

Developing a Virtual Learning Environment for Art & Design: A Constructivist Approach

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Abstract

This paper examines some of the underlying pedagogical principles which influence the design and implementation of a Virtual Learning Environment developed to support teaching and learning in Art and Design. These principles are premised on a constructivist viewpoint, that is that knowledge and understanding are not acquired passively but in an active manner through personal experience and experiential activities, learning is based on problem solving and active engagement with ideas. A critical evaluation of existing systems identifies three generations of Virtual Learning Environment (VLE). The paper then describes how these established principals were developed into a set of design specifications for a new VLE. The new prototype system is described in detail and the implications for institutional change are discussed.

Introduction

Today's schools of Art and Design aim to deliver a sophisticated curriculum equipping students with a wide range of professional skills. Predominantly their learning is experiential based on doing. Learning and teaching have never been more complex in Art and Design and as a result both learners and tutors require sophisticated resources to support them. The aim is to provide learning resources that will develop higher-order learning skills including critical thinking, problem solving, research and lifelong learning.

The role of the qualified Art and Design graduate is also changing rapidly. The 'artist starving in the garret' model is hopefully very rare, it is being replaced by the computer literate, media savvy professional able to work collaboratively with an understanding of the social and organisational context in which they are operating. They are expected to be able to think critically and solve a wide range of problems, be adaptable, work effectively in cross-disciplinary teams and be capable of constantly updating their own skills and knowledge in response to changing requirements. Therefore there is increased pressure on educators to provide their students with the knowledge and skills to be able to work in new domains and situations. Graduate careers are multi faceted, so called portfolio careers, in which it becomes essential to document achievements and skills acquired – *ref: Mike Press "New Lives in the Making", Crafts Council Crafts 2000 Conference, Stafford.*

With government initiatives encouraging universities to adopt policies which support lifelong learning, one response has been to make learning resources available online and in some cases complete courses.

This paper is aimed at those involved in the management of teaching and learning in Art and Design and those interested in exploring the potential of computer mediated and web based learning as a means to enhance and support the delivery and quality of conventional teaching provision. The paper examines the principles that lie behind the design of virtual learning environments, of how a constructivist and generative approach to learning can be incorporated into a VLE design and examine some of the challenges involved in implementing a new VLE system within a university structure.

Underlying Principles

Computer based learning resources in the form described in this paper are often referred to as Virtual Learning Environments or VLE's.

A VLE refers to learning management software that provides computer mediated communications (email, bulletin boards, news groups, etc.) and online methods of course delivery. Joint Information Systems Committee JISC (in the United Kingdom) has defined a VLE as a system that provides access to 'online interactions of various kinds which take

place between learners and tutors¹. Such systems are commonly accessed using a standard web browser application such as 'Internet Explorer' or 'Netscape Navigator' and do not require a specific piece of software or client application.

It is generally accepted that gaining knowledge and understanding which can be successfully applied in context requires active participation by the learner and this is unlikely to be acquired passively. Knowledge is acquired through experience or experiential activities. The learner is active and seeking to make sense of the world. This concept is referred to as Constructivism, which originated in the 20th century through the work of Piaget, Bruner and Vygotsky working in the field of psychology and philosophy.

A learning environment based on this approach is designed to facilitate project-based and student centred learning. It also implies that learning is based on the learner undertaking tasks that contribute to the knowledge base, hence the term 'knowledge building communities', for example there is rarely only one solution to the given task or problem.

Virtual Learning Environments that apply a Constructivist model to learning have been given the acronym REAL's 'Rich Environments for Active Learning'. REAL's are VLE's that attempt to engage learners in 'dynamic, authentic learning activities that increase their control and responsibility over their learning processes while they learn problem solving and collaborative skills' – ref: *Grabinger and Dunlap 1995*.

A Critical Evaluation of Existing Systems

One of the most compelling overviews of the way in which learning environments are developing was given by Professor Ben Schneiderman (recently retired Professor and Director of the Human Computer Interface laboratory (HCIL) in the University of Maryland² at the CHI98 Conference.

The paper, entitled 'Codex-Memex-Genex : The Pursuit of Transformational Technologies' (Shneiderman 1998) identifies a range of ways in which networked technologies can be used to enhance the quality and effectiveness of collaborative processes in contexts where a technical infra-structure is already in place.

A review of a wide range of different environments available elsewhere suggests three 'generations' of VLE's, from passive transmission through to active collaboration and latterly reflective development.

Generation 1 : Information Sharing Environments

The initial emphasis in the development of VLEs has tended to focus on passive information-transmission, sometimes referred to as the 'banking' metaphor. In this context knowledge is a 'given' which is transmitted from expert to novice, using the network simply as a vehicle for wider or more flexible access. Subject 'gateways' and 'portals' are the most familiar examples of these systems, providing access to users to a range of information and resources held in different databases.

Arguably, many systems claiming to be 'knowledge-management systems' are on closer analysis merely 'information management' systems that do not offer users the opportunity to select, organise, structure or customise the information in specific ways that can add value for the individual, the networked community or the organisation that uses it.

Generation 2 : Communicative and Collaborative Environments

The second generation of VLE's emphasises the potential of information and communication technologies to support communication and collaboration. The emphasis described by this model has moved towards a constructivist, collaborative and community-based approach supporting remote collaboration and resource sharing – ref: *Grabinger and Dunlap, 1995*.

¹ <http://jisc.ac.uk/mle/>

² <http://www.cs.umd.edu/projects/hcil/>

Milligan (1999)³ and Britain and Liber (1999)⁴ have reviewed both commercially developed VLE's and VLE's developed in-house, currently in use in UK institutions.

These include some of the more commonly used commercial systems widely adopted in UK universities such as WebCT⁵, TopClass⁶, and Blackboard⁷.

All of the systems reviewed provide some elements of collaboration and networked community. However, the field is evolving rapidly with the development of specific user interfaces and 'cognitive tools'. Recent environments combine a knowledge base with customised user interfaces - allowing users to interact with and to construct or create new knowledge, processes and practices.

Some of these environments are built on a model of passive collaboration using the technology as a means of cooperative sharing of information and resources. Such systems endeavour to:

- Make information more accessible and transparent (e.g. using the technology for dissemination, auditing, quality assurance etc)
- Structure the information and resources around users' needs (e.g. using the technology to target or individualise information and resource access, development of 'intelligent agents' or search engines)
- Provide interfaces for 'posting' information or resources to a database

In more sophisticated developments, these may add value to distributed systems within or across organisations as Managed Learning Environments (MLEs) to integrate the management of processes more effectively and transparently.

The CoMantle project⁸ at Bangor University, for example, builds on the systems approach used in business organisations to achieve this in an educational context.

The more recent models reflect the active construction of meaning by social interaction. This constructivist approach assumes that knowledge is created and recreated through dialogue and shared experience. In this type of environment the exchange, mapping, modification and creative extension of this is an 'emergent' process requiring learner to learner and/or learners(s) to tutor(s) cooperation and dialogue in shared spaces and a range of approaches.

In this model the tutor is acting as facilitator and moderator.

These environments are more closely associated with active learning rather than the passive 'banking' model. Reviews of these approaches sometimes refer to Pask's conversation theory and Vygotsky's model of 'assisted learning' (1980), in addition to constructivist theory.

Arguably the innovations in the use of technology to support these 'soft processes', (knowledge-building, knowledge representation and knowledge management), have been most rapidly developed in commercial and military contexts where the value of effective virtual collaboration impacts directly on the speed and effectiveness of organisational performance.

Generation 3 : Generative Environments for 'Knowledge-building' Communities

Adding value to a networked community of practice - the 'generative paradigm' - refers to the construction, capture and re-use of transferable knowledge and resources.

³ <http://www.jtap.ac.uk/reports/htm/>

⁴ <http://www.jtap.ac.uk/reports/htm/jtap-041.html>

⁵ <http://www.webct.com/>

⁶ <http://www.wbtsystems.com/>

⁷ <http://www.blackboard.com>

⁸ <http://toomol.bangor.ac.uk/comantle/>

The system both generates and captures knowledge assets within networked communities whether 'communities of practice', company intranets or project teams. Features of such systems include:

- Interfaces customised to specific user needs
- Collaborative spaces (textual and visual [e.g. whiteboards] and synchronous and asynchronous tools) that facilitate the rapid generation of new concepts or applications from shared practice or experience
- Systems or tools to capture and share both the processes and the products of creative activity
- Systems and tools which can achieve this with a range of visual media, and without specialist training for the users
- Scalability and inter-operability to adapt to new technologies and increases in scale of use

A growing number of networked communities depend on the use of shared applications for their collaboration, for example designers located globally, operating in different time zones while working together on a single project.

This approach goes beyond providing shared spaces for the 'knowledge building community'. It harnesses the power of networked technology to:

- Individualise access to knowledge and resources around user's needs (i.e. it is user-centric not content-centric)
- Allows the immediate capture, authoring and re-use of new knowledge and resources via the user's desktop.
- Provides a framework for organisational processes (enhancing access, transparency, currency)
- Provide tools for 'soft' processes such as quality assurance and innovation

At the time of writing the prototype system described in this paper would be categorised as generation two. However it is designed around an open architecture that will enable the future integration of generative tools such as visualising, mind-mapping, collaborative design tools and digital libraries all with archive capabilities. The design team aspire to develop a third generation system, however it is necessary to take account of the current user base and the need for staff development and cultural shifts to take place before more extensive innovations can be incorporated.

The Design Specification

One of the JISC Technology Application Programme reports states that the overall aim of introducing a Virtual Learning Environment is to reduce the administrative load on tutors in order to allow them to manage their workload more effectively so that they can give more time to individual students. In addition it is to provide opportunities to improve the quality and variety of teaching and learning, enhancing current methods – *ref: JTAP report*.

The project described in this paper in addition aimed to develop a VLE that would allow students to take ownership of their learning. The system would aim to provide facilities for communication and discussion between students, tutors and peers whilst providing the opportunity for students to benchmark and evaluate their own progress in their learning.

The VLE described in this paper began with a set of broad principles which were manifested in the form of a number of web-based tools. These tools include course administration tools, authoring tools for content development and management, tools for assessment and feedback to students, communication tools to facilitate dialogue, notice boards, timetabling as well as links to other online resources. All of these tools can be accessed using a single web interface that is customisable to individual user requirements whilst retaining a university identity. The interface will also allow for the system to be expanded at a later date to incorporate more generative tools such as those described above.

Design Methodology

To design a new VLE system which would achieve the maximum level of adoption and acceptance by the identified stakeholders – namely students, tutors and education managers it was necessary to apply an appropriate design method and structured approach from the outset of the project.

It was felt essential that a user-centric design approach was used and in this case the end users identified were students studying both on campus and at a distance, members of academic staff, researchers and staff from a range of support departments.

The research and development process consisted of three main elements:

- A critical evaluation of existing systems and tools
- A wide consultation with stakeholders
- An iterative development of prototypes

This consultation was carried out using questionnaires and facilitated brainstorming events. The resulting mass of data was subsequently analysed and mapped using a software application called 'Inspiration'⁹.

This mind mapping software provided an effective method of visualising the design process and as a result the design methods and tools used in developing web-based systems have also evolved and become more effective.

After considerable iterations a navigation structure was arrived at. This provides customised menus based on whether the user is a student, tutor or an administrator. It also became clear that these three groups had very different perspectives and requirements. The student priorities are for immediate access to their projects, content, timetables and assessment information. Tutors prioritised tools for course management, content development and communication. Administrative staff prioritised course administration tools and information distribution tools such as notice boards.

An important facility that is likely to receive more attention in the near future is the ability to include a Personal Development Profile (PDP) system within the environment. This is one of a number of 'Cognitive Tools', - *ref: Jonassen, 1996*, which can be used as a pivot for constructive dialogue between tutors and students.

It also offers more cost-effective integration of a number of educational and organizational processes:

- integrating the teaching, learning, assessment, reflection, recording processes more reliably, accessibly and transparently on a portable web-based document
- integrating the teaching, reflection, feedback, support, assessment and evaluation processes around individual user needs.

Macintosh (2002) provides an overview of current developments in this field.

Several universities have developed online PDP systems including LUSID (University of Liverpool), RAPID (University of Loughborough) and InternetPARS (University of Durham and Nottingham). At this stage in the development of online PDP's it is too early to say whether such systems will enhance or retard the reflective process as there may be a conflict between institutional requirements and individual needs. The design of the PDP imposes a structure which may in practice be too restrictive and lead to a formalised form of feedback inappropriate to many Art and Design disciplines.

A particularly important element in a VLE is the ability to establish discussion groups. These can be used in a variety of ways. They can provide an area for informal (non assessed) discussion on any topic or they can be used as part of the assessment process. Students can be asked to submit carefully prepared responses to contribute to a formal debate. Discussion tools vary in design and complexity. A good example is provided by the JISC mail base that can be found at ¹⁰. Another model, which provides a more graphical approach to the structure of content, is KnowledgeForum ¹¹.

⁹ <http://www.inspiration.com>

¹⁰ www.mailbase.org.uk

¹¹ <http://www.learn.motion.com/lim/kf/kf3info1.html>

Developing a Prototype VLE

The original prototype VLE StudioSpace 1998¹² was initially developed using a relational database and web publishing software.

This early prototype consisted of a module descriptor database, student records, a resources database, a self appraisal and assessment database and incorporated 'FirstClass'¹³, which provided the communication tools. This system was not connected to centrally held databases.

Although staff used elements of the system, extensively keeping the information contained on the databases current and up to date soon became problematic. Following an extension to the original project it became possible to re-develop the system using an SQL database. This made it possible to import data from centrally managed databases, moving the VLE towards an MLE – *see Fig1*.

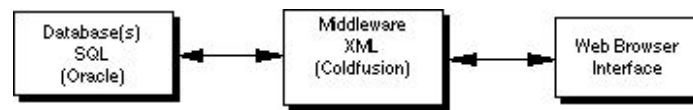


Figure 1

Figure 1 shows the relationship between the software technologies in the system. The web pages are generated dynamically in response to a user request. Data is extracted from the centrally held database, is then processed in accordance with the users query and finally published back to the web interface. To the user this process appears to be almost instantaneous.

The MLE provides access to large amounts of data, for example the system described in this paper provides access to large numbers of module descriptors, student records, databases containing projects briefs, research information and links to library systems. The resources database was also 'seeded' with over two hundred records covering a range of subject specific information. The amount of information available soon becomes vast, so to be effective as a learning environment tutors must mediate access to the information

As Diana Laurillard remarks 'It is as absurd to try and solve the problems of education by giving people access to information as it would be to solve the housing problem by giving people access to bricks' (1996).

Two databases are required to provide the core data for the VLE - the student record database containing details of all the students enrolled at the University and a module descriptor database. In the case of the modules are documents containing the learning outcomes and assessment criteria covering a block of work measured in student hours. These also relate to credits. The modules are developed using what is referred to as a systems approach - *ref: 'Designing Instructional Systems - A J Romiszowski 1988*. This structure provides the starting point for the pedagogy embedded in the VLE.

¹² www.studiospace.net

¹³ <http://www.centernity.com>

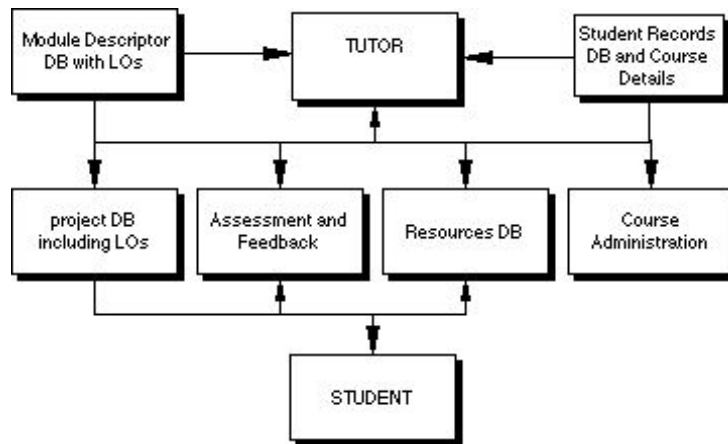


Figure 2

Figure 2 shows the information flow in the MLE – N.B. DB = Database and LO's = Learning Outcomes.

As Stiles had remarked VLE's are not neutral, the design of the interface and database imposes a structure that can compound bad practice as well as provide opportunities for good practice¹⁴. The other elements that determine the pedagogy inherent in the VLE are formed by the structure of the VLE, the use of the communication and feedback tools. The VLE contains authoring tools and the use of a content management system, templates or web editor programme to provide a consistent look and feel to material available in a VLE.

The resources database developed as part of the VLE allows content to be added to the database online and for users of the resources to rate the value of the resource. This rating facility works in a similar way to commercial websites, for example the Amazon.com book review system. This feature begins to provide a mechanism for verifying the quality or usefulness of resources over time.

Future developments will include the incorporation of a whiteboarding tool plus an extension to the content management system. The aim will be to move the system towards a generation three environment as categorised by Ben Schniederman.

Conclusion

A VLE for use in Art and Design must complement the pedagogical approach as used within the discipline, an approach to learning that includes experiential, problem based, project based, student centred and team based learning.

This paper has set out the principles underpinning the design of a Virtual Learning Environment for Art and Design. The design is based on a constructivist approach to learning. The introduction of a Virtual Learning Environment into the art school culture is resulting in the externalising of knowledge and clarifying the nature of professional practice. Although the developments described in this paper are at a prototype stage the pressures to introduce such systems will continue to grow. Initially resources, in the form of staff time, are required to develop content and to overcome problems encountered. However the opportunities offered by a VLE far outweigh the perceived difficulties and will enable Art & Design educators to more easily cope with the increased complexities and speed of constant change.

It is important for the discipline that academics responsible for delivering art and design are involved in any institutional developments or plans to introduce a VLE. It is also important that VLEs reflect the nature of the discipline by providing a well-designed, visually stimulating environment that genuinely supports the real world learning environment.

¹⁴ <http://www.jisc.ac.uk/mle/>

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<http://www.virtual-u.org/screens.html> - Virtual University