Chapter 17
Social Networks for Learning: Breaking Through the Walled Garden of the VLE

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Abstract e-Learning is ubiquitous. The virtual learning environment (VLE) is the mainstay of UK universities e-learning provision. However, its' deployment is often standardised and pedestrian; typically resources are made more available to the learner without necessarily adding value to the learning. Many contemporary theorists in e-learning advocate learning environments developed using social network technologies and Web 2.0 tools, to encourage learners to customise and personalise their learning environment. A key tenet of any social network is communication. Learners, as 'digital natives', routinely use social networks to communicate with friends and family. To harness and exploit the communication and collaborative qualities of a social network, a university SLE prototype was developed and is evaluated in this chapter. Learners become active participants in the learning process. They access public internet content to practice independent information-search and -discernment skills, which they can share with others, breaking through the 'walled garden' of the VLE.

Introduction

According to Holmes and Gardner [1], 'e-learning offers new opportunities for both educators and learners to enrich their teaching and learning experiences, through virtual environments that support not just the delivery but also the exploration and application of information and the promotion of new knowledge'. However, in O'Hear's [2] view, 'the early promise of e-learning . . . has not been fully realised . . . for many [it] has been no more than a hand-out published online,

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coupled with a simple multiple-choice quiz. Hardly inspiring . . . '. Yet, by using social networks and web services, 'e-learning has the potential to become far more personal, social and flexible' [2]. O'Hear advocates e-learning 2.0, which 'takes a "small pieces, loosely joined" approach that combines the use of discrete but complementary tools and web services – such as blogs, wikis, and other social software – to support the creation of ad-hoc learning communities'. Indeed, social software can initiate new ways of learning as it incorporates a range of tools which allow learners to interact and share data with other learners, primarily via the web [3]. Walton et al. [4] contend that social learning technologies used in an educational context can 'create a new, dynamic and engaging learning environment for tomorrow's students'.

This contemporary approach to learning using social software, represents a fundamental shift in the way people learn and so must be put into the context of the variety of approaches to learning and teaching that are available. Traditional approaches to learning and teaching are teacher-driven where 'teacher knows best' [5, 6] and learners passively 'receive' information. However, in the last decade or so there has been an increasing trend towards social constructivist approaches that empower learners to build on past experience through individual and group activities [7]. Abadzi [8] contends that the role of a social constructivist teacher is to take a back seat in the *teaching* but instead to provide the *social* environment and supportive resources that will afford students the freedom to actively control, direct and make sense of their own learning. An associated approach is the discovery learning method, in which students are encouraged to discover new information for themselves or in groups [9]. Whilst such collaborative and enquiry based activities may well take place face-to-face, a technology-based network can provide a structured and supportive learning environment [7, 10–12].

Virtual learning environments (VLE), described by the British Educational Communications and Technology Agency (BECTA) as 'standardised, computer-based environments that support the delivery of web-based learning and facilitate online interaction between students and teachers' [13], are being used routinely in schools and higher education organisations to support this process [7, 10–12]. However, while VLEs typically provide the functionality to upload course content for learners and monitor usage they generally have limited, if any social network functionality [14]. Hart advocates a social learning environment (SLE), which she describes as 'a social network application in which individual learners and groups of learners can meet to collaborate in the creation of materials and resources, share resources, knowledge and experiences, and learn from one another' [14]. Hart adds that through social interaction with tutors and other learners, SLE-based activities can improve learners' personal and professional productivity in both formal and informal ways. 'In other words, a SLE does not manage, control and track users but rather provides an open environment for them to work and learn collaboratively' [14]. A SLE then, is a social network that comprises a number of social elements, including networking, social bookmarking, communicating and collaborating with others, blogging, podcasting and RSS feeds.

From an educational perspective, there may be limited value to learning environments by themselves [15]; Pole and Jones [16] contend that resources can be more

available to students without necessarily adding *value* to the learning. Motivational features, such as chat facilities and discussion boards, need to be embedded in the learning environment to stimulate learners to engage with it [17]. However, Woodill [18] cautions that just because people are using 'social media', it does not mean that 'social learning' is taking place. Consequently, care must be taken in the design of the SLE to include elements that engage learners and motivate them to participate in discovery learning.

This chapter reviews the literature to explore the notion and rationale for e-learning and the inherent benefits and challenges associated with VLEs and SLEs. The chapter then describes the development of a social network application for discovery learning in the context of a higher education (HE) ICT module. The eTUTOR (Education Through Ubiquitous Technologies and Online Resources) project, was funded by the Joint Information Systems Committee (JISC) through the Next Generation Technologies and Practices strand of the Users and Innovation Programme.

e-Learning and Learning Environments

What Is e-Learning?

Traditionally, learners have needed to meet at the same time and place to exchange knowledge, thereby allowing learning to take place. However, with the sophistication and ubiquity of technology, which is not location specific, it is now possible for individuals to learn anything, anywhere at any time, a development termed e-learning [19]. e-Learning is defined by Bullen and Janes [20] as 'learning which takes place when internet technologies are used to facilitate, deliver, and enable learning processes over a distance'. However, there is no agreement in the literature as to a single definition of e-learning. Mann [21] for example, contends that 'in the EU "e-learning" is defined as a form of distance learning, with learning materials accessed from the web or from a CD via a computer. Typically, tutors and learners communicate with each other using e-mail or discussion forums'. Yet, this suggests that only distance learning is considered e-learning and that the internet is essential for communication. Stockley's [22] definition is much broader as he suggests that e-learning is 'the delivery of a learning, training or education program by electronic means' and is not restricted to the internet, but involves 'the use of a computer or some other electronic device to provide training, educational or learning material'; this can include CD-ROM, DVD, intranet and mobile phone technology [22].

JISC [23] places the emphasis more specifically on the 'learning' and not the 'technology' by defining e-learning as 'learning facilitated and supported through the use of information and communications technology'. It can cover a spectrum of activities from the use of technology to support learning as part of a 'blended'

approach (a combination of traditional and e-learning approaches), to learning that is delivered entirely online. Whatever the technology, however, 'learning is the vital element'. According to Holmes and Gardner [1], 'e-learning offers new opportunities for both educators and learners to enrich their teaching and learning experiences, through virtual environments that support not just the delivery but also the exploration and application of information and the promotion of new knowledge'.

However, for the purposes of this chapter, the deliberately open-ended and flexible definition by Horton [19] will be adopted, where e-learning is considered 'the use of information and computer technologies to create learning experiences'.

Rationale for e-Learning

Siemens [24] suggests that the two primary values of e-learning are to make learning more accessible and more effective. He describes these roles as:

1. To *extend* learning (effectiveness). This role involves the addition of discussion forums/email/virtual presentations, software simulations, etc. to existing learning. Holmes and Gardner [1] describe this mix of conventional face-to-face learning (often classroom-based) with e-learning, (which may be at a distance) as *blended* learning.
2. To *replace* traditional learning (accessibility). 'Pure' e-learning in this role is a replacement to traditional learning. The learner may have access to classroom courses, but is able to self-select the schedule to make e-learning more convenient.

Many UK universities have developed a blended approach to e-learning, using technology to extend the existing provision. The combination of e-learning resources and traditional teaching materials and strategies is intended to maximise the advantages of both methods and overcome the associated disadvantages of each approach individually [16].

e-Learning is widely acknowledged to have many advantages for students, teachers and educational organisations and has consequently resulted in many universities rushing to join the e-learning market to enjoy the associated benefits. For example, as Salmon [25] suggests, e-learning can facilitate 'flexibility' and 'adaptability to audience'. Similarly, Aswathappa [26] purports that whilst e-learning is consistent for all learners, it allows individual students to set the pace to meet their own learning needs and styles, but with built-in guidance. According to Zhang et al. [27], computing technologies 'are providing a diverse means to support learning in a more personalised, flexible, portable, and on-demand manner'. The mainstay of UK universities' technological e-learning provision is the virtual learning environment (VLE).

The Virtual Learning Environment Goes Social

The Joint Information Systems Committee (JISC) [28] suggests that the term VLE refers 'to the 'online' interactions of various kinds which take place between learners and tutors'. Fry et al. [12] add that the VLE is a 'menu-based or point and click interface for constructing an online course area without the need for specialist web development skills'. The primary functions of a VLE are to deliver controlled access to structured course materials, to track students, provide learning support, a medium for communication and links to other administrative systems [11]. An alternative classification by El-Ghareeb [29] categorises the main functions of a VLE into Course, Exam, Assessment and Collaboration sectors, with each sector offering extensive component functionality; for example, Course Authoring and Student Tracking functionality would be included in the Course sector and the Communication sector would contain forums and chat rooms. Most VLEs act as a repository for course materials but also have the capability to provide student results, conduct e-Assessment and host forum-based discussions. Indeed, the Higher Education Academy (HEA) [30] suggests that it is the inclusion of communication tools that differentiates a VLE from other forms of e-learning. However, it is difficult to gauge how widely communication tools such as online forums, wikis, blogs, podcasts, etc., are being used in VLEs since there is little published evidence of their use [3].

According to Zhang et al. [27], a VLE supports traditional learning approaches in that it can reinforce basic principles studied in lectures by providing for instance, practical exercises, online testing, links to other websites and additional resources (such as industry publications and software) should students wish to explore the themes. There are numerous other advantages associated with VLEs, which include that student access is widened, that it promotes active and independent learning, there is the potential to support large student cohorts and learning materials can take a variety of forms and media thereby providing a range of materials to fit different learning styles [15, 30]. Such a student-centred approach allows students to learn at their own pace and at a time to suit themselves, thereby enhancing their experience of the programme studied. Lecturers benefit because content is easily updated and there are fewer disruptions caused by students requesting copies of notes due to absence; this enables lecturers to spend more time conducting research and enhancing learning materials/strategies [16].

According to Farmer and Tilton [31], in 2001, 19% of universities and colleges did not use a VLE but by 2005 only 5% were without the VLE. During the same time period, a decline was noted in the use of proprietary VLEs from 93% to 57% [31]. VLEs are typically categorised as open source, commercial (proprietary) and/or free. Open source VLEs provide the source code to developers to enable the manipulation and enhancement of the environment; they are often, but not always, free and examples include Moodle and Sakai. Alternatively, commercial VLEs are purchased under licence, typically closed-source but with the provision of technical support; Blackboard and Janison are examples. Free VLEs typically

do not provide the source code or charge for usage but can be downloaded and used without limit; an example is the KnowlEdge eLearning Suite [29]. Between 2001 and 2005, there was a rise in the use of open source VLEs from zero to 11% and locally/self-developed VLEs increased from 7% to 30% [31]. Fry et al. [12] suggests this trend is the result of commercial systems being overly prescriptive while Toole [32] suggests that the need for VLEs is lessened because new web based online learning environments/applications can be created using software and services readily available on the internet [33].

Despite all the benefits associated with VLEs, there are also challenges. VLEs can become a dumping ground for traditionally designed materials, there may be copyright issues, off campus access can be problematic, planned online support is required, educators and learners must be trained and there is often reduced face to face contact [15, 30]. In a survey conducted by Pole and Jones [16], lecturers believed that the use of a VLE encourages 'handholding' of students and the inhibition of independent thought. e-Learning suits best those students who are self-motivated, yet these are seen to be in the minority. Furthermore, the VLE does not generally facilitate immediate, two-way communication and can result in a lack of personal contact and feedback; students can feel isolated as they cannot always interact with their peers.

Moreover, Pole and Jones [16] contend that VLE resources can be more *available* to learners without necessarily adding *value* to the learning. Indeed, van der Klink and Jachems [34] caution that 'a lack of clarity of the institutional role of e-learning is increasingly likely to result in its use solely to supplement face-to-face teaching without adding any value to the learning process'. Whilst lecturers may perceive a positive gain from the highly structured and accessible online environment, Holmes and Gardner [1] argue that this might restrict innovation and spontaneity of delivery of content. Indeed, when questioned about the challenges involved in the use of e-learning, some lecturers stated that they needed more time and resources to develop the materials [16]. This concurs with Bullen and Janes' [20] contention that due to time constraints few education providers are able to identify innovative or even appropriate roles for e-learning.

A social learning environment (SLE) could mitigate some of the problems above. Hart [14] defines a SLE as 'a place where individuals and groups of individuals can come together and co-create content, share knowledge and experiences, and learn from one another to improve their personal and professional productivity; and is also a place that can be used both to extend formal content-based e-learning to provide social interaction with the learners and tutors, as well as to underpin informal learning . . . In other words a SLE does not manage, control and track users but rather provides an open environment for them to work and learn collaboratively'. A SLE comprises a number of social elements, including social networking, social bookmarking, communicating and collaborating with others, blogging, podcasting and RSS feeds. Anderson, cited by Minocha [3] describes Educational Social Software as a set of networked tools that support and encourage individuals to learn together while retaining individual control over their time, space, presence, activity, identity and relationship.

Why Use Social Networks and Web 2.0 in Education?

If educators are to be learner-centric, they should use the communication methods that are popular with learners, and that are in accord with learners' activities outside their studies. Today's learners, described by Prensky [35] as 'digital natives', use technology in a variety of different ways to meet their needs. For example, they may share images/photographs captured using mobile phones sent via MMS or uploaded to social networks, watch YouTube video clips, share ideas by chatting to each other using text messaging (SMS) or instant messaging services such as MSN Messenger, Blackberry Messenger and social networks features such as Facebook Chat [3]. The adage 'if you can't beat them, join them' springs to mind. However, Prensky [35] describes many teaching staff as 'digital immigrants', that is, they are not as *au fait* with the use of such technologies as the learners, or are resistant to learn [36] yet everyone needs to be computer literate and able to work collaboratively in the workplace [37].

A fundamental principle of a Web 2.0 social network is its read/write facility, enabling participant interaction and collaboration [3]. Social network technology can support group interaction and thus counter the isolation of self-paced e-learning by fostering a learning community providing mutual support [38]. According to Wenger [39], learning occurs in *communities of practice*, where the practice of learning is the participation in the community. Members who have a shared interest or competence, interact and learn together and develop a shared repertoire of resources (experiences, tools and ways of addressing recurring problems). In the Web 2.0 era, a learning activity is a *conversation* between the learner and other members of the community that consists not only of words but of images, video, multimedia and more. In so doing, a rich variety of dynamic and interconnected resources is formed, created not only by experts, but by all members of the community, including learners [40]. Furthermore, as the interactive nature of social networks facilitates collaborative work, group tasks such as projects and reports may be of a higher quality than if individuals had worked alone (synergistic effects) [37]. In addition to higher quality learning outcomes, participants in the process benefit from both peer recognition and peer review, both excellent preparation for more modern collaborative teamwork [37]. Moreover, the social software allows individual contributions to be tracked for assessment purposes, if desired [3].

Leslie and Landon, cited by Minocha [3] argue that because people can communicate widely with other community members, they can move beyond the more limited circle of their immediate contacts. Thus social networks help to create both an environment and an infrastructure for 'informal and borderless learning' [3]. Minocha [3] describes the rationale for social networking as a virtuous circle, in which the learner generates something of personal use, which benefits the larger network as a whole, which in turn creates additional value for the original user.

According to Mejias [41], the use of social networks develops in learners the practical research skills needed to make best use of online information networks and engages students in 'learning to learn'. He adds that social networks facilitate

distributed research, in which 'the power of many' exposes the individual learner to far more research, resources and ideas than they could possibly generate on their own. However, while the movement away from VLEs to internet based social networks exposes students to greater opportunities for research and collaboration, it leads BECTA [37] to comment 'the Web 2.0 tension to be managed is one between welcoming the diversity of Web 2.0 publication, while recognising the need to help students navigate it with confidence and a critical attitude'.

Pedagogy and the 'Fit' with Social Networks for Learning

Mainstream educational learning theories include behaviourism, cognitivism and constructivism. The behaviourist approach focuses on learners' observable behaviour and the stimuli and responses involved in changing behaviour. Whereas behaviourism does not attempt to understand internal thought processes (black box thinking), cognitivist theorists attempt to understand the mental process of learning, so that the process can be improved. Both these schools of thought place the learner as a passive recipient of knowledge from external sources, that is, that responsibility rests with the teacher to deliver knowledge while the learner passively internalises it [42]. Conversely, constructivism depicts the learner as an active participant in the search for knowledge and that the learner directs his or her own problem-solving process [3].

Social networks and Web 2.0 are closely aligned with modern thinking about educational practice, and in particular the social constructivist and socially-oriented approaches [3]. Such paradigms promote that effective learning requires opportunities for learners to be independent in their study and research, have a wider range of expressive capability and more collaborative ways of working, all of which are facilitated by Web 2.0 tools in social networks [43]. Developing the skills of problem solving, research and collaborative working also equips learners well for the world of work.

The underlying pedagogy is considered by other educational theorists however, who comment that Web 1.0 is aligned with constructivism allowing the individual to search actively for information and knowledge. Siemens [42] proposes that Web 2.0 methods and tools permit the educational process to transcend constructivist theories by moving on from isolated, individual activity to interactivity amongst a community of collaborating learners termed 'collaborative constructivism' or 'connectivism' [3].

Table 17.1 provides a summary of the Web 2.0 principles aligned with pedagogical aspirations for social learning as specified by Walton et al. [44].

In order to create a social network learning framework several components are required [44]:

– *Technology*: rather than a 'one-size fits all' centralised, institutional system, there must be a move towards more loosely-coupled, personalised learning

Table 17.1 Social learning: Web 2.0 principles aligned with pedagogical aspirations [44]

Web 2.0 characteristics	Key pedagogical characteristics
User-generated content	Personalised, adaptive
Power of the crowd	Authentic, 'real', situated
Data on an epic scale	Active, experiential,
Architecture of participation	Collaborative, sum is greater than the parts
Network effects	Communicative, peer supported
Openness	Reflective, cumulative

environments, using third party applications and widgets as well as bespoke developed tools, to create personal learning spaces, including, for example, the learner's profile.

- *Content*: users need to be encouraged to actively participate with others in the search for, customisation and generation of content. For this they require unrestricted access to content in a variety of formats and the tools to aid its discovery. This is a barrier in some institutions due to network restrictions [36], the 'potential conflict between the opportunities provided by exposing learners to public internet content and the comparative safety of the "walled garden" VLE of the institution' [3], and the fear that learners will source or produce inappropriate material [37].
- *Pedagogy*: learning in personalised social networks tends to be unstructured and informal, based around peer to peer dialogue and independent study. Learners generally value *some* structure and support which can be achieved through the use of appropriate tools and narrative structures. Indeed, Crook et al. [37] point out that even with increased 'learner centeredness', there will still be significant demands on teachers to provide structure and facilitate the learning. Walton et al. [44] evaluate the paradox of discovery learning 'how can I inquire about something which I don't know anything about?' Often the initial, tentative exploration about an unfamiliar subject will be deeper and faster when familiar social networks are engaged. It is essential that learners have access to suitable content and are supported in identifying good content and finding consistent and timely ways of accessing it.
- *Community*: social networks and Web 2.0 applications succeed through the strength of the communities they foster. These social networks need not be limited to one educational module, programme or university – they could be global [44].

Web 2.0 services will doubtless increase in complexity and scale during the coming years as users continue to creatively adapt new tools to produce knowledge, leverage collective intelligence, and build social capital [38]. Educational institutions use of social networks and Web 2.0 tools appears to have been mainly positive and they are continuing to develop their provision [3]. There may be a 'peak of inflated expectations' as discussed by Armstrong and Franklin [36] but given the current governmental and environment pressures on higher education there is an

urgent requirement to establish new forms of learning that meet the need of the new generations of learners whose experience has been fundamentally influenced by the internet and Web 2.0 social technologies [44].

The eTUTOR Project

The previous sections of this chapter have evaluated the benefits and challenges inherent in e-learning, and particularly those associated with VLEs and SLEs, as described in the literature. This section describes the application of those concepts in the development of a social learning environment for a university computing module. The project was termed the eTUTOR (Education Through Ubiquitous Technologies and Online Resources) project, funded by JISC through the Next Generation Technologies and Practices strand of the Users and Innovation Programme.

Background to the eTUTOR Project

In anticipation of next generation technologies and practices in the development of e-learning, the eTUTOR project was developed to evaluate the use of current technology in the context of educational learning. It addressed the contention that in the future, the creation of an online learning environment and the sourcing of online learning content and resources, will be predominantly facilitated through the use of freely available web services and web-based materials [45]. The project used free social network software and web services coupled with search engine functionality to create an online learning environment in which a learner-centric discovery learning pedagogy would apply. The intention was to facilitate access to open educational resources available globally rather than individuals creating their version of that content locally. It was acknowledged that the quality of resources gathered might not be consistent because the ability to aggregate Web 2.0 services would not be as far advanced as required for quality educational delivery. However, an assessment of current capability would be valuable in anticipation of predicted future trends [46–48].

There has been a great deal of previous work on learning environments developed using social software, including a number of JISC funded initiatives [49]. The eTUTOR project benefited from the outcomes of these projects and used the information provided when planning the learning environments used. There have also been a number of projects looking at the functionality of Web 2.0 services and their potential to contribute to online learning environments [40]. The functionality of commercial VLEs includes synchronous and asynchronous communications, learning content and resource hosting and management, database and information

management and a number of services. All of these services can be provided individually through Web 2.0 applications and the project had the objective of exploring the ability to aggregate them into a fully functional SLE [45].

The Project Aim and Rationale

According to JISC [49], the broad aim of the eTUTOR project was to apply the principles of the e-Framework to 'explore the possibility of creating an effective online learning environment from currently available Web 2.0 services and social network software, and to use this environment to deliver quality assured learning modules using existing online content and resources'. The rationale for the eTUTOR project grew from the work of the Wales e-Training Network (WeTN) online delivery programme and ran in parallel with the JISC *WALES* project which evaluated social network software in the support of online learners; as a consequence, a number of innovative directions for the future of education were revealed [45], some of which were investigated in this project.

The context for the project was the growing open educational resource movement. MIT's Open Courseware initiative, for example, provides their learning materials free online. Similarly, the global Open Courseware Consortium, whose main contributor in the UK is the Open University through its OpenLearn Unit, is committed to sharing high quality content freely with all and its objectives align well with the rationale for the eTUTOR project. Open Educational Resources generate economies of scale in collaborative e-learning content development and are operationally scalable as networks become larger, which is likely given that it is claimed that web-based learning will eventually become a globally networked service [47].

A further consideration is that resources with the potential for use in an educational context are being generated and made available on the web every day. It is also evident that such resources are being increasingly identified, catalogued and presented automatically by search portals. The providers of these services are already beginning to recognise the value of structuring their presentations for educational use [45, 50], potentially minimising individual lecturer course material preparation time. Moreover, a significant proportion of the learning resources sourced from the web would be from non-educational sources, that is, information and guidance materials created by all manner of organisations for their own purposes but useful to students to place their learning in a contemporary, real-life context.

'The existence of open online courseware on a global scale means that learning resources are there to be discovered by learners' [45]. The use of the internet by individuals seeking knowledge and skills, for whatever reason, can result in informal learning and therefore, the effectiveness of learning online is increasing dramatically. Thus, the discovery learning approach of the eTUTOR project aligns formal learning much more closely with informal learning by adopting the same approach that learners use when they routinely search the internet.

Although there is much debate regarding the best learning approaches, the effectiveness of discovery and inquiry-based learning is widely promoted, for instance, through the work of Piaget [51], Bruner [52] and Papert [53]. Yet, Mayer [54], although criticising discovery learning, advocates guided instruction and in doing so, strengthens the argument that discovery learning aids cognitive development. Learners new to discovery learning need more guidance and that is the approach taken in the eTUTOR project. Toole [45] contends that 'there is a growing consensus in the e-learning community that discovery learning will be a central feature of future globalised education'.

Design and Implementation of the SLE

This section describes the design alternatives and selections made in the creation of two modules of the eTUTOR SLE prototype: *Personal Computer and Internet Technology* and *Computer Games Development*. The design decisions are detailed below, using the *Personal Computer and Internet Technology* module screenshots to illustrate points made.

In accord with the aim of the project, the design of the eTUTOR SLE conforms to the e-Framework for Education and Research, an initiative that promotes technical interoperability and reusability through service-oriented approaches [1, 26]. The project adopted a service oriented architecture approach that is based on 'innovation in assembly', and where development tools are reused in a variety of ways and scenarios, as advocated by Weller [55] and broadens the notion of VLE 2.0; this concept can be considered as a precursor to SLE 2.0.

According to Chatti [56], two types of mashup (a combination of data or functionality from more than one external source to create a new service) can be considered when constructing a SLE. The first, uses developers' programming skills to embed Application User Interfaces (APIs) such as iGoogle, NetVibes and Yahoo widgets and services, including Del.icio.us, Flicker and GoogleMaps. However, as the SLE is likely to be used by developers with little or no programming skills, this project used the second type of mash-up, using easy-to-use widgets and feeds to aggregate information from different sources, which requires no programming knowledge.

The Host Environment

There are many social network applications online that include the communication and resource presentation features that can support online learning and complement or rival, traditional VLEs. A number of options were compared for use in the eTUTOR project, including KickApps, pbWiki and Crowdvine; the evaluation criteria included level of functionality (e.g. social communication tools including

Add as friend feature, Web 2.0 collaborative tools, coursework submission options such as wall, blog, forum), the ability to embed widgets, having an educational version that did not carry advertising and free from cost. Initial experimentation compared Wetpaint and Ning; for this module, Ning, a free social network solution, was selected as it was deemed to be easiest to build, manage and use, providing more easy-to-use social and collaboration tools for users. Ning appeals to people who want to create their own unique social networks around specific interests, which could be an educational network for example. It enables users to customise their own visual design and choice of features with little or no knowledge of web design. Educators around the world, technical and non-technical, are using Ning to develop educational resources. Furthermore, learners are likely to be familiar with and comfortable using the popular leading social network sites such as Facebook and MySpace, and so there is likely to be some transferability of usability skills to the Ning environment [57].

Ning has a modern look and feel, with full use of Web 2.0 features allowing customisation of the community site. The social networks running on Ning's service are developed with Open Source PHP, giving advanced users the flexibility to deploy their programming skills, though no programming is required. Like Facebook, there is a large variety of interactive widgets available for Ning, which are very easy to install/embed by both learner/user and tutor/administrator. Consequently, the environment is ideal for educators to rapidly create an interactive social learning environment. However, unlike Facebook, learners using Ning, have their own customisable page and are able to change the colour of many elements, such as the text, headers, background or tables to suit their own look and feel.

Figure 17.1 illustrates the home page of the *Personal Computer and Internet Technology module* of the eTUTOR social learning environment developed in Ning. The page is divided into discrete sections, which accommodate all the aspects of the SLE including: Introduction text, Events, Chat, Notes, Members, Discovery Map, Videos, Latest Activity, Forum, Blog, etc.

The development of the SLE using Ning was relatively speedy and the management of the environment was very easy. For educators with little prior knowledge Ning is highly suitable as a development platform for the creation of a social learning environment.

Mind Mapping Software

This project required the creation of a customised gateway to web-based learning resources and consequently a suitable navigation structure was required that was clear, self-explanatory and easy-to-use. Early experimentation led to the decision to *visually* portray the structure and specifically to adopt mind-map representations of the module curriculum [45].

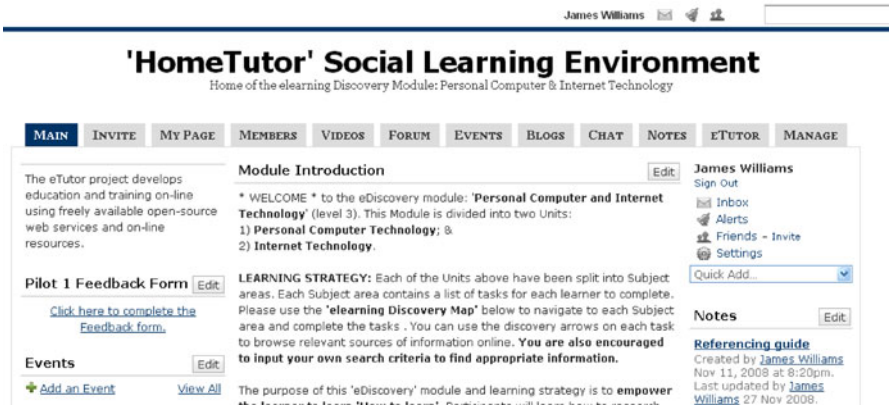

Fig. 17.1 Learning environment home page [58]

There are many mind mapping tools available online, though Mindomo and MindMeister were chosen for evaluation for this project. The criteria used for comparison and the results are illustrated in Table 17.2.

Based on the evaluation in Table 17.2, MindMeister was chosen because of its' ease of use, the ability to create multi-layered maps and because it facilitates real-time collaboration by enabling multiple people to simultaneously work on the same mind map and see each other's changes in real-time. The immediacy of MindMeister's facility to share information is a social feature that allows learners to feel supported by each other while the collaboration aspects hone their group working skills.

An online mind-map entitled 'Discovery Map' was created using MindMeister. The design focused on the 'learning outcomes' of the modules, that is, the knowledge and practical skills that a learner would be able to demonstrate on completion of the module. A structured sequence of learning activities in numerical order guided the learners towards achieving the outcomes of the module. For example, the *Personal Computer Technology andInternet Technology* module required partitioning to display the course content so the module was first subdivided into two units, namely *Personal Computer Technology* and *Internet Technology* (Fig. 17.2).

The mind-map depicts a set of linked nodes, with every node representing one module topic for research and tasks for completion. Each individual node provides URL-enabled arrow icons containing pre-defined search strings linked to a search engine results page that when selected, presents appropriate learning resources related to the learning activity for the topic. Thus the search engines results are customised for the particular resources being researched and the learners have opportunities to further refine the search to 'discover' more specific content [57], as shown in Fig. 17.3. The learner can then use the search results to complete the learning activities (tasks). This Discovery Map provides a coherent pathway through the units, their topics and learning activities, in a user-friendly format.

Table 17.2 Mind mapping software evaluation [57]

Criteria	Evaluation
1. Ease of use:	Although Mindomo offers a wonderful array of tools, significantly greater than MindMeister, this was its downfall. MindMeister is significantly easier to use and offers all the essential features deemed necessary to achieve the project's requirements
2. Hyperlinks:	It is very easy to assign a hyperlink to a node. The user can either click on the 'hyperlink' icon in the main horizontal menu or alternatively utilise the hyperlink accordion menu on the left. However, using Mindomo it is not possible to create a link inside a node, instead a small square link box is created at the side of the node. This feature is very useful but not user-friendly as there is nothing to indicate that it is a hyperlink
3. Upload/attach learning resources:	Online mind mapping software can be used not only to structure a course, list favourite website links or organise tasks/projects, but also as a document repository to organise lecture/tutorial files for example. This feature is available in the premium version of both MindMeister ($4 a month) and Mindomo ($6 a month). It is very easy to add attachments to a node using MindMeister
4. Multi-layered Maps:	MindMeister also allows you to link to multiple mind-maps, allowing the creation of multi-layered maps. This feature is very useful as a tutor can present the user learner with increasing amounts of information regarding the learner's interest
5. Synchronous collaboration:	MindMeister allows multiple people to collaborate on the same map in real time, Mindomo does not. MindMeister gives the author of a map the ability to share with multiple people who can then work on the map at the same time

The Discovery Map aims to encourage and empower learners to seek out information for themselves. However, as learners go through the discovery learning tasks, they do require support from the online tutor, mainly in two forms: via forums and messages posted in the learning environment and weekly chat sessions. Each learner had a personal blog where they were to post a brief report on the outcomes of each task as they completed them. They were also required to post a weekly reflective blog entry and to contribute to a collaborative forum, sharing insights, problems and solutions with the tutor and their peers. This social engagement helped ensure that learners did not feel isolated.

Search Engine Selection for Customised Searches

Given that the MindMeister nodes provide URL-enabled arrow icons containing pre-defined search strings, a key decision in the development process was the

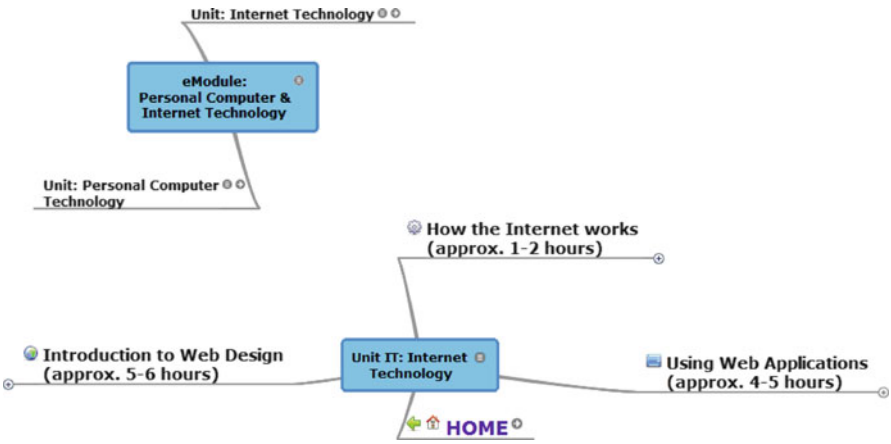

Fig. 17.2 Module and unit maps [58]

Fig. 17.3 e-Learning discovery map learning activities [58]

selection of a suitable search engine. A number of search engines were evaluated to assess their appropriateness for use in this project, including Google the search engine market leader (see Fig. 17.4), and other search engines that have different approaches, such as Ask and Yahoo. Google Customised Search Engine (CSE) was selected because its search for resources can be configured to be very specific and it can be further refined by users to prioritise good quality resources.

Learners need guidance in web searching techniques and tools to help them to discover the online resources. Typically, students do not have the knowledge or formal learning to allow them to create their own sophisticated search strings. Two possible search method solutions were evaluated: Customised Google Search Engine (CSEs) and Customised Google Search String. An experiment compared the effectiveness of each approach, and based on the appropriateness of the websites listed in the search results for each learning activity, the Customised Google Search Strings results seemed to present links that were more relevant to the learning activity. The Discovery Map was then created to organise and list the learning activities. The tutor/developer tested and inserted appropriate Google search strings for each of the learning activity nodes on the map as illustrated in Fig. 17.5 [58].

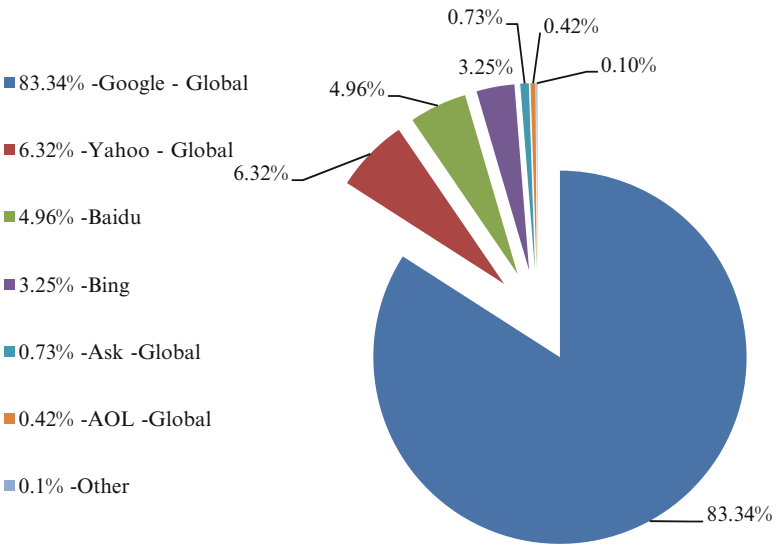

Fig. 17.4 Search engine market share (September, 2010) (Data derived from [59])

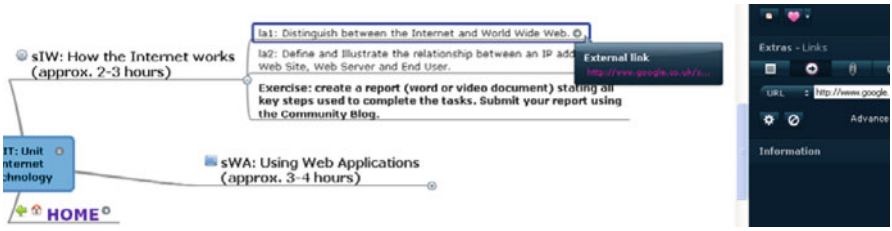

Fig. 17.5 MindMeister.com mind map – Google search strings [58]

Each time the learner clicks on a node, a Google search result page appears, allowing the learner to examine the search result list and use the information to complete the learning activity, thereby developing their knowledge and skills. The learner may also continue to refine the search by editing the individual search strings, thus becoming more skilled in discovery learning techniques.

All three Discovery Map search methods can be included in a single page: Google Search, Custom Google Search and Pre-defined Google Search String (as shown in Fig. 17.6). The inclusion of all three methods enables learners to recognise and use search method alternatives, and to select their preferred method.

As learners select successive nodes, more detail is revealed. Figure 17.7 shows the learning activities associated with a particular node.

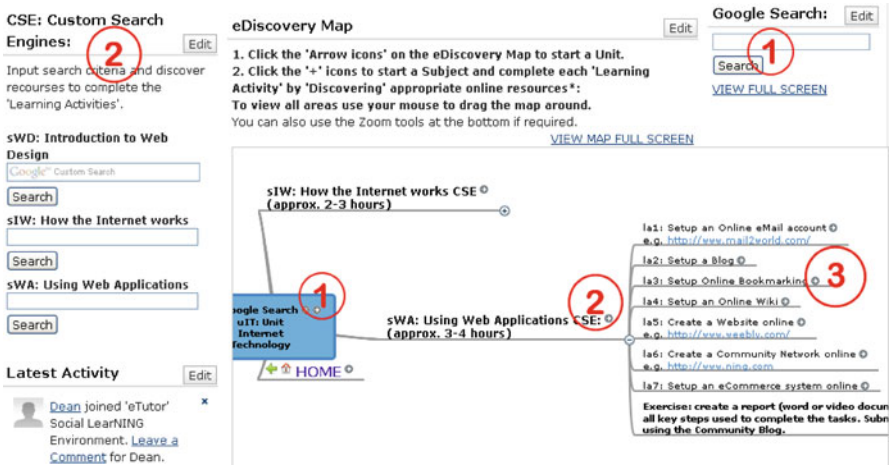

Fig. 17.6 Discovery map search alternatives [58]

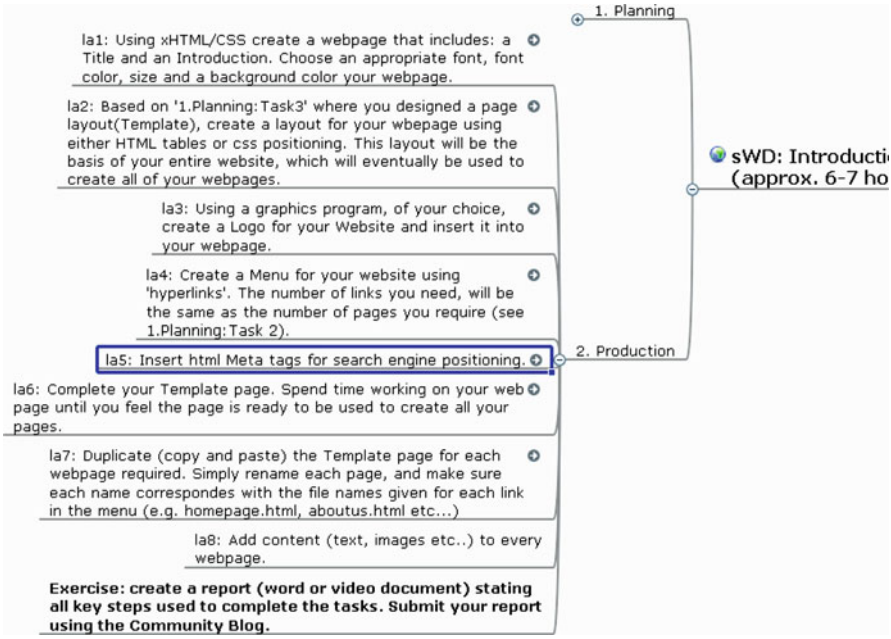

Fig. 17.7 A typical learning activity [58]

Results and Evaluation

This section describes the results of the eTUTOR project, including developer testing and feedback, usability testing with four expert users, a questionnaire survey involving 20 undergraduate learner respondents, and supplemented by users' blog and forum posts. All results and respondent comments are sourced from the pilot report of the eTUTOR Project [58].

The Social Learning Environment

The eTUTOR system is ideal for educators to rapidly and easily create a SLE and provides a suitable platform for any type of collaborative exercise, whether it is for learning, commercial or leisure projects; the creation of a Ning network only takes a few minutes. The functionality and potential of Ning is only limited by the number of widgets that can be obtained or created and given that new widgets are continually being developed, the possibilities are endless [57]. Using the Ning platform, it feels like there is a free development team constantly updating and evolving the system as the web itself continues to expand and evolve to meet the need for greater social tools, richer and more engaging user experiences. The management of the SLE is also very easy. The Ning system provides a central 'Manage' page for the Network creator, as can be seen in Fig. 17.8:

After only using the SLE during tutorial sessions over a 2 week period, 80% of undergraduate respondents found the SLE easy-to-use while 85% of learners thought the use of a social network enhanced their learning. This may be because social networks make learning fun, more interesting and stimulating for the student. Students liked the user friendly dashboard style of Ning, where content was organised on one page, similar to other social network sites such as iGoogle, Facebook and MySpace. Respondents also commented positively on having their own individual page and map to organise their resources, the implied schedule of tasks that could be viewed as a whole and favourite internet sites (favourites). The easy-to-use software encouraged wider adoption of the technology, with some students using it to organise aspects of their personal lives.

The Ning environment allows participants to leave comments on forums, blogs, private messaging and personal wall spaces to support the learning of others. This opportunity for collaborative learning and social commentary was clearly valued by undergraduate respondents. Learners' favourite features include the informal but productive community culture, ease of communication with others and social features such as Buddypoke. Indeed, most learners valued the social aspects of the learning environment and none mentioned feeling 'isolated', an oft-cited drawback associated with e-learning. The Web 2.0 social network allowed for asynchronous communication and collaborative learning within individual student groups and between multiple groups of students. Using these communication tools, feedback

Fig. 17.8 Ning social learning environment management system [58]

from learners indicate that they enjoy supporting each other through the learning activities in an open social community environment. Feedback on learning activities can be uploaded in audio or video format. Respondents liked the multimedia aspects, including video links to online tutorials, the ability to link preferred resources to the learners personal home page and using 3D interactive applications.

The ability of the learner to achieve the learning outcomes of a module largely depends on their personal motivation. However, the tutor's ability to create an open and supportive community learning environment, where the learners are assisted to manage themselves and their time effectively, is also crucial. The module incorporated a 'self-reflective blog', which when used as part of the module's assessment, encouraged in learners, skills of self-evaluation. Learners commented that this motivated them to break the work down into regular, self-paced learning packages. The tutor witnessed an increase in independent learning and positive reflection. The emphasis on the search for credible information encouraged students to cite all sources used, thereby demonstrating the breadth of their research and improving their referencing skills.

However, at the time of writing, Ning did not provide a method to store and organise large amounts of learning resources, although there were widgets available, or one could have been created. However, the improved quality of up-to-date learning resources online means the need to create learning repositories continues

to diminish. There were few responses regarding the learners' least favourite aspect of the SLE though several learners commented on the amount of email notifications they received when groups of which they are members updated discussion forums, etc. This issue was easily resolved by showing students how to change the email settings but it did reveal a training need that will need to be addressed in future induction sessions. However, most learners are very familiar with the interfaces of social network sites such as Facebook, and required no initial training on how to use the network. one learner did comment that 'I have got used to the structure of Blackboard'. One respondent did not like the 'work' involved with the community, though overall feedback was positive, including comments such as 'it's all good'.

The Discovery Mind Map

The Discovery Map displayed the module learning activities and learning resources for the topics in a single, clear and structured interactive graphical interface. It enabled the learners to proceed through the sequence of tasks for each subject in a user-friendly and structured form to achieve the learning outcomes of the module. Eighty-five percent of learners found the map easy to use. Some found the map's visual nature aesthetically appealing and felt that the ability to view all topics in a single view was one of the most useful features; in particular they liked that they could expand and collapse nodes at will to display content. In addition, learners commented positively on the ease of access to resources, provision of tutorials in both file and weblink format, both of which show the value learners place on receiving information/tutorials from educators. From this perspective, discovery learning is valuable to supplement learning activities and traditional handouts and indicates that a blended rather than pure e-learning approach can be the most effective solution.

It can be argued that the Discovery Map is not any better than a traditional VLEs ability to list resources in a typical file directory fashion. There is no real difference between the map and a traditional structured list of learning activities with accompanying hyperlinks, which of course can easily be created in Blackboard or any electronic document. However, learners preferred the interactive and graphical nature of the map. It is an alternative that gives the learner the ability to organise and present a large amount of learning resources on one page, in one interactive graphical representation, that also allows the learners to contribute and be a part of the resources provided.

Customised Searches

A learning activity was selected and a search string was constructed using the keywords relating to the learning activity: 'create a webpage using xHTML'. The

Table 17.3 Search method effectiveness test [58]

Search Engine	Relevant links (x/10)	Analysis
Test 1: Google Search	2	Using key words from the learning activity 2 out of 10 sites were deemed relevant to the learning activity i.e. a link that provided the practical information on the first click and without purchasing a book. The search provided many links guiding the user to commercial sites that sell learning guides on xHTML and CSS
Test 2: Custom Search Engine (CSE)	8	The same Google search string was used from the previous search but within a specially created custom search engine. Eight out of ten search results were deemed relevant. However several links were from the same tutorial websites. Websites were selected for the CSE based on industry experience and the most relevant were chosen from the top ten Google page results
Test 3: Refined Search String	7	Using the same method as test 1, but with a refined search string (basic xHTML tutorial), 7 out of 10 search results were deemed relevant to the learning activity. There was only one repeat learning resource
Test 4: Refined CSE string	10	Using the previous refined search string within a CSE, 10 out of 10 of the search results were relevant to the activity. Although several results were from the same tutorial sites, this happened much less than the CSE only method. Overall, a greater variety of relevant results and less repetition

single search string was used in four different ways to obtain the search results from Google in order to compare the number and relevance of the entries in each search result list (Table 17.3).

Based on this analysis, using a refined search string with a Custom Search Engine greatly increases the quality of the learning resources presented to the learner, and is the most effective discovery learning method tested. As identified previously, the use of customised search strings enables the learner to rapidly home-in on the most valuable resources. Customised search strings can be added to any level of the Discovery Map, from centre node to individual learning activities or indeed anywhere on the Ning environment. For example, they can be added underneath the map thereby enabling the learner to simultaneously view the learning activities whilst using the search engine. However, use of this method impeded learners' ability to create effective search strings for *themselves*, and given that the ability to search creatively is an essential skill, the creation of a CSE customised for particular learning outcomes or learning activities in which learners create their own search strings, is recommended [57].

Discovery Learning

Discovery learning facilitated and structured by the tutor using Web 2.0 technologies produced high quality online resources that improved the learning process. However, the role of the tutor was crucial in guiding the learner through the learning process, from goal setting, time management and encouragement to achieve their goals. One of the most useful features of the social network according to learners' feedback was the regular contact and clarification of learning activities from the tutor that helped them to stay focused. Learners were encouraged to solve problems through social collaboration with peers and independent self-reflection before contacting the tutor. In addition to building social team-working and problem-solving skills, this method ensured the tutor was not over-burdened by learner communication and was able to answer questions on the support forum or via email at his or her convenience. Furthermore, the use of the community network communication tools (e.g. for individual Modules) empowers the module lecturer/tutor with tools such as 'community broadcast messages', 'group messaging', or simply 'send a message to an individual student', enhanced support and monitoring, which will ultimately increase retention.

Eighty-five percent of undergraduate learners responded that use of the discovery learning SLE enhanced their learning. During usability testing, one expert learner commented:

> For both tasks I began by looking at the web pages provided by the tuned Google search engine that the mind map takes the learner to. I then followed any further links, web pages, videos etc. provided by the suggested web pages . . . Even though the timescale given on the mind map was 1-2 hrs I easily spent 3-4 hours on the two tasks combined. This was due to the fact that I would click on hyperlinks within the suggested web pages to dig deeper into the subject, as well as using Google to search for more specific areas related to the tasks. This shows discovery learning has taken place at least with me and this would be of great benefit for "real learners".

It is an accessible source for online tutorials making it easier to work at home, or any convenient place yet still being part of a learning community. Learners commented that when learning with peers, they felt more motivated and less likely to procrastinate. As previously identified, social and collaborative learning technology offers a peer- and tutor-supportive learning environment. 'Peer-to-peer support is a positive aspect of learning; the awareness that peers are struggling with the same difficulties is important' [60]. It is vital for the tutor/moderator to create a social and professional learning culture, and in a supportive manner to help students to maintain their focus on learning activities. The system allowed the tutor to review easily student progress, particularly via the weekly blog and provided a useful monitoring tool to identify which learners required help and/or encouragement. This was also a very constructive teaching and learning strategy for a more traditionally delivered module to ensure students make better use of their own study time. The learners' 'My Page' and 'My Map' could be used to create a personal learning plan and to store a portfolio of accomplishments/work completed. Initially the tutor or

'learning coach' can help the learner to set goals and plan study-time; learners can then take control of the direction of their own learning and later reflect on their achievement using their blog facility.

Conclusion

The advent of social networks and Web 2.0 technologies has marked a watershed in the role and impact of technology in higher education that will result in a fundamental shift in the way we learn. Web 2.0 technology has the potential to transform education and provide a response to the challenges of a changing education landscape, environment and stakeholder expectations. For learners, social networks facilitate a connectivist, discovery learning approach in which they control the direction and pace of their own learning, using technologies that are familiar in everyday life. In addition, social networks foster a learning community that provides a (safety) net of peer collaboration, review and support, in which participants access, generate and share resources widely. As well as learning the social software tools that are increasingly used and in demand by employers, learners also hone their research and group work transferable skills, making them more employable and useful in the workplace.

For educators, many of the attributes associated with the use of Web 2.0 tools in social learning environments provide a neat 'fit' to the constructivist pedagogy advocated by many contemporary educational theorists. The role of the educator becomes that of facilitator rather than teacher, as the expectation of students is that they become much more actively involved in their own learning. They are able to engage learners in an interactive dialogue and provide early feedback and advice on learner progress. However, some of the principles and approaches in the socially-networked, Web 2.0 domain do not sit easily within a higher education context. The changing methods of teaching and the design and assessment of online, collaborative learning activities, for example, can be challenging and there may be an adverse impact on workloads. However, in determining their strategies for future success and sustainability, higher education institutions, and those who work in them, must respond to the challenge by establishing a customer/learner-centric approach and new forms of learning using Web 2.0 technologies.

Rather than using a VLE, the eTUTOR project described in this chapter is a social learning environment developed using learning content and resources primarily sourced from the internet and assembled on a foundation of a free social network (Ning). Such environments can be constructed with relative ease by users with little or no knowledge of web design. This provides the flexibility and freedom for users to incorporate as many or as few services that they deem to be relevant and appropriate for their needs, from a diverse range, without relying on specialist skills. There are two distinct eTUTOR stakeholder groups: the tutor as developer and the learner and tutor as users. The developer can create the social learning environment

with ease and the user is motivated to collaborate with other users. As the tutor has a dual role, inefficiencies or weaknesses in the SLE will become apparent during use (user role) and s/he will be able to take corrective action (as the developer).

The project provided the learner with a customised gateway to online learning resources that were harvested and presented for use using search engine applications. The social learning environment and online mapping software offered an engaging, rich, social learning experience for learners facilitated by an online tutor, to promote an open and supportive culture of collaboration. A tutor can provide high-quality learning resources relevant to the learning outcomes from the internet and present them in a structured format, whilst highlighting the importance of collaboration and independent discovery learning and personal creativity. Using the SLE, students develop research techniques and improve their content discernment skills i.e. the ability to select wisely appropriate sources of information. They are encouraged to solve problems through self-reflection and social collaboration before contacting the tutor. This method builds self-confidence/esteem and team-working skills. Through the completion of the learning activities, students develop a positive, pro-active attitude. The project presents an effective Web 2.0 solution for collaborative community- and technology-enhanced discovery learning.

The social learning environment is ideal for the Facebook generation as it is based on the tools that they use to communicate in their social lives and does not constrain them to methods of learning that they perceive to be old-fashioned. The learner-to-learner and learner-to-tutor relationships are enhanced due to the close collaborative style of working together; this also encourages learners to be self-motivated and to collaborate with peers safe in the knowledge that the tutor is also there to support them (e-guide on the side). This solution is suitable for any project that requires electronic collaboration and information management while providing opportunities for personalised, adaptive learning using a variety of learning tools derived from free, open source, ubiquitous social networks.

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