E-learning
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Students today can’t prepare bark to calculate their problems. They depend on their slates, which are more expensive. What will they do when the slate is dropped and it breaks? They will not be able to write.

Teachers Conference (1703)

Introduction

[Students today] absorb information quickly, in images and video as well as text, from multiple sources simultaneously. They operate at ‘twitch speed’, expecting instant responses and feedback. They prefer random ‘on-demand’ access to media, expect to be in constant communication with their friends (who may be next door or around the world), and they are as likely to create their own media (or download someone else’s) as to purchase a book or a CD.

(Stephen Downes, n.d.)

Today’s students are rarely disconnected from technology. They expect to find the information they need, whether for an assignment or for their own interests, quickly and visually. They are permanently connected with their peers via mobile phones, online chat and Facebook, and they expect this technology to be invisible (the instructions that come with mobile phones are not written for the under 25s). Table 1 shows some of the contrasts between learners and teachers with respect to their differing attitudes to work. More mature students will also be familiar with writing assignments on computer and conducting literature searches online. So what impact does this have on education?

Nonetheless, although they are very comfortable with technology, this does not necessarily mean that they possess all the evaluative skills they need to assess the information at their fingertips. In a report from the Higher Education Funding Council for England (HEFCE) young people were said to ‘rely on the most basic search tools and do not possess the critical and analytical skills to assess the information that they find on the web’ (HEFCE 2009).
In this chapter I hope to give an introduction and an overview to current trends and techniques in e-learning, including some of the more common examples of technology that are currently available in the classroom or could easily be obtained, should the reader wish. This list is by no means complete as there are many possibilities that are continuously changing as new products are developed, but hopefully the reader will gain enough of an overview to assess the gains to be made by trying a new technology and be more informed if they are asked by somebody else to use one for their teaching.

But, first, what is ‘e-learning’? The term ‘e-learning’ has become more common in the twenty-first century, but computers have been used as intelligent tutoring systems for decades. Furthermore, the HEFCE now prefers to refer to ‘Enhancing teaching and learning through the use of technology’ as it finds the term ‘e-learning’ to be too narrowly defined (HEFCE 2009: 1). However, it is still a term that is commonly used to describe the use of computers in teaching and learning and probably will be used until some inevitable day in the future when ‘e-learning’ simply becomes ‘learning’.

In the clamour for all this new technology, there is a danger that it could become a panacea for any problems in schools, such as larger class sizes. We must also bear in mind that as this technology is pushed into schools, this push may come from the vendors of the technology, rather than a pull from teaching staff themselves. Therefore, what is commonly seen is a few enthusiastic ‘early adopters’ trying the latest ideas, reluctantly followed by many other teaching staff who may feel rushed and disenfranchised by the new technology. Any changes to teaching practices need to be embraced by all staff and reassurance given that this technology is never going to replace the expert face-to-face teaching that a qualified educator can give.

### Table 1

<table>
<thead>
<tr>
<th>Digital native learners</th>
<th>Digital immigrant teachers</th>
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<tbody>
<tr>
<td>Prefer receiving information quickly from multiple multimedia sources</td>
<td>Prefer slow and controlled release of information from limited sources</td>
</tr>
<tr>
<td>Prefer parallel processing and multitasking</td>
<td>Prefer singular processing and single or limited tasking</td>
</tr>
<tr>
<td>Prefer processing pictures, sounds, colour and video before text</td>
<td>Prefer to provide text before pictures, sounds and video</td>
</tr>
<tr>
<td>Prefer random access to hyperlinked multimedia information</td>
<td>Prefer to provide information linearly, logically and sequentially</td>
</tr>
<tr>
<td>Prefer to interact/network simultaneously with many others</td>
<td>Prefer students to work independently rather than network and interact</td>
</tr>
<tr>
<td>Prefer to learn ‘just-in-time’</td>
<td>Prefer to teach ‘just-in-case’ (it’s on the exam)</td>
</tr>
<tr>
<td>Prefer instant gratification and instant rewards</td>
<td>Prefer deferred gratification and deferred rewards</td>
</tr>
<tr>
<td>Prefer learning that is relevant, instantly useful and fun</td>
<td>Prefer to teach to the curriculum guide and standardised tests</td>
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Despite each one of us being surrounded by technology in the workplace and at home, educational technology is still in its infancy. A lot of technology tries to recreate what is current practice within the classroom. In the same way that the first mechanical tractor was severely restricted by being given reins for steering in an attempt to recreate the horse it replaced, this use of new technology in old ways and simply recreating what can be achieved in lecture theatres on the computer can limit the possibilities of what is available. Using technology in new ways will also ensure that the technology being employed will complement the teacher, not attempt to replace the expert in the classroom; if technology is to be successful in the classroom, it needs to add something pedagogically to existing teaching methods.

It is tempting for the technology enthusiast to try any approach that they have come across in their teaching just because it is available. While it is invaluable to try new ideas and explore the possibilities that new technologies can offer, it is important that the technology is fitted around the educational needs of the students rather than vice versa. This may seem an obvious point, but many new technologies can involve a steep learning curve in their early stages of use. Only later versions tend to become easier to use seamlessly and become invisible as tools. This is an issue for younger students who are used to using mature online tools in their own time and for older students who may be less familiar with any kind of technology.

Consideration also needs to be made to the involvement of teaching staff in the adoption of new technologies. Simply rolling out a new technology without consultation can lead to a great deal of resistance and can result in that technology not being used fully. This issue could be illustrated by the UK government’s initial strategy to give every primary and secondary school within the UK an interactive whiteboard. These whiteboards look similar to a normal whiteboard but can be connected to a computer and used to interact in various ways, depending on the version used. The contents of the computer screen may be projected onto the board and marks made on the board with the pens can act as an input to the computer. The boards originated in the commercial sector, designed for group discussions, but have since been rolled out in secondary and primary schools.

Unfortunately, many of these boards remained in the boxes they arrived in for some time. This is in part due to the time constraints of teachers, but this has not been aided by a ‘push’ of the technology from higher-level strategies, rather than a pull by teachers. In two papers, Miller and Glover (Glover and Miller 2001; Miller and Glover 2002) looked at what made these new tools successful in schools and concluded that elementary schools had to show three key attributes: ‘a will to develop and use the technology’; ‘teachers had to be willing to become mutually interdependent in the development of materials’; and ‘there had to be some change of thinking about the way in which classroom activities were resourced’. In secondary schools, they concluded that there needed to be an appreciation that a new approach to pedagogy in the school was needed alongside suitable training and reflection on the activities that were part of the changes. Fortunately, most schools have now embraced this technology.

Finally, before we move on, it is important to emphasise that is can be very easy and a common mistake to get carried away with the technical aspects around the use
of computers in education and to forget why we were trying to use them in the first place. Whatever technology is being used, it needs to be based on sound pedagogical principles for it to be viable and useful to all those involved.

### Types of e-learning

This section describes some of the more common forms of educational technologies currently in use. Many of these systems will be familiar to today’s students, especially those in higher education, although not necessarily in an educational context (such as blogs). Again it should be highlighted that there is not enough space to create an exhaustive list here and this should be seen as a starting point.

#### Virtual learning environments

Virtual learning environments (VLEs) are portals that provide tools and facilitate the presentation of learning materials to be used by students and staff, usually over the world wide web (WWW). Users log on to the system and are then presented with learning materials, links, discussion boards, portfolios of marks, assessments and other online resources. The view offered to students will usually be different to that offered to staff. Students will see a list of courses that they are enrolled on and within each of these they will see the features that their lecturer has chosen to use within the VLE. In contrast the lecturer will see the ‘back end’ of the system and will be able to upload resources for the students and select and control what means the students can have to interact with themselves and each other, such as in discussion boards.

VLEs are arguably the most common form of ‘e-learning’ in higher education, but whether these truly offer ‘e-learning’ is debatable. It depends on their use. While these systems offer the ability to teach and interact with students in new ways, for the most part they are not used in this way. Blin and Munro (2007) identified a difference between the use of VLEs for ‘resources’ and ‘activities’. Resources are the files that are distributed by the VLE, including items such as Word files, PowerPoint and PDF files. In contrast, activities are the tasks that students can participate in within the VLE, including such things as forums, assignments and assessments. They found that 93 per cent of the use of their VLE was in the form of resources and suggest that it is not until VLEs are seen as a tool to be used rather than a repository to store files that their full potential will be reached and teaching practices will really be changed. It is this untapped potential that needs to be highlighted here; there is value in providing files online and the use of these by students to support their learning – however, this is normally seen as a more administrative role of VLEs and it ignores the more interactive possibilities of the medium.

In an evaluation of the Blackboard VLE at the University of Teeside, Bingham and Yaneske (2006) found a split between the expectations of students and staff. Staff expected Blackboard to enhance the learning experience just through its implementation, possibly because it was sold to the institution as a solution in itself. In contrast, the students saw the VLE as a tool and were focused on its content, rather than on the
VLE itself. Reassuringly, the students still wanted to have face-to-face lectures; even though the lecture notes were posted on the VLE, they saw the VLE more as a supplement to traditional learning. This was more important to the mature students, who showed the strongest preference for traditional teaching, although interestingly they also felt that the lectures did not add much to the material available online, possibly indicating a view that lectures were a passive experience. However, these students did state that question-and-answer sessions at the end of lectures and during tutorials were useful, and this is probably the source of their preference for face-to-face teaching. The authors go on to stress the importance of ensuring that all users of a VLE, both staff and students, should be prepared thoroughly for its introduction. This helps to ensure that it is used effectively.

Iredale (2006) also highlights the fact that VLEs can support a knowledge transfer model, rather than radically change the way that students are taught. However, she found that the students like the way the VLE afforded their learning ‘anytime, anyplace, anywhere’ (Iredale 2006). Although students may prefer face-to-face contact with their instructors, they do seem to appreciate the facility to log in at any time they choose and participate in discussions and read notes. Again, Iredale highlights that it is the content of the VLE that is the most important factor in whether it is used by the students.

If a VLE is successfully integrated with a course it has been found that students enjoy sharing information among themselves, and horizontal learning will occur. This kind of learning between students can easily be supported by setting up the VLE in such a way that students are free to share resources, for example through their own discussion boards. If this takes place then a community of practice may form which will then aid the students in their studies.

As a new generation of the WWW evolves (the section on e-learning 2.0 below has more details on this) so it is predicted that VLEs will also evolve. As a result of this, personalised learning environments (PLEs) have started to appear. In a PLE the user controls the information they are presented with. This means they can join any groups they find interesting or useful, communicate with their peers and tutors in a way that suits them and learn both formally and informally through their use of the PLE. This approach to a learning environment appears to sit well with the research reported above and therefore these may well be features we see appear in VLEs in the future.

Open learning and open educational resources (OERs)

Open educational resources (OERs) are teaching and learning materials that have been created digitally and are made available for others to use for free under an open licence. An open licence is one that allows the user to use, modify and distribute the work for their use and the use of others in ways that would not be possible under a normal copyright licence. The materials themselves are any digital assets that can be used in education, from simple images to videos, animations, teaching packages and other course materials, all the way up to complete courses and modules.

As a subset of OER, open courseware (OCW) is defined by the Open Courseware Consortium as the ‘free and open digital publication of high quality college and
university-level educational materials’, which is then organised into courses and made freely available and ‘openly licensed, accessible to anyone, anytime via the Internet’.

The OER and OCW movements are often attributed as being launched when the Massachusetts Institute of Technology (MIT) in America put its complete range of courses online in 2002, and it was around this time that the term ‘OER’ was first used. This led to a number of other institutions following their example; in the UK the Open University is one of the leading institutions in the movement. With over 600 free online courses at all levels at the time of writing, the Open University’s Open Learn project provides the opportunity for many to try out their courses at no cost or to plan a course of study from anywhere in the world. Users register in their Learning Space and can access course materials that are identical to those used by paying students, from foundation to postgraduate level. The only difference is that they only contain formative assessments and the user does not gain an Open University qualification at the end of their course. Most other institutions offering OERs operate a similar model to encourage users to enrol. It has been reported that an extra 7,000 students have signed up to the Open University’s courses as a result of this approach (Stannard 2010).

In 2007 Apple announced its creation of a service to distribute audio-, video- and PDF-based learning materials via an interface similar to its successful iTunes music store. Named iTunes University, or iTunes U for short, the service originally covered material at college and university level, but has since been expanding to include schools. The service is available at no cost to the institutions or the users and the materials that a user has access to may be controlled by the institution (and therefore this service does not come under the OCW definition).

As an adjunct to OERs it is also worth covering Creative Commons (CC) licensing in this section about shared resources. CC is a non-profit organisation that has created free legal tools that allows creators of works to share them under conditions that they specify using the choice of licence they attach to them. The project’s website (http://creativecommons.org) estimates that 350 million works were licensed under the scheme by 2009.

The scheme allows users to specify whether a work they have created can be used commercially or only non-commercially; altered then redistributed or only redistributed if it is unaltered; and whether or not the user has to share what they produce in the same way as the original work. All the licences are explained on the project’s website.

It is an extremely useful project when creating learning resources as it means that databases of existing works (for example, photographs) can be searched to be used in projects; however, things can get very complicated if resources with more than one type of CC licence are to be combined in one project as deducing what licence that final project must be released under can be problematic.

It should be clear to see from all these high-quality resources that there may be no need to reinvent the wheel when it comes to starting a new e-learning project and it is worth searching for existing and available materials before large investments are made in creating new materials. However, a study by Rolfe (2012) reported that many academic staff members shared work with their close neighbours but did not make use
of materials from elsewhere. Nonetheless, if investments are made in new materials it can also be very beneficial to share these over the internet as valuable marketing materials for the creators.

**Constructivist approaches**

In an attempt to move away from a didactic approach to teaching and learning, many constructivist approaches are emerging within the field of e-learning. Software packages that allow the user to explore a scenario or experiment with parameters and come to their own conclusions fit well within Diane Laurillard’s intrinsic feedback paradigm as they provide the user with a realistic scenario that reacts in a similar way as the real world that it is recreating, but in a safer, more guided manner.

A clear example of this is in medical education. Dummies and computer-based simulations allow the student to perform various investigations and try treatment options to see the effect of their choices, but the ‘patient’ feels no discomfort and is still there for their next attempt. The amount of feedback the student receives can be varied in any simulation to suit the learning needs; a beginner may be taken through a complex scenario with step-by-step help or a competent user may be left to make entirely their own decisions.

An example of this type of approach is the ‘Alice v2.0’ software produced by Carnegie-Mellon University in Pittsburgh, USA (www.alice.org). This free software is designed to help students who are new to computer programming. It removes the need for students to type precise, syntactically correct commands to produce a functional piece of software that performs an often abstract task. Instead, students select commands from a list of options on the lower part of the screen to move cartoon characters in a virtual world that they can see at the top of their screen. This approach enables them to play with the various parts and structure of a computer program and immediately see the effects. While they are experimenting with building blocks that are common to many programming languages, the user is hopefully building an awareness of how they work, without getting held back by mistyped commands and missing brackets in the code. Students who have started a programming course with Alice still have a steep learning curve when they do their first ‘real’ programming, but at least they have by that point acquired the concepts and language to discuss the problems they are having and an awareness of the part of the program that may not be working correctly.

Serious games provide a similar structured yet flexible approach to learning. Games such as Peacemaker (www.peacemakergame.com) challenge the student to bring peace to the Middle East. A tall order, but the game guides the user through the various issues and viewpoints from each side of the conflict as they take the part of either the Israeli prime minister or the Palestinian president. Whether the student solves the problem or not is not the key aspect, rather that they grasp some key aspects of the scenario along the way. Supporters of these games argue that they allow learners to immerse themselves in an engaging environment and to develop higher-order skills, especially in games that allow the user to interact with other players in a virtual world.
There is only space here to give this very brief, and by no means exhaustive, overview of these tools. However, one thing that all the above examples (with the possible exception of Alice 2.0) have in common is that they all contain content that is created by the designers and programmers of the software and systems.

One direction that e-learning is taking recently is in parallel to changes on the internet in general, where it is the user who creates the content; this is what we will cover in the next section of this chapter.

**E-learning 2.0**

‘Web 2.0’ became a controversial buzzword in the first decade of the twenty-first century, and even those people who agree that it represents something new on the internet can’t necessarily agree what exactly Web 2.0 means. The term was coined in 2004 to cover the new applications and sites appearing on the internet after the dot-com bubble burst in late 2001 (O’Reilly 2005). A group of web pioneers noticed that even after many sites crashed and burned in 2001 a lot of sites were still standing very strong and they seemed to have many things in common. Whether Web 2.0 does represent a change in Web architecture or not, or in fact whether it does exist or not, there is certainly an evolution underway in the way the WWW is being used, even if there is no revolution.

In the past, the contents of websites were controlled by the creators of those sites, and similarly, the contents of teaching packages, such as those above, were created by the teacher or lecturer. Now students have the opportunities to discuss their work and create material collaboratively. Many sites that have been successful over the past few years have content that is created by the users of the sites, rather than by the designers. The designers of these sites set up the architecture and mechanisms that enable users to contribute and then let the users step in. Once the sites reach a critical mass of users the content can become very rich. Example sites include Wikipedia, Facebook, YouTube, Twitter and WordPress where, rather than creating individual home pages, users can network and create groups based on shared interests; Del.icio.us for creating, sharing and searching web bookmarks; and Google Docs and Spreadsheets where users can collaboratively produce documents over the web. The more people that work on a site or project, the better it becomes.

**Facebook**

Created by Harvard student Mark Zuckerberg in 2004 as a way for students at his university to network, Facebook has grown to become a $100 billion company with nearly 800 million active users. Originally the site was only available to students with university email accounts in certain institutions, but in 2006 it became accessible to anyone over the age of 13, and its use exploded. It is now considered by many to be one of the ‘Big Four’ of the internet – the others being Google, Apple and Amazon.

It has been suggested that the features of many such social networks are ideal for education as they allow the sharing of ideas, collaboration, peer feedback and...
interaction. However, many attempts to use Facebook in education have met resistance by students who see it very much as their private space to discuss their work if they wish, but not somewhere they wish to see their educators. Selwyn (2009) reported that discussion of their studies was an ‘often uncomfortable intrusion’ (p. 170) into their social world; however, it was also an important and invaluable part of the university experience for them and an extension of their offline lives. Resistance will almost certainly be met if attempts are made to teach students using this medium, but it needs to be acknowledged in this chapter as an important tool for communication and peer learning in students’ lives.

**Wikis**

A wiki is a website that allows anybody visiting the site to add content, remove content or edit the content that is already on the page. Some wiki sites track who is making the changes and require people to log in and identify themselves, but others allow anonymous editing. The most famous wiki is probably Wikipedia, the online encyclopaedia that anybody can edit, should they disagree with or wish to add to an entry. There are mechanisms in place (such as the monitoring for large edits) designed to prevent the site falling apart through abuse, but there is still the possibility that small changes can be made and these may slip through the net for some time. There have been reports in the media that its accuracy is not very high, but other research has shown the accuracy to be not very different to the *Encyclopaedia Britannica* (Giles 2005). Breadth of information and the speed at which information is updated is where Wikipedia really has its strengths, but if Wikipedia is going to be used by students, they need to be made aware of its strengths and weaknesses (as with any source of information).

Wikis may be used by students for collaborative work and working online may enable less confident students to become more involved. All users may contribute to a single piece of work by sharing contributions and peer reviewing, which may be printed and kept as a finished piece of work. The audit trail left by the software can be useful in identifying which students are having difficulties and to confirm that all the users have contributed.

**Blogs**

A blog (originally called a web-log) is a commentary on the writer’s interests, activities and viewpoints, usually displayed with the most recent entry first. Many blogging communities, such as WordPress and Livejournal, provide mechanisms for bloggers to read other bloggers’ entries and to comment on them, creating a community of users. Estimates of the numbers of blogs in existence vary, but most are in the hundreds of millions.

Blogs may be used by students to keep a reflective diary of their learning and to share problems with their peers, creating a social portfolio of their work and developing a community of practice (Wenger 1998). Seeing other students struggle with the
same concepts can also help learning. It is a less formal medium than an essay and usually offers a very personal viewpoint. A number of tools are also available for students to access others’ blogs on topics of interest. Also, similarly to wikis, the subjective nature of this medium needs to be emphasised to students.

Despite their popularity, resistance by students to using blogs in education has been reported. This may be because they are seen as education encroaching on their personal lives rather than the experience of their personal lives being brought to their education. They may also blog in their own time and may not want the ‘split personality’ of two personas online.

As well as offering content created by their users, these sites share a number of other features and many of these are a means to exploit this collective work. Folksonomy is a term used to describe the ‘tagging’ of material by its users. Tagging involves attaching keywords to web content, rather than categorising it. It allows groups of content to be formed in an overlapping manner, in a similar way to how the brain has been shown to associate concepts, and it allows users to create their own categories of web bookmarks (Del.icio.us), photographs (Flickr) or blog entries (WordPress). The use of these resources reflects a constructivist approach, as the users create their own dialogue with themselves and others as they learn, mark-up and categorise material using their own taxonomies. By collaboration, these different experiences and approaches can be shared to produce a collective experience and body of learning.

But what can this offer education? This approach, where the user creates the content, contrasts with the previous section and material where it is assumed that the creator of any resource is the expert and where the content is static. An alternative approach to this method is one where only the infrastructure is created by a technologist and then the students are left relatively free to explore the problem space and develop solutions. This approach does not free up any developer time, as creating a flexible yet robust system that has all the features the users need takes time to develop, but it allows a flexibility that is not possible with ‘fixed’ technologies and creates a system that may be used in a variety of ways.

To absorb facts is only of slight value in the present and usually of less value in the future. Learning how to learn is the element that is always of value, now and in the future. (Rogers 1983: 18)

With such an approach the users become the experts and the experts become the facilitators. These learner-generated contexts shift the control of the learning to the user and are certainly not new in the field of education. They are, however, relatively new in the field of e-learning and represent a shift from the application of pedagogy to andragogy and possibly heutagogy. Andragogy is defined as the art of allowing students to direct their own learning by motivating them to explore a topic in a way that is relevant to themselves. In addition, heutagogy is where this topic itself is also determined by the students. This content can then be pushed out and shared with others for collaborative work and communicated with others using services such as instant messaging.
It should be noted that, although Web 2.0 has influenced this shift in e-learning, this is not a totally new approach to the use of technology in education. In the 1960s Joseph Licklider saw the potential of networked computers connecting people to enable them to exchange knowledge and information and increase their ability to learn.

Pre-dating the Web 2.0 revolution, Terry Mayes at Glasgow Caledonian University described using computers to enable students to learn from one another (Mayes et al. 2001). New tools that are emerging onto the WWW would apply nicely to the ‘dissemination’ system that Mayes and his colleagues created. This project was based on Bandura’s ‘vicarious learning’ (Mayes et al. 2001), where students learn by observing the others undergoing the process of learning themselves: a computer-based system that stored the previous work of students so that future students could observe the previous learning experience of others and learn from it themselves. Students could see others struggling with the same concepts as they were and learn from this. Mayes et al. did not want to replace traditional face-to-face tutorials, but thought this approach could be a useful way of dealing with large student numbers or distance learning.

Mayes et al.’s technique was to record previous dialogues, in video, audio and text, and then to present these to subsequent students in a static form. They saw the original group, which was being recorded, develop a strong social bond and deep levels of learning, which was passed on to the following students. Students who reviewed the previous learning experiences showed more understanding and an increased use of critical evaluations and justification for their views, and derived more of their own conclusions. However, in this context it would be difficult to facilitate the online discussions year after year for the students and to archive this in a non-labour intensive manner. Maybe this is something new blogging and wiki-based technology could aid, with the archiving of older material more automatically.

A move away from a didactic approach to a more constructivist one is also supported by research by Michene Chi (Chi et al. 2001). In a comparison of a didactic style of tutoring, where tutors explained concepts to students, and a more interactive, Socratic approach, when they were suppressed from giving any explanations or feedback, the students learnt just as much with the interactive approach but this seemed to be a deeper understanding and the result of them taking more control of their own learning. They suggest that active learning, when students interpret new material in the context of prior knowledge can be accomplished by making inferences, elaborating the material by adding details, and integrating materials. More complex or deeper forms of construction might be forming hypotheses and justifications; reflecting, summarizing, and predicting; justifying, criticizing, and exploring; or revising one’s existing knowledge.

(Chi et al. 2001: 477)

These are just the processes that blogs and wikis can support as they enable students to reflect on their own learning, read the reflection of others and collaborate, with the facilitation of a tutor, on a joint piece of work. In their conclusion the authors go on to suggest that since construction from interaction is so important in learning,
computer-based tutoring systems should implement ways to elicit students’ constructivist responses, possibly by scaffolding their learning. They say this may be difficult because a tutoring system will not be able to understand the students’ remarks; however, using the computer system only as an infrastructure, with the scaffolding provided by other students or a tutor, may be a solution.

We have focused so far on Web-based constructivist approaches to learning, but we need not restrict ourselves in this way. Kimber et al. (2007) reported that students collaborating by creating their own concept maps learnt a great deal from this process. They state that students can be ‘learning with technology’, focusing on the cognitive and social aspects of using technology in the classroom and, through this, developing a deeper understanding of their subjects and had become ‘creators of knowledge and not mere consumers of information’.

A change in e-learning may have been seen since the emergence of Web 2.0, but that doesn’t restrict us to only using the WWW to benefit from these concepts. Even though we have divided this chapter into two clear headings, this dichotomy is not as strong as this would suggest and there is always a possibility to use older tools in new ways.

**The creative use of available software**

It can be very easy to create complicated solutions in e-learning when it would be possible to use more common tools more effectively and efficiently. Software that can be used in the creation and implementation of e-learning can be very expensive and also costly in the time it takes to set up, write and test a system. Therefore, in order to make the best use of the resources that are available, it is important to weigh up the pros and cons of different approaches, taking this time into account.

Tools that are readily available to most teaching staff, such as Microsoft Office, can be put to very good use. The software available within the Office suite can be used both to create effective learning resources for students and used by students in their learning, and these should not be overlooked when exploring ways for students to work with computers. Excel or Access may be used to create computer models for students to work with and this may give them the opportunity to work with real data while simultaneously gaining important transferable skills with these packages.

Mind-mapping software is another example of software that can be cheaply, or even freely, acquired and used creatively in the classroom. This software enables students to work on their own ideas by drawing flowcharts and diagrams of their ideas and then lets them evolve clearly without the mess that can be created by continually changing ideas on paper. Groups of students can also work on the same maps or combine maps to produce group work.

**Cloud software**

There seems to be little agreement on a universal definition of Cloud computing. But broadly, the term Cloud computing refers to the use of software that, instead of
running on the user’s own laptop or desktop computer, does all its computational work on software running on a computer elsewhere. The user then accesses this software over the internet, most often by using their web browser or mobile app. Many users may therefore be using the same piece of software and can access it from all over the world – anywhere that has an internet connection.

This approach of software as a service has a number of advantages to users. First, cost can be greatly reduced due to economies of scale, especially as access may be paid for only the length of time it is needed. Fast computers can run services quickly and updates made without users knowing, so they need not be troubled by any requirements for more computing power on their desk, as long as they can run a suitable browser to run the services. Their work will also be accessible from wherever they log in, removing the need to carry a laptop. Perhaps the biggest benefit of all, however, is data reliability. A spilled cup of coffee on a laptop is not a problem as all data is stored online and backed up as work is created, the user can simply log in again from elsewhere and carry on working.

When it comes to education there are many applications suitable for e-learning and it is a list that is growing. One leader in the field is Google Apps for Education. The service is free to qualifying institutions and at the time of writing provides email, calendars, data storage, word processing, web pages and group collaboration tools. Using such a service frees up an institution from the need to supply IT support, but also puts it at the mercy of an external company that may wish to take their products in a direction that may not be optimal for some of its users. It also has to be considered what Google has to gain from offering such a service for such large numbers of users at no cost.

Resistance has also been reported by some institutions to the move to Cloud applications, but these same institutions are also under increasing pressure to keep up with constantly changing technologies (Sultan 2010). Sultan reports many financial savings being made by adopting this approach. However, the change does not have to be institution-led. Individual users, whether they are students or staff, may be able to make use of the services they find for the projects they are working on. Applications exist to edit photographs or videos, create databases, hold online meetings, manage projects, build websites or create animations. The tools are out there and the list is expanding.

**Mobile learning**

Sometimes called m-learning, mobile learning has grown considerably since the smartphone became affordable to most students. In the past, the challenge was to create e-learning resources that would work on most users’ computer systems, some with slow dial-up telephone connections to the internet, some with fast broadband, some with small monitors and some with large screens. Just as this became less of an issue due to the lowering cost of broadband and computer monitors, people have started to increasingly access the internet via their smartphones. Now the challenge is to create systems that are accessible and usable from the desktop and on the phone.
The pay-back for this extra design effort (and it needn’t be a big effort if it is built-in from the start) is that users may access their learning ‘just in time’. Apple brought us the concept of easy-to-buy, inexpensive (or free) software downloaded in a few clicks on its iPhone and iPad through its App Store. This has since been replicated by other systems, so it is now possible to download an ‘app’ when it is needed and learning can begin immediately.

Traditionally, mobile phones have not been welcome in the lecture hall, but with computing power greater than the best desktop computers in existence not that long ago and fast connections to the internet, can they be harnessed for learning? Many say they can and opportunities are missed if they are not. These devices are extremely useful for learning in context. Students on work placements may access information and notes on a VLE, historical photographs and data can be accessed in the appropriate location using GPS positioning.

As a parallel to e-learning itself, m-learning is a growing area for research. Applications can range from very simple audio podcasts to cutting-edge augmented-reality software. The important point to note is that mobile phones and handheld gadgets may feel like a threat to teachers in the classroom due to a change in ownership of the technology (Traxler 2010), but they may be an opportunity.

For those interested in reading more about this application of technologies and the pedagogies, history and issues around it, then Mobile Learning: Transforming the Delivery of Education and Training, a free-to-download e-book by Professor Mohammed Ally, expert in distance education, is an excellent resource (www.aupress.ca/index.php/books/120155).

### The importance of an implementation strategy

Whatever type of e-learning is used, it is vital that a suitable strategy for its introduction and development is employed. Leading with the technology and fitting the teaching round it is not the way to develop a successful system. The learning needs of the students should always come first, but it is all too common to speak to somebody who has seen a new ‘gadget’ that they wish to use, without any firm consideration being paid to the pedagogy.

All of these systems have the potential to be very costly to produce or implement; therefore, as a piece of software is designed, it is important to bear in mind what costs are involved and to weigh these up against the usefulness of the software. If there is a simple and pedagogically sound solution then this is the best outcome. This may be something as simple as a free wiki or a cleverly designed PowerPoint file. It is the affordances that a particular system can offer that are the crucial issue. Once a shortlist of systems that can support the pedagogy has been made, then the simplest, fastest and cheapest on the list is probably the best choice.

Of course, there will be times when a new piece of technology may inspire new ideas for teaching online, but this must always be kept in perspective and assessed against the alternatives to ensure that it really is of benefit and not just novelty. Many
commercial companies will spend large amounts of money marketing their software to academic institutions, to convince them that their money will buy a new opportunity for their students. However, the teaching staff may be more than happy with the systems they have currently and the technology will be resisted. This same teaching staff may have needs that require supporting, if the right technology can be found. Success will be found when these two strategies can be matched.

Alongside analysis of how a particular type of e-learning may help a cohort of students, it is also unavoidably necessary to consider the costs that will be involved. It is very easy to underestimate the necessary development costs for a project. Things inevitably take far longer to produce than predicted; however, once software has been produced there are usually negligible further costs in its use, so it may be used repeatedly; this needs to be considered, along with a strategy to keep the resource up to date, to keep its shelf life as long as possible.

Besides the financial efficiency of a choice, the cognitive efficiency may also be considered. There may be alternative methods for presenting information and teaching a subject, yet some may convey information much more efficiently for the students (Cobb 1997). For example, a video showing how to set-up some equipment may take two minutes, yet a text description of this same process may take 15 minutes to read, even if the teaching effect is the same.

Any technology that is used needs to be embedded in a curriculum and the learning context if it is to succeed. Laurillard claims that the reason so many technologies come and go can be attributed to a lack of organisational context, rather than the inferior qualities of teaching they offer, as many other poor-quality teaching methods remain purely because they fit the context well and are well and truly embedded into the teaching systems (Laurillard 2002). It may also be found that once students know of a resource’s existence they will return to it in their own time, for revision or clarification, and tell others if they find it useful. In fact, students who are given the option to work through more examples of their own volition will often do far more work than when it is prescribed (Laurillard 2002).

Furthermore, Keller and Cernerud (2002) found that when they researched students’ perceptions of e-learning, the strategy used to implement the system was more important than any of the background factors with respect to the students, such as age, gender, experience with computers, attitudes towards computers and learning style. Of two schools, the one with a more consistent, stable and familiar Web platform and clear goals for the implementation of e-learning involving both students and teachers had much more positive feedback from students than the one with a less consistent approach and no overall goals.

A further framework for the successful implementation of an online teaching and learning system is Gilly Salmon’s ‘E-tivities’ (Salmon 2004). E-tivities are described as ‘frameworks for online active and interactive learning’. The framework applies most closely to online discussion groups as it was the use of these in the Open University that prompted the original research, but the five steps described in the book can be equally applied to any other social, online learning activity. The stages are as follows:
1. Access and motivation: this stage consists of helping users overcome technical difficulties and their apprehension with new technology and new people.

2. Socialisation: an online community is created through ‘active and interactive e-tivities’. Users start to share thoughts and work and the moderators help people to build connections between the users.

3. Information exchange: cooperative tasks are achieved and people interact with each other and the moderator(s) to perform these tasks.

4. Knowledge construction: participants start to construct knowledge in their own ways; at this stage moderators help to build and keep groups going by controlling the group dynamics.

5. Development: participants take control of the group and are responsible for their own learning. Users no longer need to think about how they are going to work online and they become creative.

Salmon creates a very structured set of guidelines for moderators at each stage of the model in order for them to get the best results in their online teaching, and this is a very useful guide for anyone wanting to use a discussion board. Much of the advice will also apply equally well to any group activity using blogs and wikis, and failure to support students through their experience online may create a scenario in which the technology is getting in the way of, and even preventing, the learning. Students cannot choose to understand, they can only choose to concentrate hard and try to understand (Laurillard 2002); it is up to the moderators and designers of these systems to enable learning.

**Conclusion**

The use of e-learning is not going to revolutionise education on its own. Even if these new technologies are absorbed into current teaching methods and become everyday practice, they are not going to change the experiences of the average student beyond recognition, no matter what the vendors and creators of software may tell us. What we will see is a change in education that mirrors the changes that are happening in the way people communicate and think about information when they are not studying. Many tools are becoming available that can augment and supplement teaching and education in very valuable ways. These can enhance the experiences of students and teachers and offer new choices for teaching in the same ways that new methods of communication via the internet have offered new ways for us to keep in touch with our family and friends, even though these relationships have not essentially changed.

In the early 1990s, ‘multimedia’ became the buzzword for new technologies and was also used in the context of education. Now that this buzz has decreased, the use of videos, DVDs and CD-ROMs is no longer seen as a separate and ‘special’ part of teaching. In the same way ‘e-learning’ will eventually become ‘learning’ and we will no longer differentiate what material is learned using a computer in the same way that we don’t differentiate what is learned using books. For the foreseeable future, at least, technology will continue to develop and educationalists will carry on trying out and
applying this new technology to the teaching of students in new ways. However, we are yet to see a huge paradigm shift in education as a whole. Changes in the WWW towards Web 2.0 and social media and, in parallel, the new technologies of e-learning 2.0 probably currently offer the closest we have to this large change as they move away from an expert–student classroom model, but they still make up a small part of the e-learning seen in schools and universities. A change may still come, but there is yet to be any convincing evidence that old methods are to be replaced by new, apart from in small areas of curricula.

In an enthusiasm to embrace these new technologies, it can be easy to exploit them for their own sake and novelty value. While the use of something new can be motivating, caution needs to be exercised to make sure that these new tools aren’t used for their own sake. That said, there are gains to be made in the use of e-learning and, as the introduction to this chapter illustrates, if the teaching methods we use do not keep pace with our learners, then we risk losing some along the way and missing out on the opportunities that new technologies may offer us. It is important that new ideas are explored and evaluated and allowed to grow into more mature ideas, as they no doubt will.

There is plenty of scope for innovation that is grounded in sound pedagogy, such as the Alice project and the work of Futurelab (www.futurelab.org.uk), and the application of technology to pedagogic principles rather than vice versa can produce very interesting results. Furthermore, this often also results in more innovative projects as course materials are not simply plugged into existing software.

Hopefully, after studying this chapter, the reader will have a clearer view of some of the current issues in e-learning and feel more confident in assessing and trying out some of these ideas in their own studies or teaching. It can be a very interesting and dynamic field of study.

References


