Instructional technology in medical education: lessons learnt

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Summary

New instructional technologies, especially Web-based applications, may play an increasing role in medical education, particularly for distance and distributed learning. As medical educators turn to this medium, numerous benefits and opportunities, but also challenges and pitfalls, will arise. The successful development and implementation of instructional technologies in medicine require an appreciation of the medium's heterogeneous nature, its strengths, weaknesses and limitations. These in turn rely on partnerships with various experts and the early adoption of evaluation. We have summarized the lessons learnt from developing Web-based courses on palliative care in a framework for adopting instructional technologies. This framework incorporates development, implementation and evaluation.

Introduction

The importance of distance education in medicine is increasingly being recognized and educators are beginning to turn to the Internet as a potential delivery medium for that training. A wide spectrum of medical disciplines and specialty areas are involved, including palliative care, where deficits in training have been identified[1,2]. In 1998 the Division of Palliative Medicine, in collaboration with other institutions, started exploring the World Wide Web as an educational delivery method for distance and distributed learning in palliative care. This resulted in collaboration on a 'pain module' for pharmacy students, the PallCare EdNet Pilot Online Course and the PallCare EdNet Online Resource. The pain module used Web-based conferencing as a component of an integrated course that included encounters with patients and small-group face-to-face discussions, while the EdNet Course was a comprehensive, exclusively on-line course that relied on interdisciplinary, case-based small-group discussions. The Online Resource is a Website with searchable databases of cases, reviews, references and educational links.

Although a role for new instructional technologies, including Web-based learning, has often been suggested, few faculty members have experience with it and many express concerns about its adoption. Those adopting this medium and its numerous applications invariably discover various challenges and pitfalls but also unexpected benefits. This paper summarizes some of the opportunities and difficulties encountered during the development of the Web-based instructional platforms outlined above.

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Challenges

A systematic review of the medical literature revealed a paucity of information related to methodology and outcomes of Web-based instruction in medicine. The literature was mainly descriptive, did not explore the various educational applications of the Internet in much detail and lacked appropriate evaluation. This is in contrast to education[3,4], where there is a growing body of experience and knowledge, albeit heterogeneous in nature and quality. There was therefore little experience from medical education that could be drawn upon to develop the course.

Faculty members and medical educators generally have little experience with instructional technologies. Programmes to introduce faculty members to it are imperative, as are development support structures for instructional technologies. At the University of Alberta, faculty members have access to several resources, including the Division of Academic Technologies for Learning. These resources are mainly outside the medical faculty. It appears that many medical faculties have limited structures to support the effective implementation of Web-based learning. We contend that, although institutional resources need not be duplicated, more effective intra- and inter-institutional partnerships with increased collaboration between content experts, instructional designers, programmers, evaluators, educators, students and administrators should be developed. Resources to coordinate and stimulate the effective use of instructional technologies should be created within the various departments.

The adoption of Web-based learning, both in the context of independent courses and integrated within more traditional delivery methods, can be resource intensive, particularly during the initial start-up phases. Limited funding opportunities, lack of protected academic time for content

experts, who are often active clinicians, and limited recognition by faculty evaluation committees of Web-based instruction can present challenges for adopters of instructional technologies and Web-based learning.

Pitfalls

Two of the major pitfalls in introducing instructional technologies, including Web-based learning, are: embracing technology simply for its novelty rather than its pedagogical strengths and applications; and setting out without an appreciation of the 'big picture'. The first results in inappropriate use of technologies and this may stifle learning, lead to erroneous conclusions and result in disappointment. Content expertise and blind enthusiasm alone do not ensure effective applications of instructional technologies. The second fails to recognize and understand the process, deals with problems only when they occur and is harder to control. Project deadlines may be missed and money spent on the wrong things.

One of the major misunderstandings about enhancing learning with new media is the assumption that technological advances will, by virtue of their very existence, improve the quality of learning[5]. New technologies and media must be more than just additions to existing practices or ways of mechanizing old methods of doing things[5]. They must serve as catalysts for fundamentally rethinking what learning is about. New strategies for how we learn, where we learn and when we learn should be entertained.

Opportunities

The Internet, particularly the Web, has the potential to increase access to learning, especially with the growth of problem-based learning, distributed learning (flexible learning at one's own time, place and pace), learning at the point of care and lifelong learning[6]. Continuing professional development and structures to facilitate and encourage this are required. Information technologies play an important role in these developments since the ties between informatics and education are natural — informatics is all about how we access and use information and this affects how, where and when we learn[7]. The EdNet Project, for example, is developing structures to support learning for rural health professionals, residents and urban practitioners in palliative care, and access to information that practitioners can access when required. The other potential benefit of instructional technologies and Web-based learning relates to the various learning styles of adult learners. With appropriate development, Web-based learning can accommodate these variations to a certain degree[8]. Numerous other potential benefits of and opportunities for instructional technologies have been described but all need to be systematically evaluated[4,9,10].

In our experience an unexpected benefit of embracing technology has been that new instructional technology has served as a catalyst to review our methods of instruction and learning. It has encouraged us to provide active, needs-oriented learning that takes learning styles and adult education needs into consideration.

A framework for adopting instructional technologies and Web-based learning

Table 1 outlines a conceptual framework for adopting instructional technologies and Web-based instruction. This framework relies on key considerations in development, implementation and evaluation. Goals are crucial since they will affect evaluation. There are two key questions. (1) What is the specific need for implementing instructional technology? (2) Does its use add something that would be impossible without it? A variety of technologies are available so that selection depends on understanding their respective strengths and weaknesses, learners' needs and access to the appropriate equipment. In the pain module for pharmacy, for example, two of the identified needs were greater student access to a variety of clinical and pharmacy experts and a need to build a pool of real-life cases for learners to draw from[11]. Computer-

Table 1 A framework for adopting instructional technologies

Objective	Details/examples
Form partnerships and collaborations with:	Content experts Instructional designers Programmers Administrative staff Evaluation experts Potential learners Information experts
Establish and clarify the goals of the project/course	What is the rationale for incorporating new instructional technologies? What do these technologies have to offer that traditional methods do not?
Conduct a needs assessment	Surveys Focus groups Literature reviews
Select appropriate technology	
Identify resources early in the process	
Include all stakeholders early in the process	
Adopt evaluation methods early in the process	Needs assessment Formative evaluation Summative evaluation
Differentiate between the delivery medium and the instruction	
Use sound instruction methods	
Train and support faculty members and instructors	
Train and support learners and users	

mediated conferencing proved an effective tool. In identifying the appropriate resources, one needs to appreciate the role of collaboration. Collaborators should include content experts, instructional designers, evaluation experts, graphic artists, computer technologists and programmers, learners and instructors, among others. From the outset, participants, including administration, educational leaders, programme directors, colleagues and learners, should be included.

The importance of evaluation also needs to be emphasized. Appropriate endpoints and methods should be utilized. Developers of instructional technologies applications often lack familiarity with evaluation methods and tools[12]. Clark contended that there is a need to change the way in which new technologies for learning are assessed[13]. Delivery technology should be separated from instructional methods. Evaluation should look at these separately and should also include cost analyses. Focusing on sound instruction is paramount[14]. This includes the following concepts: learning is context based; learning is through active involvement; learners derive understanding and interpretations of the task in hand by active participation in it; knowledge is constructed and reconstructed personally and internal to the learner; learning is through collaboration with others and involves sharing existing knowledge with others and a willingness to resolve misunderstandings. The learner should have some personal autonomy and control over learning.

Conclusions

New instructional technologies and Web-based learning may play an increasing role in medical education, particularly for distance and distributed learning. As medical educators turn to this medium, new benefits and opportunities will arise, but also challenges and pitfalls. The successful development and implementation of instructional technologies in medicine require an appreciation of the medium's heterogeneous nature, its strengths, weaknesses and limitations. These in turn rely on partnerships with various experts and the early adoption of evaluation.

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