

e-learning in clinical teaching

Clinical teachers teach diverse groups of learners who are increasingly familiar with learning through an online environment. e-learning provides huge opportunities for enhancing clinical teaching and facilitating communication. However, to be effective, e-learning must be grounded within sound educational approaches.

This article explores the role of and potential for introducing a range of technologies in clinical teaching, set within the context of a framework of principles for good teaching practice. It looks at how teachers might select and implement technologies appropriately when planning teaching sessions, writing learning objectives and designing learning activities and assessments.

What is e-learning?

e-learning is now very much part of mainstream medical education. Medical students and trainees are very familiar with using computers and other technologies as part of their day-to-day life, in health-care management and in education. In this article e-learning refers to electronically-mediated learning in a digital format (using computers and the internet) to enhance or facilitate teaching and learning (Bullen, 2006). This definition covers the use of technologies to supplement face-to-face teaching through to distance teaching opportunities in which teacher and student may never meet face-to-face such as BMJ Learning (Walsh and Dillner, 2003).

Ellaway and Masters (2008) distinguish between e-learning, e-teaching and e-assessment, highlighting that e-learning is not just about the content and the delivery of teaching, but is a pedagogical approach that aims 'to be flexible, engaging and learner-centred: one that encour-

ages interaction (staff:staff, staff:student, student:student) collaboration and communication'.

Although there are huge opportunities to enhance clinical teaching through e-learning a number of challenges exist in addition to determining pedagogical aspects. Teachers will need to be familiar with the range of innovations available so that they can select appropriate means of developing content, facilitating the process of learning and enabling communication. Other challenges include becoming familiar with new systems, processes and online environments, making time to filter through and select appropriate materials, having time to support learners as they use e-learning and keeping materials and activities up to date.

The educational context

'The challenge for medical educators is to be aware of the new changes and to consider how the latest technology can be used to enhance learning' (Sandars and Haythornthwaite, 2007).

Technological innovations appear tempting, particularly when students are learning at a distance and when there is such an array of possibilities available. However, if we are going to talk about e-learning in an educationally useful way we need to start by talking first about teaching and learning. Taking an approach that first identifies and looks for answers to educational challenges will be more likely to result in the appropriate use of technologies (Laurillard, 2008). Technology must take second place to good practice in education, hovering 'shyly in the wings, ready to lend its power, but only as needed' (Ahmed, 2003).

Three models or frameworks help us think about the place of e-learning in clinical teaching:

- The 'seven principles' of good teaching practice
- Distinguishing between the 'content' and the 'process' of e-learning
- 'Constructive alignment'.

The 'seven principles'

Chickering and Gamson (1987) introduced the seven principles for good practice in undergraduate education, according to which, good educational practice:

1. Encourages contact between students and faculty
2. Develops reciprocity and cooperation among students
3. Encourages active learning
4. Gives prompt feedback
5. Emphasizes time on task
6. Communicates high expectations
7. Respects diverse talents and ways of learning.

Although devised for undergraduate education, these principles are relevant to all learning situations. We can easily see how the principles could be achieved in face-to-face teaching, where teacher and learners are physically located in the same space (such as a classroom) at the same time. For example, a session might begin with the teacher communicating his/her high expectations by outlining learning objectives and defining the standards to be met in order to pass an assignment. At the same time the teacher might clarify time on task in relation to completion of learning activities and due dates for assignments.

Contact between teachers and learners can be encouraged by the teacher setting aside additional time during which he/she is available to talk to learners. Active learning can be encouraged by group-based learning activities based on collaborative research, which also encourages reciprocity and cooperation between learners. Requiring individual learners to take a lead in specific activities and building on learners' needs is one way in which the teacher can demonstrate respect for diverse talents and ways of learning. Prompt and timely feedback on progress or areas for development can be given while activities are being carried out or in one-to-one tutorials.

There is no point in introducing a technology just because it is available or for the

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sake of innovating. ‘The novelty factor can often cause us to be tempted to implement the latest and greatest technology, sometimes without thinking carefully enough about whether or not this is actually going to result in meaningful learning’ (Lee, 2005). A straightforward way to judge the potential value of a technology is to consider the seven principles and to ask how the technologies might help in adding value, realizing the principles in practice and achieving educational outcomes that would not otherwise have been possible (Gamson, 1995; Chickering and Ehrmann, 1996).

Many clinical teachers are running a busy service and may teach diverse groups of students and trainees. Putting the principles into practice may be more difficult in clinical settings than in a university setting where teaching sessions for groups of learners are clearly timetabled. Here, e-learning might help to ‘scaffold’ the learning, through providing a common set of learning materials, links to library resources or by enabling group discussion or collaboration to occur without the need for teacher and learners to be in the same room, or even working at the same time. One advantage of e-learning is that learners and teachers can work independently and communicate asynchronously (not in real time) through discussion boards or email. Or teachers and/or learners may communicate in real time (from their own homes or other workplaces) through chat rooms, instant messaging or Skype. Such ‘classrooms without walls’ can provide useful learning spaces for trainees and students who might find it difficult to meet in real time.

Content and process

Another way of thinking about how to incorporate e-learning is to distinguish between whether you are aiming to support learners through providing access to content using e-learning (e.g. course materials, links to other websites, online databases) and/or whether you aim to use e-learning to support the learning process. Of course, many programmes aim to do both, but the expectations and choice of technologies used and the types of activities selected will be shaped by your overall aim as a teacher and your students’ learning needs.

e-learning content includes curriculum content, course materials, e-journals, e-books and other resources available through an e-library or online database, commercial materials, the internet (e.g. via Google, Google Scholar or Wikipedia), reusable learning objects, audio and video materials (such as clinical recordings) or podcasts or RSS (really simple syndication) feeds (Ellaway and Masters, 2008; Morris and McKimm, 2009). Learners expect tangible benefits from using information and communication technology and expect unrestricted access to resources, information and networks, however, they also expect face-to-face interaction to form a large part of their educational experience (Joint Information Systems Committee, 2008). For clinical learners who need to work and learn from patients, this is vital.

Contact between clinical teachers and learners (and the learners themselves) can be limited by teacher availability and pressures on students’ or trainees’ time (Issenberg and Scalese, 2007). Earlier versions of the World Wide Web – now referred to as Web 1.0 (Boulos and Wheeler, 2007) – were repositories for information, enabling access to information from anywhere and at any time, and facilitated communication through email and other means. The use of Web 1.0 technologies such as email, a chat room or a discussion board can increase opportunities for contact and supplement face-to-face contact. The less face-to-face contact time there is between teacher and learner (e.g. in distance learning programmes where technologies provide the only means of contact) the more crucial it is that technologies are used appropriately to facilitate contact and communication.

Web 2.0, although difficult to define (Anderson, 2007), is seen as a World Wide Web characterized by new applications and services which have created what is known as an architecture of participation and collaboration (Doherty, 2008). Users of the web can now create and co-create content, share content and collaborate much more easily through tools such as blogs, wikis, social bookmarking services, multimedia sharing services and social networking spaces (Anderson, 2007) (Table 1).

Although many e-learning activities directly replicate face-to-face activities (group discussions, reading articles), other activities can be significantly enhanced through e-learning which can facilitate collaboration and cooperation between learners. For example, using the web to deliver a clinical case scenario, supported by online resources (such as simulations, test results, scans and images), would make the case available at any time and place for a group of learners as long as they had internet access. Using Web 2.0 tools such as a wiki environment would allow each learner to discuss the case without having to physically meet with others. This flexibility is important for learners who find face-to-face meetings difficult because, for example, of the demands of a part time job or shiftwork.

We might assume that learners who have grown up in the digital age would be driving e-learning. However, ‘not all learners are confident users of the wide range of learning technologies available, and there is an increasing literature that highlights the challenges for learners (many of which are similar to those identified by clinical teachers)’ (Morris and McKimm, 2009).

Table 1. Web 2.0 services and applications

Categorization	Explanation	Application or service
Blog	An online personal journal or web log	http://www.blogger.com
Wiki	A collaboratively authored website	http://www.wikispaces.com
Social bookmarking	A system for storing bookmarks on a remote server and to share bookmarks with other users of the system	http://delicious.com
Multimedia sharing	Services that facilitate the storage and sharing of multimedia content	http://www.youtube.com
Social networking	Professional and social networking sites that facilitate meeting people, finding like minds, sharing	http://www.ning.com

Constructive alignment

So far we have looked specifically at principles for good practice for individual teachers but we also need to ensure that technologies are successfully integrated at a course level in terms of a coherent teaching plan. A curriculum, course or 'lesson' should have an aim, specific learning objectives or outcomes, learning activities designed to enable students to realize the learning objectives, valid and reliable assessments designed to measure student learning (Atherton, 2005; McKimm and Swanwick, 2009) and evaluation to measure the effect of the intervention. These are the basic elements of 'the educational paradigm' (Figure 1) which, guided and informed by educational principles (Matheson, 2009), should be linked together so as to enable 'constructive alignment' (Biggs, 1996).

Planning and implementing e-learning activities

A consideration of these elements helps us see how technologies might be appropriately integrated into teaching at a course and/or curriculum level (Elgort et al, 2008). Figure 2 provides an illustrative example using a template developed to support the creation of flexible and distance teaching materials to ensure constructive alignment. This example is informed by the teaching and learning seven principles, defines teaching and learning methods and indicates how e-learning content and process might be introduced.

In this example, the teacher uses e-learning to facilitate the group learning process, providing supporting content and links as well as structuring the learning process so as to achieve the learning outcomes which are then assessed. Evaluation is important, particularly after introducing a teaching or learning innovation, in order to gauge whether learning improves as a result of the innovation and whether changes might need to be made. Evaluation of Web 2.0 tools as teaching innovations is not something that is currently happening (Elgort et al, 2008), referred to by Booth (2007) as an 'educational bypass'.

Conclusions

e-learning provides huge opportunities and potential benefits for both learners and clinical teachers, enabling access to a vast

amount of resources and facilitating communication when face-to-face learning is difficult. However, it is vital to maintain the main focus on improving teaching and learning while acknowledging that new technologies can enhance and facilitate teaching and learning. **BJHM**

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Ahmed A (2003) Faculty adoption of technology: Training comes first. *Educational Technology* March/April: 51-3

Anderson P (2007) What is web 2.0? Ideas, technologies and implications for education. Joint Information Systems Committee. www.jisc.ac.uk/media/documents/techwatch/tsw0701b.pdf

Figure 1. Linking up the elements: the educational paradigm. From London Deanery (2008).

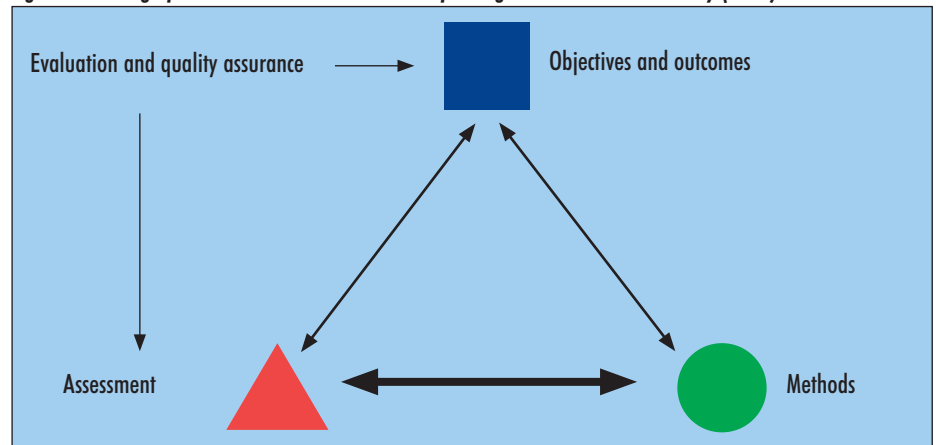


Figure 2. Development template for e-learning – an example.

Aim	Learners will work collaboratively in small groups for 1 week to produce a group presentation and written individual assignment summarizing the key principles of transmission, disease process and management of influenza(s) from both individual patient and public health perspectives		
Learning objectives/outcomes	Learners will be able to demonstrate understanding of the key principles of transmission, disease process and clinical and public health management of influenza(s)		
Methods	Assessment	Evaluation	
Process: Learner role/activity, e.g. students will work collaboratively in small groups to produce a summary of the key principles of transmission, disease process and clinical and public health management of influenza(s) Process: Tutor support role, e.g. written instructions, marking schemes, course announcements, frequently asked questions page, moderation of online discussions		Formative assessment, e.g. learners present their group's summaries (online or face-to-face) Summative assessment, e.g. written individual assignment Assignments marked in accordance with defined criteria and marking scheme, constructive feedback provided	Student feedback questionnaire on whether the content provided was helpful and/or appropriate, any difficulties with accessing materials or links, did they feel equipped and confident in using Web 2.0 tools, how group communication worked, whether tutor support was sufficient, whether they felt that e-learning helped them to achieve the learning outcomes
Content: Resources, e.g. hard copy reference materials scanned and uploaded onto a virtual learning environment, multimedia resources such as video, audio and images, selected online links such as relevant websites, links to e-library			
Process and content: Mode of delivery, e.g. web-based learning materials, CD-based delivery of multimedia resources, online group work through a wiki, chat room or discussion board			

From Learning Technology Unit, Faculty of Medical and Health Sciences, University of Auckland

- (accessed 15 May 2009)
- Atherton JS (2005) Teaching and learning: Assessment. www.learningandteaching.info/teaching/assessment.htm (accessed 15 May 2009)
- Biggs J (1996) Enhancing teaching through constructive alignment. *Higher Education* **32**: 347–64
- Booth A (2007) Blogs, wikis and podcasts: The 'evaluation bypass' in action? *Health Info Libr J* **24**: 298–302
- Boulos MNK, Wheeler S (2007) The emerging web 2.0 social software: An enabling suite of sociable technologies in health and health care education. *Health Info Libr J* **24**(1): 2–23
- Bullen M (2006) When worlds collide: Project management and the collegial culture. In: Pasian BL, Woodill G, eds. *Plan to learn: Case studies in elearning project management*. Canadian eLearning Enterprise Alliance, Dartmouth, Nova Scotia: 169–76
- Chickering AW, Ehrmann SC (1996) Implementing the seven principles: Technology as lever. *American Association for Higher Education Bulletin* **49**(2): 3–6
- Chickering AW, Gamson ZF (1987) Seven principles of good practice in undergraduate education. *American Association for Higher Education Bulletin* **39**(7): 3–7
- Doherty I (2008) Web 2.0: A movement within the health community. *Health Care and Informatics Review Online* **June** www.hinz.org.nz/uploads/file/Journal%20Jun08/Doherty%20P49.pdf (accessed 23 December 2009)
- Elgort I, Smith AG, Toland J (2008) Is wiki an effective platform for group course work? *Australasian Journal of Educational Technology* **24**(2): 195–210
- Ellaway R, Masters K (2008) AMEE Guide 32: e-learning in medical education. Part 1: Learning, teaching and assessment. *Med Teach* **30**: 455–73
- Gamson ZF (1995) The seven principles for good practice in undergraduate education: A historical perspective. In: Hatfield S, ed. *The seven principles in action: Improving undergraduate education*. Anker Press, Bolton, Mass
- Issenberg SB, Scalese RJ (2007) Best evidence in high-fidelity simulation: what clinical teachers need to know. *The Clinical Teacher* **4**: 73–7
- Joint Information Systems Committee (2008) *Great expectations of ICT: how Higher Education institutions are measuring up: Research study conducted for the Joint Information Systems Committee (JISC)*. IPSOS MORI, London
- Laurillard D (2008) The teacher as action researcher: Using technology to capture pedagogic form. *Studies in Higher Education* **33**(2): 139–54
- Lee M (2005) New tools for online collaboration: Blogs, wikis, rss and podcasting. *Training and Development in Australia* **32**(5): 17–20
- London Deanery (2008) The educational paradigm. www.faculty.londondeanery.ac.uk/e-learning/setting-learning-objectives/the-educational-paradigm (accessed 15 May 2009)
- Matheson D (2009) Learning objectives. www.nottingham.ac.uk/medical-school/tips/aims_objectives.html (accessed 15 May 2009)
- McKimm J, Swanwick T (2009) Setting learning objectives. *Br J Hosp Med* **70**(7): 406–9
- Morris C, McKimm J (2009) Becoming a digital tourist: a guide for clinical teachers. *The Clinical Teacher* **6**: 51–5
- Sandars J, Haythornthwaite C (2007) New horizons for e-learning in medical education: ecological and Web 2.0 perspectives. *Med Teach* **29**(4): 307–10
- Walsh K, Dillner L (2003) Launching BMJ Learning. *BMJ* **327**: 1064

KEY POINTS

- e-learning is now part of mainstream medical education.
- The primary reasons for introducing e-learning must be concerned with meeting learners' needs and facilitating the educational process, not simply seizing on technological innovations.
- We must not assume that learners are familiar with e-learning tools, but provide support for access and use.
- Opportunities for enhancing learning through e-learning include access to a wide range of resources and information and facilitating communication.
- Challenges for teachers include working with new systems and processes as well as finding time for developing and maintaining e-learning resources.