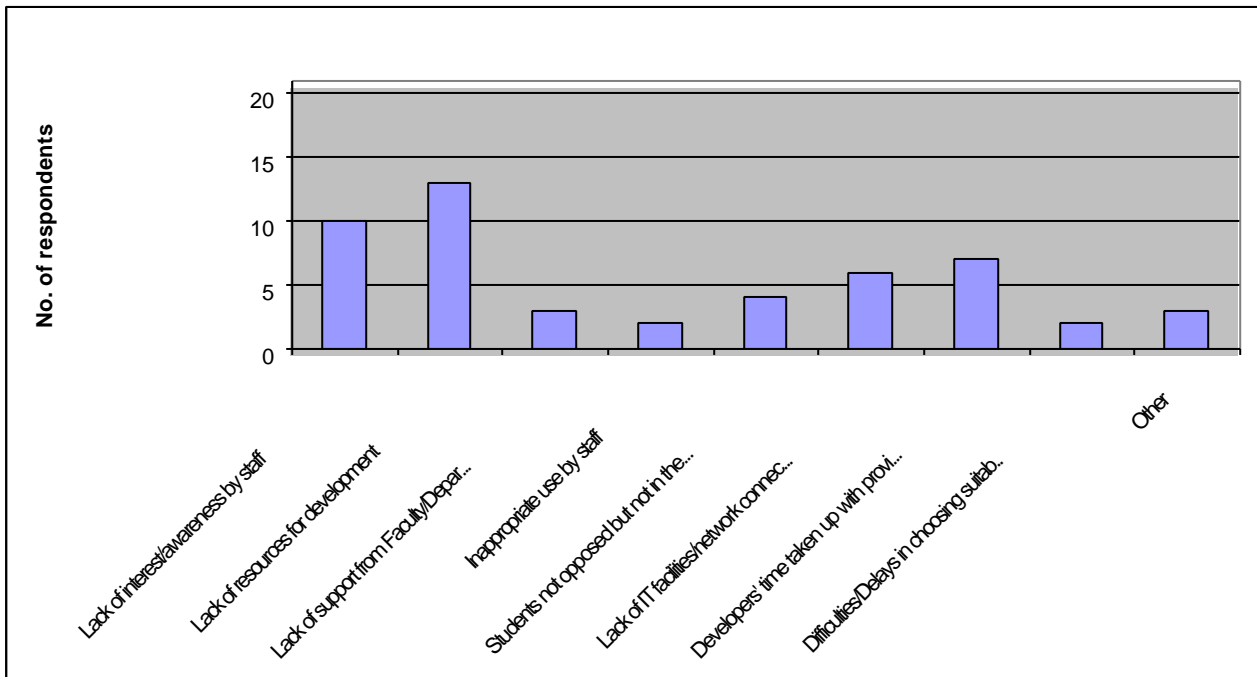


Figure 14

"Other" problems mentioned were:

- Motivating non-enthusiast staff
- Inability to get direct links to main College students admin systems
- Lack of staff and lack of security for existing staff
- Issues with the central institution databases exchanging information
- Providing access from off-campus
- Communication with staff

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## 5. Discussion

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This section returns to some of the key issues emerging from the data presented in the previous sections.

### 5.1 Developing the VMLEs

#### 5.1.1 Effective drivers for development

It would seem logical that a VMLE implementation will encounter less resistance from teaching staff if it is seen as an initiative coming from the faculty or institution at the highest level. Lack of staff awareness/interest has been identified as a problem by at least 10 of the 21 institutions surveyed. However this problem was reported by only 4 of the 13 institutions where development has been driven by the faculty centrally. Moreover, of the 10 institutions that reported the problem, only 3 said the faculty or institution was involved in driving the development of the VMLE.

Moreover a chi-squared ( $\chi^2$ ) test returns an observed value of 3.88, against a critical value of 3.84 using a probability level of 0.05 and degrees of freedom = 1. This suggests there is a marginally significant negative correlation between institutions where development of the VMLE has been driven centrally, and those that suffer from lack of staff awareness and interest in the system.

Although by no means conclusive, these figures would support quite strongly the respondent from Guys', Kings and St Thomas medical school who writes:

*"It is essential that there is full support from senior faculty and admin for these systems to work effectively." coderef=quest8*

#### 5.1.2 Commercial vs. Bespoke VMLEs

Of the 21 institutions that provided data for this study, only two are exclusively using a commercial VMLE system (Leicester, St Georges). The interviewees have provided strong reasons why this has been the case (see Section 3.1.6). At several of the Universities involved in the study the University as a whole is adopting or has adopted a commercial system but the medical school has chosen to create its own bespoke solution.

##### 5.1.2.1 Advantages of bespoke systems

The requirements of Medicine are clearly different from those of other academic subjects, mainly because of the complexity of the curriculum. Furthermore in medical education the same material frequently comes up repeatedly to be used in different ways, requiring extensive cross referencing between different points in the course. The main deficiency of commercial VMLEs for medical education is that in general they are unable to reflect this complex structure. Systems such as Blackboard and WebCT require materials to be uploaded into individual parts of the course structure and only allow them to be viewed from that perspective.

By contrast, the underlying database structure of many bespoke medical systems allows materials to be listed, searched and viewed from different perspectives, such as by association with a particular course element, learning outcome, keyword, vertical theme or lecture/tutorial. Hence materials can be viewed from different contexts without the need for duplicate copies. Unlike commercial systems, they are able to reflect connections between the components of the curriculum where for example there are vertical themes, such as clinical skills or medical ethics, which run throughout the curriculum and link in at different points.

Moreover whereas most commercial VMLEs are designed to reflect a modular course structure that allows optional study units to be combined in different ways to create a degree course, medical curricula tend to consist largely of mandatory elements taken in turn by all students.

Even though commercial systems have progressed substantially in the past few years, at the same time there has emerged a substantial body of highly developed expertise working specifically in the medical education field. A clear vision is emerging from these people about how to develop these systems further and to turn them into sophisticated personalised learning environments that are even better suited to the specific needs of this context. In this respect the bespoke medical VMLE community is likely to remain ahead of their commercial rivals for the foreseeable future.

### 5.1.2.2 *The disadvantage of bespoke systems*

The result of the survey indicates very clearly the main problem of bespoke systems: 15 out of 21 medical schools are developing a system for exclusive use at their own institution, and at the same time the most commonly mentioned obstacle is lack of resources for development. Furthermore many units have become victims of their own success and are having to devote more and more of their limited resources to supporting the existing system rather than spending time developing it further.

Given the shortage of resources, this massive duplication of effort, involving only very limited sharing of systems and components between institutions seems wasteful and illogical. This seems particularly true given that different systems have developed strengths in different areas, which if shared could enhance the functionality of all the systems.

### 5.1.3 **The potential for sharing developments**

The TLTP3-86 project (<http://nle.ncl.ac.uk/nle>) led from Newcastle University has set out to establish the extent to which a VMLE developed at one institution can be shared at others. During this study discussions were held with three of the sites involved (including an informal discussion with the Project Officer at Sheffield as well as interviews at Newcastle and Nottingham). The impression gained is that many of the components of the original system have been successfully transferred to other institutions, but that curriculum variations mean that wholesale transfer is not practical and considerable local development is still required.

Nationwide there is wide variation between the curricula at different medical schools, both in terms of how they are structured and how they are delivered. This means that a one size fits all "Medical" VMLE developed for and by the sector may be little better than a commercial off-the-shelf system. The ELEN Virtual Campus project (Diercks-O'Brien 2000) found comparable difficulties in its attempt to roll out a single VLE to 7 HE institutions. A forthcoming formal evaluation of the TLTP3-86 project (due August 2001, see: <http://nle.ncl.ac.uk/nle>) will no doubt cast more light on this.

A more fruitful approach to the problem may be to try and share some of the components and content of these systems, without necessarily adopting the complete environment. The survey (Section 4.2) and the analysis table (Appendix E) show that most of the systems in use in medical schools have a number of key components in common. There is now considerable expertise across the sector in the use of technologies that facilitate the sharing of components and content. The modular nature of a platform such as the Zope object-oriented web application system enables a framework of tools to be developed to created from which multiple sites can be developed. Zope objects are all stored using XML (Extensible Markup language) technology, which allows easy import and export of content across a wide range of platforms.

It would seem logical therefore to have a pool of tools and components that can be shared but combined at each site in a way that suits local conditions. These would be even more powerful if they were made to be configurable to suit local preferences. These could include a Computer Assisted Assessment engine, Communications Tools, Timetabling, Search and Indexing Tools, and Personalisation Features, and a PARS.

A likely obstacle to such a development is the fact that so many institutions are already developing their own systems and any initiative to reshape them to conform to a single technology standard will take time and may meet with understandable resistance. Nevertheless developers who are following trends in web technology will be aware of the potential of systems such as Zope and XML, and there are examples of institutions who have started by using proprietary technologies but have subsequently begun to adapt their systems to use more flexible technology.

### 5.1.4 **Populating the systems**

Another development issue at a number of institutions is that progress in populating the systems with appropriate content is slow and patchy, with wide differences between parts of the curriculum and between subject departments.

Many institutions have taken the view that the only sustainable model for populating their site is to make it the concern of teaching staff and administrative staff, rather than the responsibility of learning technologists. They therefore provide the tools and training to do this, and create templates to help authors get materials into an appropriate format.

However this approach does itself not solve the problem, as content creation and management requires significant time and may be a low priority for busy clinicians and academic researchers. Lack of staff involvement was identified as a problem at least by 10 of the 21 schools in the survey. As one respondent says:

*"it is difficult to get all staff to provide learning and teaching materials for their parts of the course". coderef=quest5*

Furthermore many clinical staff do very little teaching and often have a relatively underdeveloped awareness of appropriate pedagogical strategies for this medium. (This was either mentioned or implied as a problem by many of the interviewees, although it was not reflected in the questionnaire survey.)

Four possible ways of alleviating this issue are:

1. *For academics and clinicians to be offered an incentive for using and populating the system*  
The hope has been expressed that VMLEs can offer facilities that will encourage these groups to use it by saving them time on core activities such as research or administration. Having got them interested and familiar with the system it is then be a much smaller step towards use for learning and teaching.
2. *For some level of continual support to be available for academics in populating and using the system*  
A model that seems to have been successful particularly at Birmingham is where there are educational developers working to support teachers in each of the three clinical years. This role includes pedagogic training as well as support with using the VMLE. The relatively high level of use of the Birmingham VMLE for these years compared to the relatively unsupported preclinical years, especially since this pattern is the opposite of several other sites, suggests that the educational developers' role may be crucial.
3. *For online document editing facilities to be made available*  
One of the most time consuming aspects of managing online teaching materials in native formats is that with most systems, making changes to an online document involves editing the offline original, then deleting the original and reuploading the new version. This can be avoided if online documents can be edited directly. This is made possible by storing all documents on the VMLE as XML, irrespective of their original format (Word, pdf, HTML etc). Tools can then be used for editing documents online independently of their specific format. Documents can then be rendered back into the original or any other format.
4. *For institutions to share content as much as possible*  
Experiments carried out so far indicate that the technical questions involved in this appear resolvable. There is also clearly a will towards sharing resources among the developers at many of the sites. The sticking points remain resistance among senior figures in faculties to sharing intellectual property with competing institutions, and a fear among academics that their materials will be plundered without acknowledgement.

## **5.2 The systems, their functions and content**

### **5.2.1 How effectively are the contents displayed and organised?**

The emphasis of most of these systems is on course information and administration rather than delivery of online learning and teaching. Content presented in the foreground tends to be documentation providing information about the course (course handbooks or study guides), whereas resources for learning and teaching such as online tutorials, communication tools or CAL packages are mixed up within this and can be quite hard to find.

This does not seem necessarily to be the most appropriate way of presenting the material. Informal data from Sheffield suggests that it is teaching materials that are most valued by students, whereas for staff the curriculum information is particularly important in helping with planning etc. Much of the information foregrounded in these systems is probably used at least by students mostly for reference purposes, and what they need to look at more frequently and therefore have presented most prominently is the teaching materials. This issue may have implications for what should be presented to different groups of users in the future releases of VMLEs that offer individualised "My Curriculum" views of the system.

Furthermore coverage of different subjects is still very variable and students can not necessarily tell which courses have resources available without drilling through all the background information. The Newcastle and Nottingham systems address this to an extent by displaying search results in two separate sides of the screen, one for teaching materials and the other for course information.

## **5.2.2 HTML vs Native formats and their relative status**

Most of the VMLEs present different parts of their content in one of two different ways:

- 1) As HTML documents that are presented as integral to the structure of the site and are built directly into its navigation system.
- 2) Documents and files of other, often very varied, types. These include Word, PowerPoint, pdf, Excel, .jpg, .video clips and others. These are normally displayed on the site as links embedded into HTML content pages, and often require a browser plug in or are opened within their native application.

It is interesting to consider the relative status of these types of resources, the distinction between which often seems blurred, a fact that has presented difficulties in describing the different content of the systems. Could it be that the resources presented as HTML seem more "official" and permanent, whereas the native documents seem more ephemeral and subject to change? Often, but not always, the HTML resources are those that come through the faculty office, whereas the native format resources are those authored by academic staff. The choice of format would seem to suggest how the two types of resource are meant to be used by students, whether printed or read on screen, used for reference or read in full. But it is not necessarily clear that this is a result of deliberate decision or simply the outcome of convention.

The distinction between this will be less acute when tools become more widely available that allow a document to be stored in a single standard format (XML), and rendered into any format required (Word, .pdf, HTML etc) depending on its intended use.

## **5.3 How they are used**

### **5.3.1 How effectively are they used for teaching and learning**

#### *5.3.1.1 Emphasis on administration and delivery of paper documents*

As has been mentioned, these systems emphasise delivery of course information and administration functions. Contents are organised around study guides and frequently take the form of electronic versions of documents such as lecture notes that would otherwise be distributed on paper. The emphasis on curriculum information and administration rather than teaching reflects the priorities of the medical faculties that have commissioned and funded these developments, rather than the vision of medical educators. Even where there is a vision of the potential to directly support educational activities, developers have often had to sell the system to their faculty first in terms of the administrative benefits.

Resources on these systems that are aimed at supporting and promote learning and teaching activities taking place online are relatively few. Even where communication tools are included in the systems they mainly seem to be used for administrative purposes, for announcements and similar functions rather than for learning and teaching activities such as online tutorials or student collaborative work. Data from the interviews seems to suggest that many teachers see the VMLE as a way of saving them time rather than as a way of extending learning opportunities.

This clearly does not seem to be the intention of those who responded to the survey however, as 14 of whom (out of 21) selected "Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)" as one of the two main functions of their VMLE.

The optimistic scenario is that although teachers may start off using the VMLE as a platform for existing practice, the novel nature of the medium will encourage reflective practice and thereby raise the profile of learning and teaching, thence leading to more appropriate and more adventurous uses (the so called "Trojan Mouse" effect (Soloway 1996)).

Furthermore there are already a small number of examples of effective and innovative online teaching and learning using these VMLEs, for example:

- Extensive use for student self-assessment
- Links to CAL applications either created locally or obtained elsewhere
- Peer assessments
- Collaborative assignments
- Tutorials at a distance using chat tools

Clearly this issue is very closely related to the question of encouraging lecturers to populate the system with appropriate content. Again the role of educational developers in promoting pedagogical awareness may be key, as well as cooperation between medical educators and technical developers. More examples need to be collected of innovative uses of the systems for teaching, which can be used to demonstrate the possibilities to others.

### *5.3.1.2 Integration of learning materials into the curriculum*

Another danger from a learning and teaching perspective is that there is a temptation to put materials online and simply expect that students will use them. Experience of Computer Assisted Learning at these institutions and elsewhere (Timmis 1998) suggests that materials will be used far more by students if they are built into the structure of the course rather than presented as an optional extra.

The facility developed at Nottingham for timed release of teaching materials may have a role to play here. Even though the original motivation for having this facility seems to be to structure students learning by presenting materials to them in a set sequence, another benefit may be that it can provide an element of pacing for the online aspects of the course that is normally provided in face to face learning by events such as lectures and tutorials (Mason 1996). This can give a sense of taking part in a meaningful sequence of learning events, thus enhancing motivation and providing a sense of orientation within the online environment.

### **5.3.2 Printing**

Printing from the VMLE has raised a number of issues:

1. There is a sense that for many, the system is seen as a means of electronically distributing learning materials that are intended to be viewed in printed form, thus passing both the hassle and the cost of printing to the student. The hostile reaction of students to this indicates that replacement of paper distribution is not a practical option with existing students who are used to being given printed materials. If exclusively electronically distribution is desired, it may be better to do it with a new intake of students. Furthermore there should perhaps be some way of mitigating the cost of this.
2. As mentioned above much of the course information on many of these systems is rendered in HTML format only, and not in a format suitable for printing. In their current format some files would give you a single sentence on the page while others would give you pages and pages of text.
3. The need to print materials raises a question over the value and purpose of electronic materials of this type, especially if students are still to be given printed documents for the foreseeable future. It suggests, as have some of the interviewees, that the main benefit of having this type of information on the VMLE is for students who have lost the original handout or for revision. This aspect of these systems may become more useful if means are found to avoid the need for paper documents.
4. Experiments that have been carried out by some of the medical VMLE developers into delivering parts of the VMLE content to Personal Digital Assistants (PDAs) and Hand-held computers represent a move in the right direction for the longer term. If eventually students are generally equipped with these devices and can get network access using wireless network technologies, VMLE content will become far more portable, perhaps rendering printing less vital. Nevertheless PDAs are not proving popular at the moment and there are a lot of issues about appropriate formats for delivery of educational materials to such small screens.

## 5.4 Training

Experience from the interviewees suggests that hands-on training in the practical skills needed to use the system is NOT the greatest need. The systems are designed to be easy enough to use without extensive training of this kind.

The survey has identified the following as the main training needs:

1. It is vital to maximise awareness among staff and students of the fact that the system exists, what it can do and the fact that it is easy to use
2. Staff who are putting resources onto the systems themselves need some technical awareness of appropriate formats and file sizes to prevent them uploading unmanageably large files
3. Staff and students also need training in how the VMLE can be used effectively for learning and teaching. Possibly the most convincing way to do this is for innovative users of the VMLE to demonstrate to their colleagues what they are doing with the system

Apart from the issue of what training to provide, there is the question of who should best provide it. Some of the development units in the survey provide training to students as part of their general IT, as well as one-to-one support for staff. However in general they do not see it as their role or within their competence to provide training in effective pedagogy. The other inhibiting factor is the fact that providing this kind of training eats into the resources available for development of the systems.

It would therefore seem appropriate for other units within the institution to become involved. This could include staff developers as well as education and medical education experts. Again the model adopted at Birmingham, particularly in providing educational developers to support of clinical teachers, could perhaps be followed at other institutions.

## 5.5 Lack of data integration

The survey indicates that only a minority of the systems have any form of integration with other data systems. For many of those involved in this area, data integration is the holy grail of VMLE development as it offers the promise of enormous savings in administrative time, guarantees the integrity of all the data held and avoids the duplication of records.

While in some cases the developers simply have other priorities, the main obstacles to integration are political and managerial rather than technical, for example:

- The workflow within departments for updating information may not synchronise with the updating requirements of central systems
- There may be difficulties in getting agreement on compatible data structures
- Security concerns can also prevent data from being made available

Where there has been a measure of success is where:

- The VMLE development unit also have control over other data systems
- Where there has been lobbying and discussion between high level institutional decision makers
- Where all those involved share a vision of the potential and a willingness to work towards it

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## 6. Recommendations

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### 6.1 To systems developers

1. System developers should work closely with faculty and central staff to ensure greater communication and coordination with medical educators about the content and organisation of the systems and the training of users
2. System developers should work with medical educators to create VMLE systems which are structured so that it is relevant learning materials that are foregrounded rather than administrative functions and course background information. Systems should be designed so that students can see easily what relevant materials are available. This can be done partly through individualised portals, and enhanced search facilities
3. System developers should work closely with national strategy groups (i.e. LTSN-01) to develop (or create) networks to:
  - a. Maximise collaboration and communication between developers at different institutions including attendance at events where experiences can be shared.
  - b. Ensure gradual but universal adoption of emerging technology and other standards, probably including XML, IMS (Instructional Management Systems) and MeSH indexing
  - c. Clarify the relative roles of embedded HTML and native format documents and what type of materials each is intended for and why, and provide online guidance about each resource to indicate how it can be best used, for example whether it should be read on screen or printed out
4. System developers should collaborate to undertake further research and investigation into the delivery of the VMLE onto Personal Digital Assistants and equivalent devices.

### 6.2 To national strategy groups, e.g LTSN-01

5. The national strategy groups should work closely with medical faculties and system developers to build upon existing networks to encourage coordinated and collaborative development of bespoke VMLEs
6. The national strategy groups should investigate using existing national information structures for the medical domain (eg LTSN, Omni, Biome, etc) to provide for sharing of components and resources to establish a nationally funded resource of materials and components. This should include online examples of effective use of VMLEs and case studies
7. The national strategy groups should support (fund) further monitoring of what is happening in the sector and further analysis of the progress of the developing VMLEs

### 6.3 For further research

8. The national strategy groups, medical faculties and medical educationalists should collaborate to undertake research to:
  - a. identify and write up case studies and examples of how the systems are being used effectively
  - b. provide a longitudinal study into the difference VMLEs are making to the experience of staff and students, and to learning and teaching
  - c. investigate the potential of Personal Digital Assistants for mobile delivery of VMLE content, particularly into appropriate screen layouts for this medium
  - d. measure the importance of the contribution made by educational developers towards populating VMLEs with high quality content

### 6.4 To medical faculties

9. Medical faculties should provide strategic direction and support, to enable system developers and medical educators to develop and promote the use of VMLEs

10. Medical faculties should continue to encourage bespoke developments rather than adopt present commercial solutions
11. Medical faculties should ensure that the use of VLME are provided with dedicated and long-term funding, principally for staffing and support of the systems. Specifically
  - a. Support should be provided for medical teachers creating and management content for the VMLEs. This can be combined with an educational developer role, ideally someone with educational as well as technical knowledge
  - b. Support for the running of the VMLE as a service should be kept separate from development as far as possible
  - c. Training in the use of VMLEs should not be left exclusively to the system developers; other faculty or institutional staff such as staff developers and educational experts should also be involved
  - d. Training should include aspects of effective pedagogy, both general and specific to online environments.
12. Managers in medical faculties should provide adequate incentives and rewards to encourage staff developing resources for the VMLE
13. Medical faculties should consider the implications of the replacement of paper distribution materials with exclusively online provision and if done should begin with a new cohort of students rather than with existing students and provide a means to offset the additional costs that they incur
14. Medical faculties should promote collaboration between senior faculty and institution decision makers to overcome political and managerial obstacles to the integration of data systems and to ensure that faculty strategic plans are not in conflict with those of the institution

## **6.5 For medical educationalists**

15. Medical educationalists should work closely with senior managers and system developers to facilitate communication and coordination about the content and organisation of the systems and the training of users
16. Medical educationalists should organise the training of staff and students in how the VMLE can be used effectively
17. Medical educationalists should identify local examples of teachers and students making effective use of the VMLE should be collated for demonstration and training purposes. Where possible the teachers concerned should be brought into training sessions to share their experience

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## Appendix A: Short case studies from Questionnaire responses

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The following section presents a series of short case studies of the use of VMLEs across 15 UK medical Schools. The data was collected via a questionnaire sent by email to each school by the LTSN-01, on behalf of the project. Please note that these case studies represent a snapshot that was accurate at the time the questionnaire (June 2001) but these systems are developing rapidly. The text of the questionnaire is reproduced in Appendix B.

### Aberdeen

Neil Hamilton  
Director, Medi-CAL Unit  
University of Aberdeen

They are using a VMLE "or at least an intranet on its way to becoming a VLE. Still a long way to go until a true MLE". This is being developed at this institution. It has evolved from a project that started 3 years ago.

This has been driven by:

- The medical faculty (Deans or other senior decision makers)
- Computer based learning subdivision in the medical faculty with design input from:
  - ⇒ Enthusiastic teaching staff
  - ⇒ Students

THREE main reasons for having a VMLE:

- Managing changes in the curriculum (problem-based, case studies etc)
- Managing complexity of the curriculum
- Integration of learning and other curricular resources.

Key functions delivered by actual or planned VMLE

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Information about course (study guides, curriculum structure etc)
- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)
- Assist curricular design and revision

Key features that are or will be provided by the VMLE at this institution

Currently:

- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information
- Study guides

In the future:

- Eventually a personalised home page showing relevant links for individual users.
- Possibly facilities for summative assessment in the future
- Possibly Indexing (eg through MeSH headings) in the future

Data integration with other institutional information systems (student records, library etc)

- Student information has to be entered separately onto the system
- System links to library catalogue but does not query it directly

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Students not opposed but not in the habit of using it

- Institution wide there are issues with the central databases exchanging information. Once these issues have been resolved we hope to be able to access these databases to produce a true VMLE.
- Providing access from off-campus.

This VLE "will hopefully evolve and be integrated with other University wide MIS to create a true VMLE. We are noticing a steady increase in use and demand from the students for information to be placed within the VLE. We hope that staff will start using it too to manage the curriculum".

## **Bristol**

Stephen Greenwood  
Lecturer in Medical & Dental Education  
University of Bristol

They are currently developing/implementing a VMLE for the faculty. This will be a mixture of a commercial system and one developed at this institution. This will be fully implemented within the next year.

This has been driven by:

- The medical faculty (Deans or other senior decision makers)
- Enthusiastic teaching staff
- Students

THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution
- Managing large numbers of teachers
- Accommodating increased student numbers

Key functions delivered by actual or planned VMLE:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Facilities for summative assessment
- Course administration information
- Indexing (eg through MeSH headings)

Data integration with other institutional information systems (student records, library etc)

- system queries a copy of centrally held student information

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Lack of resources for development
- Difficulties/Delays in choosing suitable system

## **Dundee**

Walter M Williamson  
Faculty Secretary  
Dundee Medical School

They have been using a VMLE (a mixture of Commercial and developed at this institution) called MESMIS (Medical School Staff/Student Management Information System) since 1998.

This has been driven by:

- The medical faculty (Deans or other senior decision makers)
- Enthusiastic teaching staff

THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution
- Managing complexity of the curriculum
- Demand from staff/students

Key functions delivered by actual or planned VMLE:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Information about course (study guides, curriculum structure etc)
- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- A dynamic timetable that can be modified online
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Facilities for summative assessment
- Course administration information
- Study guides
- Indexing (eg through MeSH headings)
- Outcome-based curriculum map.

Data integration with other institutional information systems (student records, library etc)

- System directly queries centrally held student information
- Exam results can be recorded through system onto the central student database

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Lack of resources for development
- Lack of IT facilities/network connections

"MESMIS (Medical School Staff/Student Management Information System) has to be viewed to appreciate the breadth and utility of the programme. It is web-based so access is simple."

## **Guy's, King's and St Thomas'**

Jeremy PT Ward

Professor of Respiratory Cell Physiology, Chair of GKT

Technology in Support of Teaching and Learning Committee, Director of the GKT Virtual Campus

Guy's King's and St Thomas' (GKT) School of Medicine, King's College London

GKT Schools of Medicine, Dentistry and Biomedical Science are using a VMLE developed at this institution since August 1998. The rest of College is not yet using a VMLE, but are considering doing so.

This has been driven by:

- The medical faculty (Deans or other senior decision makers)
- Computer based learning subdivision in the medical faculty

- Primarily driven by Chair of GKT Technology in Support of Teaching and Learning Committee, but strongly supported by Deans.

THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution
- Accommodating increased student numbers
- Managing complexity of the curriculum

Key functions delivered by actual or planned VMLE:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Information about course (study guides, curriculum structure etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- A dynamic timetable that can be modified online
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Facilities for summative assessment
- Course administration information
- Study guides
- Indexing (eg through MeSH headings)

Data integration with other institutional information systems (student records, library etc)

- system queries a copy of centrally held student information
- system can query the library catalogue

On-line course selection and allocation, and other registry material; however very limited access to main College student record system for security/political reasons. This may improve in the near future.

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Inability to get direct links to main College students admin systems.
- Could do with more staff and security for existing staff (all 3 on short term contracts), but otherwise well supported by School of Medicine.

"We are continually developing the system. The success of the GKT Virtual Campus has instigated a review of VMLEs within the College as a whole. One notable point is that we estimate we have saved the cost of one entire post in Registry merely by automating the special study module and PRHO selection mechanisms alone. One element that does cause concern is that it is difficult to get all staff to provide learning and teaching materials for their parts of the course, even though this is now required by the Medical Education Committee. There is therefore quite a wide spread of what is there, and also of the quality of what is there. This is getting better, but should be born in mind by others setting up a similar system. It is essential that there is full support from senior faculty and admin for these systems to work effectively. At GKT we have that (with a little initial pushing)."

## Leeds

Dr Patrick J R Harkin  
Lecturer in Pathology  
University of Leeds

They are currently developing/implementing a VMLE for the faculty. This started in 1996; the system has grown from a group of independent utilities supporting different aspects of the course. These are a mixture of developments carried out at Leeds and components brought in from other institutions.

This has been driven by:

- The medical faculty (Deans or other senior decision makers)
- Enthusiastic individual IT developer(s)

- Enthusiastic teaching staff

THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution
- Managing changes in the curriculum (problem-based, case studies etc)
- Managing complexity of the curriculum

Key functions delivered by actual or planned VMLE:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- Teaching materials
- Self-assessment questions
- Course administration information
- Study guides

Data integration with other institutional information systems (student records, library etc)

- system queries a copy of centrally held student information
- system can query the library catalogue

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Lack of resources for development
- Lack of IT facilities/network connections
- Developers' time taken up with providing a service so no further development

## Leicester

Prof. S.A Peterson  
University of Leicester

They have been using a commercial VMLE as a partial implementation since 2000, with the full implementation to start in 2001.

This has been driven by:

- The medical faculty (Deans or other senior decision makers)

THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution
- Managing varied intakes of students (accelerated entry, part-time students etc)
- Demand from staff/students

Key functions delivered by actual or planned VMLE:

- Information about course (study guides, curriculum structure etc)
- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions

- Course administration information
- Study guides
- Indexing (eg through MeSH headings)

Data integration with other institutional information systems (student records, library etc) is not applicable to this institution.

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Lack of resources for development
- Lack of IT facilities/network connections

## Liverpool

Dr Peter H Dangerfield  
 Webmaster & Director Phase 1  
 Faculty Medicine, University of Liverpool

They are using a VMLE developed at this institution. This started with a pilot in 1995, with a full start-up in 1996.

This has been driven by:

- The medical faculty (Deans or other senior decision makers)
- Enthusiastic individual IT developer(s)
- Enthusiastic teaching staff

The THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution
- Accommodating increased student numbers
- Managing changes in the curriculum (problem-based, case studies etc)

The key functions delivered by the VMLE:

- Information about course (study guides, curriculum structure etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)

Key features that are or will be provided by the VMLE at this institution

- A personalised home page showing relevant links for individual users
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Study guides

There is no data integration with other institutional information systems (student records, library etc).

Problems and obstacles have you experienced to a significant extent with respect to your VMLE?

- Lack of resources for development

"It is hoped to develop new ideas into the future. Collaboration with other sites would be a real plus especially where this could be facilitated."

## Manchester

Dr Tim Dornan  
 Senior Lecturer in Medical Education and Consultant Physician  
 Hope Hospital  
 Manchester

They are using a VMLE developed at this institution. They started about 4 years ago.

This has been driven by:

- The medical faculty (Deans or other senior decision makers)
- Enthusiastic teaching staff
- Students

THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution
- Managing large numbers of teachers
- Managing changes in the curriculum (problem-based, case studies etc)

Key functions delivered by actual or planned VMLE:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)

Key features that are or will be provided by the VMLE at this institution?

Currently or forthcoming:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- A dynamic timetable that can be modified online
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information
- Study guides

Maybe later:

- Facilities for summative assessment

Data integration with other institutional information systems (student records, library etc) is not applicable to this institution.

Problems and obstacles experienced to a significant extent with respect to the VMLE

- Students not opposed but not in the habit of using it

## **Oxford**

Helena McNally  
Medical Educationalist  
University of Oxford

Oxford are currently developing/implementing a VMLE which is a mixture of a commercial system and one developed within the institution.

This has been driven by:

- Enthusiastic individual IT developer(s)
- Enthusiastic teaching staff
- Changes in NHS service provision requiring changes in clinical teaching
- Projected increase in student numbers

THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution
- Accommodating increased student numbers
- Managing complexity of the curriculum

Key functions delivered by actual or planned VMLE:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)

- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- A dynamic timetable that can be modified online
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Facilities for summative assessment
- Course administration information
- Study guides
- Indexing (eg through MeSH headings)

Data integration with other institutional information systems (student records, library etc):

- Don't know yet!

Problems and obstacles have you experienced to a significant extent with respect to the VMLE:

- Lack of interest/awareness by staff
- Lack of resources for development
- Developers' time taken up with providing a service so no further development

## Queen's, Belfast

Dr Kieran McGlade  
Assistant Director for Medical Education  
Queen's University, Belfast

Using a VMLE developed at the institution. Started using it approx 5 years ago.

This has been driven by:

- The medical faculty (Deans or other senior decision makers),
- Enthusiastic individual IT developer
- Enthusiastic teaching staff

THREE main reasons for having a VMLE:

- Accommodating increased student numbers;
- Managing changes in the curriculum (problem-based, case studies etc);
- Managing complexity of the curriculum

Key functions delivered by actual or planned VMLE:

- Information about course (study guides, curriculum structure etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information
- Study guides

(Some of the above represents their wish list)

Data integration with other institutional information systems (student records, library etc)

- System can query the library catalogue

- Exam results can be recorded through our system onto the central student database
- At present exploring greater degrees of integration with a university wide "Queen's Online project"

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Lack of interest/awareness by staff
- Lack of resources for development
- Students not opposed but not in the habit of using it
- Difficulties/Delays in choosing suitable system

"The University is rolling out a major initiative to provide a virtual learning environment for students and teachers. The medical school hopes to integrate with this initiative particularly with regard to generic facilities. Also there is an increasing need to provide access to learning resources to medical students off campus (District General Hospitals, local hospitals and GP surgeries) with more learning taking place in these locations. This is a challenge we would like to address. Similarly teachers off campus (the majority) need to become more aware of the curriculum as a whole and how it is delivered. We hope that an enhanced VMLE will allow us to address this problem. Currently we are progressing the development of our VLE with a survey of student and staff attitudes to current provision and also a pilot project which is looking at enhancing electronic study guides with direct links to library resources. Finally we are in the process of writing a C&IT strategy for medical education. We would appreciate feedback on your findings as this would help with background to our survey of the attitudes to and usage of our own VMLE"

## Queen Mary Westfield (QMW)

Dr Patricia Revest  
 Head of learning resources, School of medicine and  
 dentistry  
 Queen Mary College (London)

Have been using a VMLE developed at this institution since Sept 1999.

This has been driven by enthusiastic teaching staff, but it was Patricia Revest's idea and she implemented it.

THREE main reasons for having a VMLE:

- Accommodating increased student numbers
- Managing changes in the curriculum(problem-based, case studies etc)
- Managing complexity of the curriculum

Key functions delivered by actual or planned VMLE:

- Support for teaching integrated into the curriculum structure(lecture notes, timetabled online tutorials, revision etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- A personalised home page showing relevant
- links for individual users
- Study guides
- Indexing (eg through MeSH headings)

Data integration with other institutional information systems (student records, library etc)

- They do not integrate YET

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Lack of resources for development
- Developers' time taken up with providing a service so no further development

"The system we have is at present fairly low tech based around static web pages although we have about 5000 of them!. We hope to develop dynamic pages soon, i.e when I learn how to do it and persuade computer services to install the appropriate web application."

## Sheffield

Ash Self  
Project Officer  
Medical Education, Sheffield University

They are using a VMLE, originally created at another institution (Newcastle), but adapted and further developed at Sheffield. Local implementation started in October 2000.

Driven by:

- The medical faculty (Deans or other senior decision makers)
- Enthusiastic teaching staff

THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution
- Managing changes in the curriculum (problem-based, case studies etc)
- Managing complexity of the curriculum

Key functions delivered by actual or planned VMLE

- Information about course (study guides, curriculum structure etc)
- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)

Key features that are or will be provided by the VMLE at this institution

Currently or shortly

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information
- Study guides

Eventually maybe in two years

- Facilities for summative assessment

Data integration with other institutional information systems (student records, library etc)

- system queries a copy of centrally held student information
- system can query the library catalogue

Problems and obstacles experienced to a significant extent with respect to the VMLE

- Lack of interest/awareness by staff
- Lack of support from faculty/departments
- Students not opposed but not in the habit of using it
- Developers' time taken up with providing a service so no further development

## St George's, London

Terry Poulton  
Sub-dean for Educational technology  
St George's Hospital Medical School

Have been using a commercial VMLE since October 2000.

Implementation has been driven by a Computer based learning subdivision in the medical Faculty and Enthusiastic individual IT developer(s).

Main reasons for having a VMLE:

- Managing changes in the curriculum (problem-based, case studies etc)
- Timed delivery of teaching material

Key functions delivered by actual or planned VMLE:

- Support for teaching integrated into the curriculum structure(lecture notes, timetabled online tutorials, revision etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)

Key features that are or will be provided by the VMLE at this institution:

- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information

There is currently no data integration with other institutional information systems (student records, library etc).

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Lack of interest/awareness by staff
- Lack of resources for development
- Developers' time taken up with providing a service so no further development

## Southampton

Michael Ward

Professor of Microbiology, Director of Division of Information and Computing, Chair of School and Faculty Information Systems committees.  
School of Medicine, Southampton University

Are using and continuing to develop a VMLE called MEDIS, that has been created at this institution. This started in 1998.

This has been driven by:

- Computer based learning subdivision in the medical faculty
- Enthusiastic individual IT developer(s)
- Enthusiastic teaching staff
- Students

THREE main reasons for having a VMLE:

- Support students studying at a distance from the institution [a multi-campus School, on clinical placements, revising at home]
- Accommodating increased student numbers
- Achieving virtual and horizontal integration of learning resource across the curriculum

Key functions delivered by actual or planned VMLE:

- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users

- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information
- Study guides
- Indexing (eg through MeSH headings)

Data integration with other institutional information systems (student records, library etc)

- system queries a copy of centrally held student information [Integrated via asp with the School and central student and staff databases].
- system can query the library catalogue

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Lack of interest/awareness by staff
- Lack of resources for development [School has provided generous support, but resource is clearly finite]
- 

"1st and 2nd year students, increasingly IT literate, have taken to the system like a duck to water. The problem is to motivate non-enthusiast staff. This is likely to be achieved by a combination of central policy/expectation and easy mechanisms for posting web pages on a common template"

"University computing services are heavily backing Blackboard.com as a VMLE. We regard this product as particularly suitable for modular courses and may use it, in addition to our own VMLE [Medis] for special study modules. The disadvantage of Blackboard.com, apart from reliance on an external dot com, seems to be horizontal linking across modules, something we regard as important in a medicine VMLE and also for inter-professional education across a very large faculty of medicine, Health and Biological Sciences. IT and e-learning have been given a high profile within the School of Medicine by the formation of a division of information and computing. Our VMLE and its content is specifically designed to work from CD for use by students in their digs where internet access is often rudimentary or non-existent. Roughly 60% of our students have their own PC"

## St Andrew's

Jim Aiton  
University of St Andrews

They are not yet using a VMLE, but are considering doing so. They don't yet know whether this will be a commercial system or one developed at this or another institution. They expect to start using it in September 2001.

This has been driven by:

- The university (VC or other senior decision makers)
- Enthusiastic teaching staff

THREE main reasons for having a VMLE:

- Technology is available
- Need to keep up with the rest of the sector
- Need to support learners in a more structured way

Key functions delivered by actual or planned VMLE:

- Information about course (study guides, curriculum structure etc)
- Support for teaching integrated into the curriculum structure(lecture notes, timetabled online tutorials, revision etc)

Key features that are or will be provided by the VMLE at this institution:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- A dynamic timetable that can be modified online
- Teaching materials

- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Facilities for summative assessment
- Course administration information
- Study guides

Data integration with other institutional information systems (student records, library etc)

- System queries a copy of centrally held student information

Problems and obstacles experienced to a significant extent with respect to the VMLE:

- Lack of interest/awareness by staff
- Lack of resources for development

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## Appendix B: Questionnaire

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There follows a facsimile of the questionnaire used for the survey. The format was designed for distribution by email.

Virtual and Managed Learning Environments in UK Medical Education:  
Questionnaire

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This questionnaire is distributed as part of a HEFCE funded project (JTAP-623), which aims to find out about the current use (and non-use) of Virtual and Managed Learning Environments (VMLEs) in UK Undergraduate Medical Education.

By VMLE we mean an on-line system, which may also be referred to as Electronic Curriculum, Faculty Web Site/Intranet etc, that provides an integrated set of tools and resources for supporting learning and course administration. These could include for example online timetables, lecture notes, course handbooks and MCQs.

The results of this questionnaire will inform future developments in this area and I would therefore be very grateful if you please forward it to the most appropriate person in your faculty. The questionnaire contains quite a lot of text but should take no longer than 10 minutes to complete.

-----

Your name:  
Job title:  
Institution:

1. Where does your faculty currently stand in respect of VMLEs? (please click between the square brackets and enter an x to indicate your answer)

- a)  We are using a VMLE
- b)  We are not yet using a VMLE, but are considering doing so
- c)  We are currently developing/implementing a VMLE for the faculty (or dept or institution)
- d)  We are not considering using a VMLE in the faculty (please go to question 4)

2. If you answered a, b or c in question 1, is this system or will it be: (please select all those that apply)

- a)  Commercial?
- b)  Developed at your institution?
- c)  Developed by another HE institution?
- d)  Don't know yet?

3. If currently using the system, when did you start using it?

If not yet using the system, when do you expect to start using it?

(please go to question 5)

4. If you answered d in question 1, could you briefly explain this position? Please return the questionnaire to us. The remaining questions will not apply to you.

5. Who has driven the development or adoption of the VMLE in your faculty? (please select as many as apply)

- a)  The university (VC or other senior decision makers)
- b)  The medical faculty (Deans or other senior decision makers)
- c)  Computer based learning subdivision in the medical faculty
- d)  Enthusiastic individual IT developer(s)
- e)  Enthusiastic teaching staff
- f)  Students
- g)  Other (please specify)

6. Please indicate what you consider to be the THREE main reasons for having a VMLE:

- a)  Support students studying at a distance from the institution
- b)  Managing large numbers of teachers
- c)  Accommodating increased student numbers
- d)  Managing changes in the curriculum (problem-based, case studies etc)
- e)  Managing varied intakes of students (accelerated entry, part-time students etc)
- f)  Managing complexity of the curriculum
- g)  Technology is available
- h)  Demand from staff/students
- i)  Need to keep up with the rest of the sector
- j)  Other (please specify)

7. What would you describe as the key function(s) delivered by your actual or planned VMLE? (choose up to TWO)

- a)  Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- b)  Information about course (study guides, curriculum structure etc)
- c)  Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)
- d)  Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)
- e)  Other (please describe)
- f)  Don't know yet

8. Which of the following key features are or will be provided by the VMLE at your institution? (please select all those that apply)

- a)  A tool for staff to upload learning materials
- b)  A personalised home page showing relevant links for individual users
- c)  A dynamic timetable that can be modified online
- d)  Teaching materials
- e)  Communications tools such as discussion boards or chat rooms
- f)  Self-assessment questions
- g)  Facilities for summative assessment
- h)  Course administration information
- i)  Study guides
- j)  Indexing (eg through MeSH headings)
- k)  Don't know yet

9. To what extent is your system able to integrate with data from other institutional information systems (student records, library etc)? (please select all those that apply)

- a)  The question is not applicable to this institution
- b)  Our system directly queries centrally held student information
- c)  Our system queries a copy of centrally held student information
- d)  Student information has to be entered separately onto the system
- e)  Our system can query the library catalogue
- f)  Exam results can be recorded through our system onto the central student database
- g)  Other type of data integration (please describe)

10. Which of these problems and obstacles have you experienced to a significant extent with respect to your VMLE?

- a)  Lack of interest/awareness by staff
- b)  Lack of resources for development
- c)  Lack of support from faculty/departments
- d)  Inappropriate use by staff
- e)  Students not opposed but not in the habit of using it
- f)  Opposition from students
- g)  Lack of IT facilities/network connections
- h)  Developers' time taken up with providing a service so no further development
- i)  Difficulties/Delays in choosing suitable system
- j)  Other (please describe)

11. Would you be willing to let the project officer have a guest login to your site? Yes/No (please delete as applicable)

If yes please indicate username and password or send as separate email to [jules.cook@bris.ac.uk](mailto:jules.cook@bris.ac.uk)

12. Please add any further information which you think may be relevant in respect of this issue at your institution.

Thankyou very much for completing this questionnaire. Could you please return it by Friday 22nd June to:

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## Appendix C: Summary of interview case studies

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This section represents data collected from each of the six interviews in brief summary form. Please note that these case studies represent a snapshot that was accurate at the time of interview (March/April 2001) but these systems are developing rapidly.

### Birmingham

Main Developer:

David Davies  
Senior Lecturer  
Medical Education Unit, University of Birmingham Medical School

This institution is using a VMLE developed within the faculty. It was first implemented in 1998.

Development has mainly been driven by:

- The medical faculty (Deans or other senior decision makers)
- Enthusiastic individual IT developer
- Educational developers at Clinical Sites
- Requirements of the QAA

Funding has come from:

- SIFT (Service Increment for Teaching) funds
- Medical faculty

No. of staff working on the VMLE:

2 staff developing the system (although not full-time), plus 3 full-time educational developers who contribute content and help maintain parts of the system.

Technology that the system is based on:

- XML (Extensible Markup language) objects
- Frontier scripting and content management system
- Filemaker Pro v5 XML databases

Main reasons given for having a VMLE:

- Support students studying at a distance from the institution
- Accommodating increased student numbers
- Managing complexity of the curriculum
- Providing curriculum documentation in a manageable and easily updateable form

Principal functions delivered by the VMLE at this site:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Information about course (study guides, curriculum structure etc)

Key features currently or shortly to be provided:

- A tool for staff to upload learning materials
- A dynamic timetable that can be modified online
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information
- Study guides
- Indexing (eg through MeSH headings)

Basic unit of organisation of the VMLE content:

- Year
- Module
- Learning Outcome for year
- Learning outcome for Module

#### Courses covered:

- All of UG Medicine course

#### Evaluation done

- No formal evaluation
- Informal staff feedback received through working with academics to populate the system
- Relevant student feedback collected as part of overall course feedback
- Server logs of usage

#### How and how much the VMLE is used:

- system is used most heavily by the 3rd, 4th and 5th year courses
- some 3rd yr courses have material only available online
- In 1st and 2nd yrs used more as an adjunct rather than in an integrated way
- 50,000 hits per day on the server
- 750 registered users

#### Training carried out:

- Educational fora to discuss learning and teaching issues among clinical teachers
- Teach the teachers courses for clinical teachers
- Workshops for University staff provided by staff development department
- Training for preclinical tutors oversubscribed and insufficient

#### Effects on learning and teaching practice

- One or two courses now delivered entirely online
- Students starting to access module booklets online despite being given a printed version
- Enables independent study

#### Integration with data from other institutional information systems (student records, library etc)

- System directly queries centrally held student information
- Exam results can be recorded through the system onto the central student database
- Dynamic links to gateways and publications databases such as OMNI and PubMed

#### Significant Problems and obstacles experienced:

- Lack of interest/awareness by staff (mainly in pre-clinical years)
- Students not opposed but not in the habit of using it (mainly in pre-clinical years)
- Lack of IT facilities/network connections

#### Critical Success Factors

- The system must be driven by and appropriate to the needs of the curriculum
- Cascade the workload by training authors to populate and maintain the system themselves

#### Future plans

- A My Electronic Curriculum page that users will see when they login using their unique ID.
- A pull-down list of MeSH search terms for searching and cataloguing
- An electronic version of information for 3<sup>d</sup> yr students about the location of their clinical attachments
- A structure for exchanging resources between institutions

## Cambridge

Main Developer:

Kim Whittlestone  
Educational Resources Manager  
Clinical & Biomedical Computing Unit  
University of Cambridge Clinical School

This institution is using a VMLE developed within the faculty. Development started approximately 4 years ago.

Development has mainly been driven by:

- Computer based learning subdivision in the medical faculty
- Enthusiastic individual IT developer(s)

Funding has come from:

- Medical faculty

No. of staff working on the VMLE:

- One developer
- One other working on a parallel project that contributes to the VMLE

Technology that the system is based on

- Database back end with a web front end

Main reasons given for having a VMLE:

- Support students studying at a distance from the institution
- Potential of the technology
- Need to keep up with the rest of the sector

The two key functions delivered by the VMLE within the faculty:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Learning resources not integrated into the curriculum but designed as optional extras (links to web sites, CBL tutorials, quizzes etc)

Key features currently or shortly to be provided:

- A personalised home page showing relevant links for individual users
- Teaching materials
- Self-assessment questions
- Facilities for summative assessment
- Course administration information

Basic unit of organisation of the VMLE content

- Function (learning resources, communication, etc)
- Medical specialty

Courses covered:

- Years 4 and 5 of UG Medicine course

Evaluation done

- Focus groups
- Interviews
- Online questionnaires
- Informal feedback
- Needs analysis
- Measure of Learning gain
- Server Usage logs

Type and level of usage

Students

- Every specialty has used ERWeb for reviews of resources or for communication but wide variety in the level of use across different specialties.
- Usage of particular resources is influenced by what the CBCU highlight as favourites.
- Otherwise fairly random depending on where student are in the course
- Nearly all students have used the system over the year
- Materials seen as being at a low level are popular

#### Staff

- Student contact facility especially popular
- Hard to get staff to review resources

#### Staff feedback

- Generally positive

#### Student feedback

- Still want printed handouts - printing costs.
- Want a detailed hour by hour timetable
- Hard to select appropriate resources from a long list
- Conversely some subjects so inadequately covered as to be not worth bothering with online
- Will use resources that are integrated into teaching - will only use non-integrated materials if not available any other way

#### Training carried out and needed

- CBCU a development unit, not a training unit, so no systematic training
- Students given basic introduction to clinical computing, but lack training in "learning to learn" skills needed to use ERWeb effectively
- Need for staff training in appropriate use

#### Effects of the VMLE on learning and teaching practice

- Little integration of ERWeb resources into the curriculum
- However:
- students have used online facilities to write collaborative essays
- some lectures replaced by computer based sessions

#### Integration with data from other institutional information systems (student records, library etc)

- Student information has to be entered separately onto the system

#### Significant Problems and obstacles experienced:

- Lack of resources for development
- Inappropriate use by staff
- Lack of IT facilities/network connections
- Developers' time taken up with providing a service so no further development

#### Lessons learned

- Some question about whether developing a bespoke system is the best approach
- Talk to people at other sites about what they've done.
- It is also essential to get your institution on side.
- Involve students in developing the system.
- Keep the research and service parts separate.
- Use other people's materials where possible

#### Future plans

- Generally wary of developments unless proved useful
- Make the system more personalised
- Modularise the components of ERWeb so they can be implemented separately
- Develop a pretest facility to enable the student to gauge whether a particular resource will be at appropriate level

## Edinburgh

Main Developer:

Rachel Ellaway  
Special Projects Manager  
Learning Technology Section (LTS) of the Faculty Group of Medicine & Veterinary Medicine at  
Edinburgh University

This institution is using a VMLE developed within the faculty. Development started in 1999.

Development has mainly been driven by:

- The medical faculty (Deans or other senior decision makers)
- Computer based learning subdivision in the medical faculty
- Enthusiastic teaching staff
- Students

Funding has come from:

- Surplus generated by Medical Illustration activities
- Medical faculty

No. of staff working on the VMLE:

- part-time developers equivalent to 1.5 full time staff

Technology that the system is based on

- flat html, with database systems running the security, tracking and dynamic features.
- html and templates maintained through Dreamweaver, the databases from SQL Server and ASP, and CSS used for all the page formatting. MS FrontPage for discussion boards and Macromedia Director's multi-user server underpins the chat tool

Main reasons given for having a VMLE:

- Managing changes in the curriculum (problem-based, case studies etc)
- Managing complexity of the curriculum
- Demand from staff/students

The two principal functions delivered by the VMLE at this site:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Information about course (study guides, curriculum structure etc)

Key features of the VMLE at this site:

- A dynamic timetable that can be modified online
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information
- Study guides

Basic unit of organisation of the VMLE content:

- Year
- Horizontal element
- Vertical theme

Courses covered:

- First three years of UG Medicine course

Evaluation done

- Student feedback received through IT skills training and other formal contact
- Meetings with student reps
- Informal feedback
- Needs questionnaire
- Relevant feedback collected as part of overall course feedback

How and how much the VMLE has been used:

Staff

- 70% of staff in yrs 1 and 2 create materials for EEMeC
- So far less use in clinical years
- Chat tools being used for online tutorials

Students

- Well used by students
- Students in earlier years use it more and more deeply
- Popular uses of EEMeC include:
  - ⇒ Online access to library information and facilities
  - ⇒ Student peer marking of assignments
  - ⇒ Voting for student reps

Training carried out:

- Hands on session with EEMeC for students at the beginning of each year
- Course for secretarial staff in MS Word includes the use of template used for populating the system
- For Academic staff one-to-one development work with interested individuals

Effects of the VMLE on learning and teaching practice

- Helps continuity by giving teaching staff an overview of the course and what is covered at each stage
- Contributes to alignment of course contents and assessments to the same learning objectives
- Contributes to growth of self-directed learning
- Encourages communication between staff and students

Integration with data from other institutional information systems (student records, library etc)

- Student information has to be entered separately onto the system
- The system can query the library catalogue
- Links to University student portal

Significant Problems and obstacles experienced:

- Lack of awareness by staff teaching on clinical years
- Lack of IT facilities/network connections

Critical Success Factors

- Develop a system to meet your course's needs
- Gradual rollout and include constant low level evaluation
- Evangelise and disseminate
- Integrate with the systems around you both technological and traditional
- Learn from others
- Be aware of the transformational nature on educational process of implementing a VLE

Future plans

- A personalised home page showing relevant links for individual users
- Rebuild system based on tables rather than frames
- A search facility will be added
- Implementation of an online personal portfolio management system
- More staff development to include evangelisation by experienced academic staff users

## Newcastle

Main Developer:

Tony McDonald  
Senior Project Officer  
Faculty of Medicine Computing Centre, University of Newcastle

This institution is using a VMLE developed within the faculty. Development started in 1996.

Development has mainly been driven by:

- The medical faculty (Deans or other senior decision makers)
- Computer based learning subdivision in the medical faculty

Funding has come from:

- The faculty
- A TLTP3 Project

No. of staff working on the VMLE:

2 core staff (Senior Project Officer and Curriculum Development Officer), and 10 others with occasional involvement.

Technology system is based on:

- The Zope object-oriented web application development system

Main reasons given for having a VMLE:

- Support students studying at a distance from the institution
- Managing large numbers of teachers
- Accommodating increased student numbers
- Managing varied intakes of students (accelerated entry, part-time students etc)
- Managing complexity of the curriculum

Key functions delivered by the VMLE at this site:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Information about course (study guides, curriculum structure etc)
- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)

Key features currently or shortly to be provided:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- Teaching materials
- Self-assessment questions
- Course administration information
- Study guides

Basic unit of organisation of the VMLE content

- Year
- Study guides for each component of the curriculum
- Teaching event (lecture etc)

Courses covered:

- All of UG Medicine course

Evaluation done:

- No formal evaluation but:
  - ⇒ Monitoring of usage
  - ⇒ Student feedback received through IT skills training and other formal contact
  - ⇒ Staff feedback received at staff meetings and during training
  - ⇒ Feedback on system received from students as part of overall course feedback
  - ⇒ Evaluation of larger project of which this is part

#### Features most used

- Self-assessment
- Student Support and Tutoring System

#### Training carried out:

- As part of overall IT training provided to new students
- Workshops for staff - focussing increasingly on appropriate use

#### Effects of the VMLE on learning and teaching practice

- Promotes teacher/learner communication
- More resources available more easily
- More feedback to students and feedback more immediate

#### Integration with data from other institutional information systems (student records, library etc)

- System queries a copy of centrally held student information
- System can query the library catalogue

#### Significant Problems and obstacles experienced:

- Lack of interest/awareness by staff
- Inappropriate use by staff
- Developers' time taken up with providing a service so no further development

#### Critical Success Factors

- Needs proper support from faculty, proper resourcing and embedding into the curriculum.
- Need to understand your own curriculum management; you can't divorce your technology fix from the context you want to put on it
- Given the opportunity students will help to drive how the system develops

#### Future plans

- Enable personalised views of the system
- Enable search on individual learning outcomes
- Experiment with sharing resources with other institutions

## Nottingham

Main Developer:

Simon Wilkinson  
Project Officer  
Queen's Medical Centre, University of Nottingham

This institution is using a VMLE, originally created at another institution (Newcastle), but adapted and further developed at Nottingham. Local implementation started in 1999.

Development has mainly been driven by:

- The vision and enthusiasm of a Senior Lecturer in Medical Education & Management, and of other individual academics.

Funding has come from:

- Initially from a TLTP 3 project
- More recently from the faculty

No. of staff working on the VMLE:

1 full time technical developer, 1 day per week Project Director.  
1 - 2 days per month server maintenance

Technology system is based on:

- The Zope object-oriented web application development system

Main reasons given for having a VMLE:

- Potential of the technology
- Seen as an interesting project

Key functions delivered by the VMLE at this site:

- Information about course (study guides, curriculum structure etc)
- Support for teaching integrated into the curriculum structure (lecture notes, timetabled online tutorials, revision etc)

Key features of the VMLE at this site:

- A tool for staff to upload learning materials
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information
- Study guides

Basic unit of organisation of the VMLE content

- Year
- Medical specialty
- Teaching event (lecture etc)
- Vertical theme

Courses covered:

- All of UG Medicine course

Evaluation done:

- On line Questionnaire
- Informal feedback
- As part of larger project

How the VMLE is used and how much:

- Mainly for self-directed learning and formative assessment
- Disappointingly low among clinical years
- Spikes just before exams
- Discussion tools not yet used by students (probably due to lack of "seeding" by staff)

#### Staff concerns

- Students won't come to lectures if lecture notes are online

#### Student concerns

- Still want printed handouts - printing costs.
- Online lecture notes sometimes differ from content of lectures.
- Can't find materials that they've been told are on the system
- Don't like documents as .pdf as This institution is harder to print

#### Training carried out:

- No formal staff training but publicity campaign has been conducted
- Students receive one-hour induction lecture on the system

#### Effects of the VMLE on learning and teaching practice

- Too early to assess
- Students may learn better studying strategies, for example that they don't need to take such detailed notes

#### Integration with data from other institutional information systems (student records, library etc)

- system queries a copy of centrally held student information

#### Significant Problems and obstacles experienced:

- Lack of IT facilities/network connections
- Standard University IT configurations not suitable for VMLE
- Lack of input from staff
- Difficulties communicating with staff

#### Critical Success Factors

- Communication with users is crucial.
- Take an evolutionary approach
- Give staff a sense of ownership
- Get involved now rather than wait for the perfect system

#### Future plans

- Deliver to different platforms, eg WAP
- Work more closely with medical educators
- Include generic (non course specific) advice and information
- Further develop bespoke MCQ system

# University of Wales College of Medicine

Main Developer:

Dr Joe Nicholls  
Head of Learning Technology Unit  
University of Wales College of Medicine, Cardiff

This institution is using a VMLE developed within the College. Development started approximately 4 years ago.

Development has mainly been driven by:

- Learning Technology Unit in the medical faculty
- Enthusiastic individual IT developers
- Enthusiastic individual academics

Funding has come from:

- Three year grant from the Graves Trust
- School of Medicine

No. of staff working on the VMLE:

- Part of one full-time project co-ordinator
- Part of one full-time programmer
- Part of one full-time web designer

Technology system is based on:

- The Zope object-oriented web application development system

Main reasons given for having a VMLE:

- Recognition of the potential of the technology
- Demand from staff/students

Key functions delivered by the VMLE at this site:

- Administration of the curriculum (eg timetables, clinical attachments, announcements etc)
- Information about course (study guides, curriculum structure etc)

Key features currently or shortly to be provided:

- A tool for staff to upload learning materials
- A personalised home page showing relevant links for individual users
- A dynamic timetable that can be modified online
- Teaching materials
- Communications tools such as discussion boards or chat rooms
- Self-assessment questions
- Course administration information
- Study guides
- Indexing (eg through MeSH headings)

Basic unit of organisation of the VMLE content:

- Course (eg undergraduate medicine, midwifery etc)
- Year
- "Subject Panel Booklets" for each major component of the curriculum

Courses covered:

- All of UG and PG Medicine, Dentistry, nursing, midwifery and PAMs courses.

Evaluation done:

- Development not sufficiently mature for formal evaluation
- Informal feedback collected from students by tutors using the system

How and how much VMLE has been used:

- Used regularly by 5 clinicians

- Used spasmodically by a further 10
- Used for mock exams
- No. of users limited by limited capacity to provide training

Dissemination and Training carried out:

- No formal training provided
- Dissemination strategy is to communicate the potential to key group of decision makers

Integration with data from other institutional information systems (student records, library etc)

- system queries a copy of centrally held student information
- system can query the library catalogue
- integrated with the College web site

Significant Problems and obstacles experienced:

- Lack of interest/awareness by staff
- Lack of resources for development
- Lack of support from faculty/departments

Critical Success Factors

- Vital for technologists and educators to work together to influence management of the potential of the technology
- Long-term perspective required

Future plans

- Creation of personalised information environments to enable lifelong learning independent of time and place
- Enable access to the VMLE via WebTV, WAP phones, PDAs etc.
- Individualised logins for modelling of individual users
- Personalised timetable
- Incorporation of push technology to send relevant information to individual users
- Creation of a range of interfaces appropriate to different modalities (MCQ, document etc).
- Make the VMLE available as open source for other institutions to use

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## Appendix D: Contents of the VMLEs studied

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This Appendix lists the different types of content provided by the VMLEs. It is intended to indicate how the systems are being used and to provide ideas that others may like to follow. However, please note that not all the content types are available on all the systems investigated and no attempt has been made to analyse in detail the content of the different systems, particularly as this is constantly changing and it is difficult to be accurate and comprehensive.

### Course Information

- Handbook for course as a whole
- Lists of modules/elements/components
- Module/element/component descriptions
- Structure and outline of teaching
- List of all teaching sessions
- List of teaching sessions linked to relevant outcomes and resources
- Names of tutors

### Learning objectives

- Details of how clinical attachments work and what is expected of the student
- Senior medicine handbook

### Assessment

- Self-assessment MCQ questions
- Self-assessment modified essay
- Self-assessment case studies
- Self-assessment OSCEs
- Example assessment papers from previous years
- Description of and criteria for assessments
- Published Exam results

### Course Administration

- Course evaluation forms
- Orientation information for clinical placements
- News items/announcements
- Timetable for each module
- Student assessment forms
- Administrative documentation to be filled in by the student such as log sheets for clinical visits

### Learning Resources

- PowerPoint slides (diagrams)
- Images
- Video clips of patients
- Video clips of lectures
- Lecture Notes
- Reading lists
- Course text books
- Tutorial exercises
- Generic study/IT skills resources
- Electronic reserve of key academic articles
- Case study texts
- Clinical skills materials

### External links

- Links to medical faculty site for further admin info
- Information about resources available locally but not directly through system
- Links to offsite journal articles

## Appendix E: Comparative features of the six VMLEs studied

UNIVERSITY	BIRM	CAMB	EDIN	NEWC	NOTT	UWCM
Name of System	MedWeb	ERWeb	EEMeC	NLE	Mediguide	ASPIRE
<b>Documents and resources: Upload and formats</b>						
Content in HTML and various native formats	✓	✓	✓	✓	✓	✓
Author upload of HTML pages	✓		✓	✓	✓	✓
Author upload of (MS Word etc) files in native format	✓		✓	✓	✓	✓
Authors can edit HTML rendered pages online	✓					✓
Authors can upload to all subject areas not just their own				✓		✓
Authors can add News Items/Announcements to the site		✓	✓	✓		
Automated conversion of common files into XML documents <sup>i</sup>	✓					✓
Automated rendering of embedded styles from Word stylesheets into HTML			✓	✓	✓	✓
Word Template for pre-formatting site content			✓	✓	✓	
<b>Navigation, Indexing and searching</b>						
MeSH indexing	✓					
Search on keywords	✓				✓	
Search on whole text	✓			✓	✓	✓
Synonyms database to aid searching					✓	
Sophisticated search of XML documents <sup>ii</sup>	✓					✓
Direct linking to resources from search results	✓			✓	✓	✓
List of Learning outcomes linked to sessions that contribute to them	✓					
Search external resources (OMNI, PubMed etc)	✓					
Explore tool <sup>iii</sup>			✓			
Course viewable by both horizontal and vertical themes <sup>iv</sup>	✓		✓		✓	

<b>UNIVERSITY</b>	<b>BIRM</b>	<b>CAMB</b>	<b>EDIN</b>	<b>NEWC</b>	<b>NOTT</b>	<b>UWCM</b>
Lists of uploaded resources for each course	✓			✓	✓	
Cross referencing between horizontal and vertical course components	✓		✓			
Collapsible/expandable tree structure				✓	✓	
Pop-up sub menus				✓		
<b>Information about resources</b>						
No. of downloads notice <sup>v</sup>				✓		
Download time notice <sup>vi</sup>				✓		
Shows date resource created/uploaded			✓	✓	✓	✓
Shows latest resources uploaded on home page				✓		✓
Newly added resources labelled as "new"			✓	✓	✓	
<b>Resources organisation</b>						
Resources linked to learning outcomes	✓	✓				
Resources linked to list of medical specialties	✓	✓				
Resources linked to study guide for each course/module	✓		✓	✓	✓	✓
Resources linked to individual teaching sessions (lecture, lab, seminar)	✓			✓	✓	
<b>Personalisation</b>						
Individual home page (e.g. "My Curriculum") <sup>vii</sup>			✓	✓		✓
Separate home page for each year at login			✓	✓	✓	
Personal Academic Record system (PARS) or similar <sup>viii</sup>	✓		✓	✓	✓	
Personal image database <sup>ix</sup>	✓					✓
Personalised web links (bookmarks)		✓				✓
Content and interface tailored to individual context <sup>x</sup>			✓	✓		✓
Archive of previous years <sup>xi</sup>			✓	✓		

UNIVERSITY	BIRM	CAMB	EDIN	NEWC	NOTT	UWCM
<b>Assessment</b>						
Formative testing	✓	✓	✓	✓	✓	✓
Summative testing		✓				
Interactive MCQs	✓	✓	✓	✓	✓	✓
Short Answer Questions (SAQs)		✓	✓		✓	
Confidence rating	✓	✓				✓
Each item allows True, False and Don't Know answer	✓	✓		✓	✓	✓
Each item allows True, False answer			✓			
Negative marking used	✓	✓		✓	✓	
Entry of peer assessment marks	✓		✓			
Questions can be edited online by tutors	✓		✓	✓	✓	✓
<b>Timetabling</b>						
Auto individual timetabling	✓		✓			
Select timetable period covered <sup>xii</sup>			✓			
Detailed course timetable for separate sections of the course		✓	✓	✓	✓	
Daily timetable for each year			✓		✓	
Overall colour coded map of each year			✓		✓	
Online gross timetable		✓	✓		✓	
Shows individual and group allocations		✓	✓			
<b>Course management</b>						
Online registration for SSMs and clinical attachments	✓	✓	✓	✓		
Information about SSM poster presentation for examiners	✓					
Registrations reminders sent out automatically		✓				
Maps of clinical attachment sites	✓	✓	✓	✓		
Timed release of materials		✓		✓	✓	

<b>UNIVERSITY</b>	<b>BIRM</b>	<b>CAMB</b>	<b>EDIN</b>	<b>NEWC</b>	<b>NOTT</b>	<b>UWCM</b>
Timed release of questions	✓	✓	✓		✓	
Automated selection of partners for peer assessment	✓		✓			
<b>Communication</b>						
Discussion board for each year			✓			
Discussion board for each course or module	✓					
Discussion board for courses or modules on request			✓		✓	✓
Chat room for whole system	✓		✓			
Chat room for each course or module						
Chat room for courses or modules on request			✓			✓
Many to many email system usable by staff and students		✓				✓
Many to many email system usable by staff only				✓		
Form for user feedback	✓	✓	✓	✓	✓	✓
<b>CAL materials</b>						
CAL materials integrated	✓	✓	✓	✓		✓
Externally produced CAL materials	✓	✓	✓	✓		
Locally produced CAL materials	✓	✓	✓	✓		✓
Customised LAN browser for viewing CAL materials		✓	✓			
<b>Student information</b>						
Online information about students	✓	✓	✓	✓ <sup>xiii</sup>		✓
Photographs of students	✓	✓		✓ <sup>xiv</sup>		✓
View students by sub group or year or attachment	✓	✓	✓	✓ <sup>xv</sup>		
<b>Reviews and evaluation of resources/the site</b>						
Star rating for materials		✓				
Rate it! function for use by staff and students		✓				

<b>UNIVERSITY</b>	<b>BIRM</b>	<b>CAMB</b>	<b>EDIN</b>	<b>NEWC</b>	<b>NOTT</b>	<b>UWCM</b>
Reviews of materials available		✓				
List of recommended web sites		✓	✓			
Facility for feedback on resources available				✓		✓
Context aware feedback <sup>xvi</sup>	✓					✓
<b>Data integration</b>						
Directly queries central University admin database						✓
Queries copy of central University admin database	✓			✓	✓	
Uses main University login	✓			✓		✓
Dynamically generated pages from object database	✓			✓		✓
Integration with resources from other Institutions	✓			✓		
Links to library database		✓	✓	✓	✓	
<b>Help</b>						
General help			✓	✓	✓	✓
Context sensitive help <sup>xvii</sup>					✓	✓

## Notes

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- <sup>i</sup> Embedded styles from Word stylesheets (e.g., Heading 1, Bulleted list, Numbered list) are automatically converted to corresponding HTML tags and styles (e.g., <h1></h1>, <ul><li></li></ul>, <ol><li></li></ol>)
- <sup>ii</sup> A sophisticated search facility that allows searches on content of XML documents. The user can then tell the system to bring up all other resources containing that phrase.
- <sup>iii</sup> An 'explore' tool that allows users to jump directly to different parts of the course or from year to year
- <sup>iv</sup> Some medical schools organise their curriculum to include horizontal elements such as pathology, oncology, obs and gynae, that occur sequentially and tend to be fairly separate from each other, alongside vertical themes such as ethics and clinical skills that can be thrown up as part of a horizontal element at various points throughout the course.
- <sup>v</sup> Authors can see how many times a resource has been downloaded by users
- <sup>vi</sup> The system tells authors how long a particular resource will take to download over a range of network types
- <sup>vii</sup> This provides any user, whether 1st yr student, 5th yr student, postgrad or staff with an individualised view of the system that presents the resources that they have permission to see and that are most relevant to that individual.
- <sup>viii</sup> This is a private web based individual learning record visible only to the student and the personal tutor. It can include exam marks.
- <sup>ix</sup> Images are indexed in such a way as to allows individual users to create and maintain their own personalised archive of digital images on the system, but also make them accessible to other users.
- <sup>x</sup> Dynamically generated pages from object database, enables the application of stylesheets (XSLT and CSS) to tailor content and interface based on user, session and URL data. Which provides a high degree of flexibility in terms of what and how content is delivered to a particular individual for a given context/activity.
- <sup>xi</sup> An archive from previous years so that students can look at their version for their particular year – because years are different from year to year.
- <sup>xii</sup> This works from the system's database and includes pull down lists to select the required range of days to show and the returned timetable includes links to information and maps of venues and the staff member involved with any given event.
- <sup>xiii</sup> Staff access only
- <sup>xiv</sup> Staff access only
- <sup>xv</sup> Staff access only
- <sup>xvi</sup> Context aware feedback (for example from students to teachers) which knows and records the page (URL) you are looking when you create the feedback so that it is clear what the feedback relates to.
- <sup>xvii</sup> Context sensitive help which can be created/edited by the author of the corresponding resource/application. If no help is available for a resource, the system automatically displays help associated with content the same context hierarchy. Training advice and materials can be provided through these help files including advice such as where to get help, and pedagogical advice. This could include tips on how to do an exercise presented on the page that it relates to.