



The Role of E-Learning in Medical Sciences Education

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Abstract: The authors present e-learning and its role in medical education by identifying the key elements and components of e-learning, demonstrating its effectiveness, the development needs of implementation faculties, e-learning assessment strategies and techniques, and how e-learning as evidence of academic scholarships. e-learning is the use of Internet technologies to increase knowledge and performance. E-learning technologies allow learners to control content, learning order, learning pace, time, and often the environment, allowing them to adapt their experiences to achieve personal learning goals. In different medical education contexts, e-learning appears to be at least as effective as traditional teacher-led methods such as lectures. Students do not see e-learning as a substitute for traditional teacher-led training, but as a complement to it and as part of a blended learning strategy. Infrastructure developed to support e-learning in medical education includes digital repositories or libraries for managing access to e-learning materials, consensus on technical standardization, and peer review methods for resources. E-learning offers a number of research opportunities for educators, along with the ongoing challenges of scholarship documentation. Innovations in e-learning technologies signal a revolution in education, enabling individualization of learning (adaptive learning), improving students' interaction with others (collaborative learning) and changing the role of the teacher. Incorporating e-learning into medical education can catalyze a shift towards the application of adult learning theory, in which educators would not primarily act as content disseminators, but would be more involved as learning facilitators and competence assessors.

Keywords: *e-learning, into medical education, blended learning, challenges, Infrastructure.*

Introduction: Modern medical educators face different challenges than their predecessors in teaching tomorrow's doctors. Changes in health care and advances in medicine in recent decades have increased the demands on academic faculties, which have required less time to teach than before^[1]. Changes in health facilities, from emergency services to the community. Chronic

care-based activities need to be adapted in an educational setting. It is difficult to find time to learn "new" areas, such as genomics, palliative care, geriatrics and complementary medicine, when medical school curriculum are already difficult to cover traditional materials. Traditional teacher-centered learning is subject to a student-centered model that allows students to control their own learning. Recent developments in competency-based curricula emphasize learning outcomes rather than learning. E-learning means the use of Internet technologies that offer a wide range of solutions that increase knowledge and efficiency, scientific and pedagogical challenges. It has gained popularity in the last decade; however, its use is very diverse among medical schools and appears to be more common in basic science courses than in clinical administrators. In this article we consider the current state of e-learning in medical education, outlining: key concepts, components of e-learning, evidence of its effectiveness, the need for faculty development to implement e-learning, e-learning assessment strategies, and e-learning can be seen as proof of academic scholarship.

Definitions: E-learning is also called web learning, online learning, distributed learning, machine learning, or online learning. Previously, there were two common e-learning modes: distance learning and computer-assisted learning. Distance learning uses information technology to educate students remote from a central website. Computer Learning (Also known as Computer Learning and Computer Learning) uses computers to provide separate multimedia packages for learning and teaching. These modes^[2] are included in e-learning just like the Internet. Integrated technology This concept is closely related to e-learning. Before the advent of the Internet, there was multimedia learning. Multimedia uses two or more media, such as text, graphics, animation, audio or video, to create interesting content that students can access through their computers. Blended learning is a relatively new vocabulary in education. But the idea that most teachers are familiar with is a technique that combines e-learning technology with traditional teacher-led learning, such as a lecture or demonstration, complemented by an online tutorial.

Teachers, administrators and students find that multimedia e-learning improves the learning experience. These benefits can be divided into both learning and learning enhancements. Learning is the most cited benefits of eLearning, including increased data availability, ease of content updates, personalized recommendations, and ease of distribution and planning. Content and responsibility. Accessibility is the user's ability to find what he she wants, and when he / she needs it. Learning is often unplanned.^[3] Updating e-content is easier than updating printed materials e-learning technology allows teachers to quickly and easily review content. Students take control of content, their learning paths, learning rhythms, timing, and often media, allowing them to modify their experiences to meet their personal learning goals. Internet technologies make it possible to continuously distribute digital content to a large number of users and. Everywhere, the added benefit of e-learning is the standardization of course content and delivery. Unlike, for example, lectures, which are given in each section of the course, automatic tracking and reporting of student activity reduces the administrative burden on the teacher. E-learning can also be designed with an outcome measure to determine if learning has occurred^[4]. The benefit of improved learning is learning improvement that is less recognized. But there may be a new revolution in e-learning than in learning management. E-learning technology is giving teachers a new paradigm based on adult learning theory that adults learn. Link new learning to past experiences, link learning to specific needs, and apply it to hands-on learning, leading to more effective and efficient learning. Learning Experience 11 Improving learning can improve student interaction and increase motivation, cognitive ability, and flexibility in student learning styles. Learning is a deep personal experience, we learn because we want to learn. By providing students with more opportunities to participate, well-designed eLearning can motivate them to participate more actively in the learning process. Interactive learning shifts the focus from a teacher-centered model. It is the centerpiece of an active and learning style. It is a central element that provides a strong incentive to learn. Interaction maintains student interest and is a tool for individual practice and reinforcement. Evidence shows that e-learning is more effective because students acquire knowledge, skills and attitudes more quickly than traditional instructor-led learning methods. This efficiency tends to increase motivation and efficiency^[5]. E-students demonstrated wider content and better use of content, resulting in better assimilation of knowledge, skills and attitudes. Multimedia e-learning. This gives students the opportunity to

choose from a variety of materials to consider different learning styles.

Components of E-Learning: Creating electronic instructional materials has several components: when content is developed, it has to be handled, delivered and standardized. The content consists of all training materials, which can vary in complexity from each component to larger training modules. Digital learning objects refer to any group of digital media that are meaningfully structured and linked to educational goals. Learning objects are discrete, independent, collected and reassembled units of learning to point. Specific learning needs which are used to create larger learning materials such as A complete lesson, module, or course to meet specific course requirements. Examples include exercises, case studies, hypermedia, simulations, and game learning modules. Content creators use instructional design and teaching principles to create teaching content and teaching materials. Content management, including all administrative functions. Examples of e-learning content include portals, digital libraries, learning management systems, search engines, and e-learning portfolios. For example, a learning management system is a web-based software that facilitates the delivery and tracking of e-learning in institutions. A learning management system can perform many functions in addition to delivering e-learning content. Morning It can simplify and automate administrative and control tasks, monitor student achievement, and serve as a constant repository of^[6] learning management systems familiar to medical educators. Is WebCT® or Blackboard®, but there are more than 200 commercially available systems and their numbers are growing rapidly. Content submissions can be synchronous or asynchronous. Synchronous delivery refers to instructor-led real-time e-learning, where every student is delivered. People receive information at the same time and communicate directly with other students, for example, video conferencing. (Audio, video, or both) Internet discussion forums and instant messaging. With asynchronous delivery, data transmission and reception will not occur at the same time. Students are responsible for their own study and learning. Teachers and students communicate with each other using technology, email or feedback. But not real-time Several methods of asynchronous delivery can be used, including e-mail, message boards, mailing lists, newsgroups, and weblogs. In addition to creating, managing and delivering content, the fourth element is part of the e-learning equation. It is becoming increasingly clear that standards are required to create new e-learning materials, such standards lead to the compatibility and application of products in a number of computer systems, facilitating the use of media. Electronic learning

widely Many organizations are involved in the creation of broader e-learning standards^[7], although these standards are not specifically designed for medical education. But there are significant benefits for medical educators.

The Evidence for Successful and Well-organized E-Learning:

The effectiveness of e-learning is mainly proven by studies conducted by higher education, government, business, and military departments. However, due to differences in scientific design, these studies are particularly limited. Generally, they are unable to determine the quality, technical nature and specific types of the e-learning analyzed. In addition, most of them use different teaching methods and teaching methods, which complicates the analysis. Most of these studies compare e-learning with traditional teacher-led methods. Continue to explore the three areas of e-learning: product utility, cost-effectiveness and student satisfaction. Utility refers to the benefits of e-learning methods. Some studies outside of health care have shown that e-learning usually does not succumb to traditional instructor-led methods. For example, lectures that support learning Gibbons and Fair-weather have shown that before the Internet contains two comparative metadata analysis, Era’s Several studies have used traditional teaching methods for the possibility of computer learning. The study used different designs in teaching and education environments, but there were conflicting results in several results. Through the pre-test results, the students’ knowledge has been improved. In addition, learners who use computers to learn can learn effectively and show good rehabilitation capabilities. Recent reviews of e-learning (especially e-learning) in different medical education contexts have shown similar results. Chumley Jones ^[8] colleagues analyzed 76 studies on the benefits of online learning from the medical, nursing, and dental literature. About a third of cognitive improvement studies rely heavily on multiple choice written tests. Although one study used standardized patients. From the perspective of students’ knowledge success, teaching via the Internet is equivalent to traditional methods. According to these two studies, there is only one piece of evidence to assess the effect of learning through online teaching. The key evidence in the non-medical literature shows that through a comprehensive cost analysis, compared with user-led learning, e-learning can save a lot of costs, sometimes even 50%. Traditional training. Due to the reduced training of trainers, travel and salary, reduced institutional infrastructure, and the possibility of expanding the curriculum through new educational technologies, researching the medical literature is just a job. Evaluate the cost-

effectiveness of e-learning and text-based learning. The authors found that printing and distributing materials is cheaper than creating and distributing e-learning content^[9]. Researches in medicine and non-metallic literature consistently show that students are very satisfied with e-learning. Improve student satisfaction through e-learning instead of traditional learning. Learn about the use and access of interactive navigation. And humanized interface design. Interestingly, students will not see e-learning as a substitute for traditional instructor-led learning. But this is in addition to this learning that is done as part of a blended learning strategy.

Availability of E-Learning Resources: Thanks to the growth of educational technologies and the Internet, the number of e-learning resources available to educators has dramatically increased. Within medical education, repositories or digital libraries have been established to manage access to e-learning materials. Although few at this time, such repositories offer a vision of expanded access to a large number of high-quality, peer-reviewed, sharable e-learning Most of the materials in this repository are free to use, although some materials have clearly defined conditions for use. In the future, these and other repositories may require a membership or other fees to cover the ongoing expenses of Web-site maintenance.

MedEdPortal, Association of American Medical Colleges (AAMC) http://www.aamc.org/mededportal	Repository All digital content types Material linked to educational competencies Peer reviewed“Virtual patients”
End of Life/Paliative Education Resource Center (EPERC) http://www.eperc.mcw.edu/	Repository Digital content in end-of-life issues Peer reviewed Links to other online resources
The Health Education Assets Library (HEAL) http://www.healthcentral.org/	Repository Large number of learning assets Growing number of learning objects Peer reviewed.
Multimedia Educatiounal Resource for Learning and Online teaching (MERLOT) http://www.merlot.org/	Repository for higher education Links to other online resources with peer-review comments Growing science and technology section
International Virtual Medical School (VIMEDS) http://www.ivimeds.org/	A consortium of medical schools Setting standards in medical education Repository for member schools
Master thesis of dr. Bernard Sklar – http://www.cmelist.com	Review of sorts of E-learning teaching materials for retrieving

Figure1. E-Learning Resources

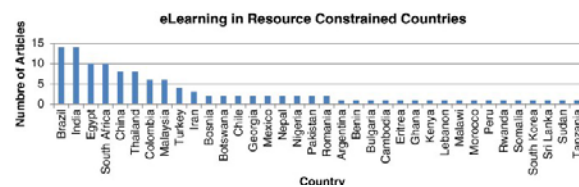


Figure 2: E-Learning in Resource Constrained Countries

Evaluating E-Learning Processes and Outcomes: The implementation of e-learning and related technologies requires significant investment in faculty, time, money and space and must be demonstrated by managers and management. As with other training materials, there are two main methods for assessing e-learning: process and

outcome. Process evaluation examines the advantages and disadvantages of an e-learning program and how results are created and generally provides information that allows others to copy. Peer review is a form of process evaluation. A traditional peer review of journal articles checks the quality of the content^[22]. Other aspects of e-learning should also be considered. For example, isn't it easy to "navigate" online content? Does education feel good? Are multimedia elements being used effectively? Is interactivity appropriate for the level of learning? Do you need specialized computer skills, hardware or software? These and other questions raise new requirements for the evaluations of experts involved in assessing online learning processes. In fact, at the request of Dean Advisory, AACM initiated an e-learning peer review process that identified these materials as evidence of teacher progress and recognized academic performance. Assessing the effects of changes in students' knowledge, skills or attitudes allows online learning developers to assess the impact of planning. The assessment framework described by Kirkpatrick^[11] in the 1950s was later applied to health education and can be used to assess e-learning interventions. Kirkpatrick Model identifies four levels of outcome-based assessment: satisfaction, learning, student behavior change, and organizational change / patient outcomes. Satisfaction measures a student's reaction: easy to use, difficult to use, interesting, boring. However, perceptual satisfaction alone is not a measure of learning. For example, great content that is difficult for practitioners to use may be poorly rated. Similarly, using multimedia is very interesting but modules that have a surface in content can also be rated as excellent. Tracking and monitoring learners' knowledge, attitudes and skills using a learning management system greatly simplifies the process of assessing the benefits of e-learning. The use of e-learning technology to assess skills and attitudes and observations from moderators provide in-depth assessment of skills and behavior^[23]. In contrast, estimating the direct outcomes of educational programs by measuring changes in student behavior, organizational change, and improved patient care is difficult, time consuming, and costly. E-learning assessments are an important part of the overall assessment of medical school courses.

E-Learning as Academic Scholarship: Literature is almost devoid of our knowledge about promoting faculty development or promoting e-learning as scholarly practice; However, as mentioned above, e-learning requires faculty capabilities that go beyond traditional teaching activities. Furthermore, by its very nature, e-learning provides a wide range of uses, accessibility, and opportunity for practitioners to share unmatched teachings. The

evaluation data from the peer review as well as the monitoring of the learning-management system tracking, and e-learning usage provide evidence of its quality and effectiveness.^[12] How will faculty members who are dedicated to this endeavor be recognized and rewarded? The following activities for faculty promotion will be considered as evidence for Scholarship:

Successful Grant Awards in E-learning:

Participate in national (and international) communities related to the development, application and application of e-learning in medical education. There are many research opportunities in the relatively new field of e-learning. Educators, administrators and the public are strongly encouraged to evaluate the impact of e-learning on the quality and effectiveness of medical education. Extrapolation methods from other clinical and academic studies, including comparative studies, are inadequate because such studies often ignore the complexity of the learning process and the possibilities of e-learning. Assessing contexts for effective use of e-learning in medical education, differentiated use of e-learning in the preclinical and clinical years, adapting e-learning to a wide range of medical specialties and clinical settings, and seeking to simplify the process of creating e-learning to gain wider acceptance and use of the Practice, which include e-learning as part of a blended learning strategy and the use of multimedia teacher design processes by medical educators.

Integrating E-Learning into Medical Education:

The integration of e-learning into existing medical curricula begins with an assessment of needs and ends with the decision to use e-learning. Although some organizations have tried to use e-learning, we believe that it is best to start with a comprehensive strategy to update or expand their curriculum, considering the benefits and burdens of mixed learning before modifying the curriculum. In undergraduate medical education, e-learning provides materials for self-teaching and collaborative learning for learners. In graduate medical education, the Accreditation Council has established six main competencies for graduate medical education, towards which e-learning can be applied. E-learning materials tailored to each of these capabilities will be integrated into the education of residents and peers, replacing lectures and other contemporary teaching methods. Asynchronous e-learning can be used effectively when demanding clinical care rotations, especially when curriculum requirements are high even though duty hours are limited. In pursuing medical education, physicians with daily clinical responsibilities can attend medical "e-meetings" using e-learning. The complexity and breadth of medical education content, along with the lack of

specialists and resources in e-learning, makes it a reasonable proposition to establish centers of excellence in e-learning. The Federal Intelligence Working Group on Information Technology Research and Development recommends setting up centers to "explore new delivery modes to educate medical practitioners and provide continuing medical education." E-learning clearly fits that description. Such centers can provide a wide range of services, including system expansion and administration, faculty and administrator training, content development assistance, learning paths and program design, marketing and support, monitoring, management, research and consulting. Internet is a US-based, collaborative, university-led project that began in 1996 to develop additional infrastructure for the Internet backbone with superhigh bandwidth capability^[14]. The fastest speed of the Internet, the complex real-time multimedia capabilities and the quality of service provide enormous potential for faculty to enhance the learning experience. Large Bandwidth Advanced immersion simulations and full-motion video use in real-time, asynchronous and contemporary teaching methods, delivered to any desktop computer.^[15] Many medical schools and healthcare companies are already producing highly-trusted e-learning materials such as virtual patient simulations that will soon be available to any educator and learner.^[16]

Directions for the Future: The advancement of e-learning and technology lays the foundation for a revolution in education, allowing learning to be personalized (positive learning), learners to better interact with each other (collaborative learning) and to be a teacher (from diffusion) facilitator^[17]. Online learning uses adaptive learning technology to assess learners' knowledge, skills and attitudes from the outset to provide the right level of learning material for every learner. In an online e-learning environment, positive learning is made possible by individualizing, tracking, monitoring and evaluating content for learners. Personalization Adaptive Learning is the ultimate learning-centered experience as it personalizes each learner's unique learning path. Or her specific learning needs and abilities^[18]. The potential of collaborative learning to overcome student loneliness is being realized in e-learning technologies. Advances in distance education today and advances in collaboration technologies such as webzines, message boards, chat rooms, email, and newsgroups are making such collaborative learning more accessible. Quantitative and qualitative studies of collaborative learning in medicine have shown changes in student satisfaction, cognitive improvement, self-awareness, understanding of concepts and practical course objectives^[19]. The emerging emphasis on medical education rather than on lifelong learning

and competency-based education has forced educators to rethink their traditional roles. In this changing example, educators will no longer act as sole distributors of content, but will make it easier for those assessing learning and ability^[20]. E-learning empowers educators to excel in this new role by providing a set of online resources to facilitate learning.

Conclusion: E-learning is evolving, whether is intended to supplement traditional face-to-face learning or be used to replace traditional learning altogether within organizations. Regardless of the purpose, it is paramount that providers' designer e-learning uses to the client and pay attention to differences in cultural learning styles and the preferences of its end users. There are many digital repositories of eLearning materials, some of which are peer-reviewed, where educators or developers can post materials for general use or import them to create new materials. The e-learning assessment should include a peer assessment process and outcomes assessment such as student satisfaction, content usage and learning effectiveness^[25]. The skills of educators in e-learning design may differ from those required for traditional learning; Teachers' salaries for research activities should take into account this difference and be proportional to the effort. Future with technological advances promises highly reliable, high-speed simulation and one-on-one learning using both positive and collaborative learning. Centers that excel in e-learning can provide national support for design, development, implementation, evaluation, collaboration and partnership with digital e-learning materials. The integration of e-learning into undergraduate, graduate and continuing medical education contributes to a shift towards adult learning in medical education, where educators are now acting not only as content distributors, but also as learning facilitators and qualification assessors.

Acknowledgments:

*The authors would like to acknowledge the support from the teacher and from the department
Dr. Mahnoor Rahman, Dr. Minahil Rahman*

References

1. Nair, Balakrishnan R., and Paul M. Finucane. "Reforming medical education to enhance the management of chronic disease." *Medical Journal of Australia* 179.5 (2013): 257-259.
2. Liu, Regina, Anju Relan, and Jason Napolitano. "The Efficiency of Online "Inked" Videos Versus Recorded PowerPoint Lectures on Teaching

- Pathophysiology to Medical Students in Pre-Clerkship Years: A Pilot Study." *Journal of Medical Education and Curricular Development* 7 (2020): 2382120519897031.
3. Leung WC. Competency based medical training: review. *BMJ*. 2002;325:693–96.
 4. Rosenberg M. *E-Learning: Strategies for Delivering Knowledge in the Digital Age*. New York: McGraw-Hill, 2001.
 5. Potdar, Pallavi A., et al. "E-Learning in Undergraduate Medical Education: An Overview." *International Journal of Contemporary Pathology* 1.2 (2015): 1-4.
 6. Moberg TF, Whitcomb ME. Educational technology to facilitate medical students' learning: background paper 2 of the medical school objectives project. *Acad Med*. 2016;74:1146–50.
 7. Ward JP, Gordon J, Field MJ, Lehmann HP. Communication and information technology in medical education. *Lancet*. 2011;357:792–96.
 8. Masie E. Blended learning: the magic is in the mix. In: Rossett A (ed). *The ASTD E-Learning Handbook*. New York: McGraw-Hill, 2012:58–63.
 9. Ogden, K. E. (2019). *Perspectives on Business and Medical Knowledge in Healthcare Leadership Roles* (Doctoral dissertation, Northcentral University).
 10. Al-Gayar, Sarmad Monadel Sabree, and Mohammed Safaa Mohamed Shubber. "A Quantitative Research for Determining the Medical User's Interest and Interact with E-Learning in the Medical Social Media System Targeted for the Iraqi Environment." *eLearning & Software for Education* 1 (2019).
 11. Gibbons A, Fairweather P. Computer-based instruction. In: Tobias S, Fletcher J (eds). *Training & Retraining: A Handbook for Business, Industry, Government, and the Military*. New York: Macmillan Reference USA, 2000:410–42.
 12. Clark D. Psychological myths in e-learning. *Med Teach*. 2002;24:598–604.
 13. Smith R. Guidelines for Authors of Learning Objects, Accessed 22 November 2015. The New Media Consortium, Austin, TX, 2004.
 14. Littlejohn A. Issues in reusing online resources. In: Littlejohn A (ed). *Reusing Online Resources: A Sustainable Approach to eLearning*. London: Creative Print and Design, 2013:1–6.
 15. Johnson CE, Hurtubise LC, Castrop J, et al. Learning management systems: technology to measure the medical knowledge competency of the ACGME. *Med Educ*. 2014;38:599–608.
 16. Phelps C, Michea YF. Learning management systems' evaluation focuses on technology not learning. *AMIA Annu Symp Proc*. 2003:969.
 17. Fallon C, Brown S. *E-learning Standards: A Guide to Purchasing and Deploying Standards-Conformant E-learning*. Boca Raton: St Lucie Press, 2003.
 18. The MedBiquitous Consortium: Enabling Collaboration for Healthcare Education Accessed 22 February 2015. MedBiquitous, Baltimore, MD 2005.
 19. Bernard R, Abrami PL, Lou Y, Borokhovski E. How does distance education compare with classroom instruction? a meta-analysis of the empirical literature. *Rev Educ Res*. 2014;74:379–439.
 20. Letterie GS. Medical education as a science: the quality of evidence for computer-assisted instruction. *Am J Obstet Gynecol*. 2013;188:849–53.
 21. Piemme TE. Computer-assisted learning and evaluation in medicine. *JAMA*. 2018;260:367–72.
 22. Chumley-Jones HS, Dobbie A, Alford CL. Web-based learning: sound educational method or hype? A review of the evaluation literature. *Acad Med*. 2012;77 (10 suppl):S86-S93.
 23. Accessed 22 November 2005. Association of American Medical Colleges, Washington, DC, 2005.
 24. Hashemikamangar, Sedighe Sadat, et al. "Efficacy of E-learning via the website of Tehran University of Medical Sciences for diagnosing tooth discolorations and treatment planning by senior dental students." *Acta Medica Iranica* (2016): 536-541.
 25. Kadam, Sunil S., Pinaki Wani, and Swapnil Akhade. "E-learning for medical education in India: a review." *Journal of Forensic Medicine Science and Law* 24.1 (2015): 1-6.