Society of Medical Education & Research

2023, Volume 3, Page No: 30-36
ISSN: 3108-4850

Annals of Pharmacy Education, Safety, and Public Health Advocacy

Exploring the Impact of Integrated Education on Medical Sciences: A Comprehensive Review

Marcela Silva-Hormazábal[1*], Ángel Alsina[2]

[1]Department of Pedagogical Specialties, Austral University of Chile, Puerto Montt 5400000, Chile.
[2]Department of Subject-Specífic Didactics, University of Girona, 17004 Girona, Spain.

***E-mail** ✉ marcela.silva@uach.cl

Abstract

Integrated education refers to the combination of traditional face-to-face education with e-learning, in which information and communication technologies are used to enhance the learning experience. Over the past decade, this approach has gained widespread recognition and success in the educational community. Many universities, especially those specializing in medical sciences, have adopted this approach. This article reviews and introduces various integrated education strategies in medical science institutions. It is a case study, with data collected from both print and electronic sources related to the topic. Integrated education in medical sciences includes effective teaching methods for university students, ongoing professional development for healthcare workers, and patient education to expedite treatment processes. One of the key aspects of integrated education is enhancing the knowledge of patients and the general public. With the increasing availability of electronic information, it is easier and more cost-effective to provide education through digital tools, which is especially beneficial in developing countries, where traditional classroom settings can be difficult and expensive to implement.

Keywords: Education, E-learning, Integrated education, Medical sciences

Introduction

Nearly two decades have passed since the introduction of electronic education (E-learning), or computer-based education, particularly in universities. Initially driven by the power of computer tools, the rise of the global Internet network made it possible to transmit a variety of information online. As a result, virtual e-learning classes were developed to fully simulate the educational process, and the first virtual universities were established to offer online and distance learning services. Over the past decade, the idea of replacing traditional face-to-face education with virtual methods began to gain traction, leading to initial attempts to implement this approach. However, the outcomes of these early experiences were not particularly positive. For example, statistics reveal that 70% of virtual education institutions in the United States failed, and the English virtual university, despite its high costs, failed to gain significant student support. Furthermore, the reluctance of universities to adopt changes in the educational system further highlights the challenges of transitioning to virtual learning [1-3].

Despite these setbacks, electronic education has achieved some of its intended goals, such as lesson reproducibility, cost-effectiveness, and accessibility from anywhere at any time. However, improving the overall quality of education remained an area of difficulty [4]. In response to the shortcomings of initial e-learning experiences and recognition of the strengths of digital tools, universities have increasingly embraced an integrated approach to education. This model combines electronic learning with face-to-face instruction, aiming to harness the advantages of both methods to create a higher-quality learning

Access this article online https://smerpub.com/

Received: 25 January 2023; **Accepted:** 19 April 2023

How to cite this article: Silva-Hormazábal M, Alsina Á. Exploring the Impact of Integrated Education on Medical Sciences: A Comprehensive Review. Ann Pharm Educ Saf Public Health Advocacy. 2023;3:30-6. https://doi.org/10.51847/h9MdCIGsUf

experience [5-7]. Today, this integrated education system is preferred over exclusive reliance on either fully digital or traditional classroom-based teaching and has enjoyed considerable success in its recent implementations.

This strategy has been adopted by numerous university virtual education programs, and integrated education has gained particular traction in medical sciences education [8-11]. The rapid growth of information in the medical field has posed significant challenges for healthcare professionals. Integrated education has proven to be highly beneficial in supporting the continuous education of medical professionals. Moreover, in the realm of medical sciences, integrated learning is not only addressing educational needs but is also playing a key role in advancing research, information production, and patient care [12-16].

In this study, we begin by introducing the combination of electronic and face-to-face training, highlighting its broad advantages. We then delve into the specific resources that the integrated education model offers to the field of medical sciences, emphasizing that these resources are not only available to healthcare providers, such as doctors and nurses but also to patients and the general public. The study concludes with a comprehensive overview of the research findings.

Results and Discussion

Definition of integrated education

Integrated education is an instructional model that enhances the quality of learning by blending traditional face-to-face instruction with the use of information and communication technologies (ICT). This model encompasses various approaches, including web-based learning, computer-based training, virtual classrooms, and collaborative online platforms. The goal of integrated education is to meet educational objectives electronically, without sacrificing the quality of the learning experience.

To further clarify, we outline the primary goals of e-learning [17-21]: enabling learning at any time and from any location, reducing the cost of education, reaching a larger audience, making educational materials easily repeatable, facilitating quicker communication between students and instructors, speeding up the learning process, promoting student-centered learning, and incorporating multimedia tools to enhance education.

While these goals are beneficial, they often do not emphasize the importance of quality. In contrast, the integrated education approach prioritizes ensuring high-quality learning. This method offers structured models for creating educational plans that can deliver effective learning experiences while incorporating ICT. These models help guide educators in designing programs that meet high-quality standards. In this sense, integrated education serves as a strategic approach to planning education, with e-learning being a tool that supports the learning process.

Advantages of integrated education in medical sciences

Integrated education in medical sciences brings several benefits to a wide array of individuals, including students, faculty members, creators of medical educational content, administrators of medical education programs, healthcare workers, patients, and the general public [17, 22, 23].

Educating university students

The integration of information and communication technologies (ICT) in course delivery can lead to more effective learning outcomes. For instance, a study found that 94% of students who participated in online courses reported learning more compared to traditional classroom-based sessions [24].

Training healthcare professionals

Due to the fast-paced developments in medical science, the continuous training of healthcare professionals via electronic platforms allows them to stay updated on the latest knowledge and skills, offering flexibility in terms of time and location.

Educating patients

Patient education through electronic platforms empowers patients to take an active role in their treatment process. It is essential to incorporate patient education in the medical field to enhance patient outcomes and understanding of their conditions.

Public health education

Education on healthy living should extend beyond patients to the general public. By utilizing ICT, health education can be widely disseminated, preventing many illnesses and encouraging healthier lifestyles.

Current practices of integrated education in medical science universities

Below are examples of integrated educational methods employed in medical universities.

Delivering theoretical and laboratory courses

One approach to integrated education involves delivering theoretical courses online. In certain instances, ICT is used as an additional teaching tool. For example, a study conducted in Japan found that the use of a CD to teach elderly oral health to medical and dental students led to a significant improvement in participants' knowledge and practical skills [25].

In a study focusing on abdominal physical examination, it was discovered that this method greatly assisted students who faced difficulties in their learning [26]. In Iran, e-learning systems in medical universities have been operational since 2002, primarily serving as supplementary educational tools. For example, at the Tehran University of Medical Sciences, a blend of electronic and face-to-face instruction was implemented in 22 core and specialized nursing and midwifery courses. The feedback collected from both students and instructors revealed a clear preference for this hybrid model over traditional teaching methods, with students showing improved average scores and higher engagement compared to the conventional in-person approach [27].

Shahid Beheshti University in Tehran adopted a similar hybrid model to deliver physiology and medical education courses at the graduate level [28]. At Isfahan University of Medical Sciences, a multimedia presentation was incorporated into seminars to teach medical students about lung sounds after their initial training. The result was a marked reduction in errors among the students using the multimedia method compared to those in the control group [29]. Furthermore, preclinical medical students at Isfahan University also received physical examination training through Schwartz's method, delivered via CD alongside traditional face-to-face classes, which led to improvements in their academic performance [30].

Additionally, Isfahan University introduced an integrated approach to teaching both practical and theoretical histology courses. In this setup, a high-performance central computer connected to a microscope through specialized imaging software allowed the professor to display microscope slide images on a monitor with various magnifications and high resolution. Each student had their monitor connected to the main system, which was also linked to a comprehensive database of microscopic images from the pathology department. This arrangement allowed the instructor to pull images from the database or the microscope, displaying them on both the professor's and students' monitors, significantly enhancing the histology learning experience [31].

In other countries, with the rapid advancement of technology, the role of information and communication technologies (ICT) in education has expanded beyond just being a supplementary tool, becoming an integral part of the education process itself. For instance, at Harvard University's radiology department, the radiological anatomy course has transitioned from traditional face-to-face instruction to a more student-centered, web-based approach. In this model, students engage with educational content online, while case studies are incorporated into the curriculum, and in-person review sessions are held bi-weekly [32]. Similarly, the Faculty of Health in the UK, known as Europe's largest e-learning provider, utilizes web-based software to deliver training to its surgical staff in a virtual learning environment [33]. In Brazil, fifth-year dentistry students receive oral health education through online platforms. A study assessing the effectiveness of this e-learning approach revealed that students who had access to both electronic materials and expert supervision (group three) showed the greatest improvement in knowledge and oral health counseling skills [34]. Johns Hopkins University also offers a wide range of fully online medical education courses for its students [35].

Electronic education's benefits are also evident in laboratory courses. For instance, Stanford University has placed biophysics laboratory images on the web, allowing students to access a virtual lab environment where they can view images and read descriptions of various devices [17].

Simulation programs represent another key element of integrated education. These programs significantly reduce costs while enhancing learning. At the University of Buffalo, for example, a simulated corpse is used in place of a real one for teaching purposes. The University of Pennsylvania employs simulation software to teach the process of collecting cerebrospinal fluid, where students observe tissue pressure and resistance when a device is applied and track their progress with immediate feedback from the program. Additionally, simulation software is used to teach abdominal cholecystectomy, calculating and displaying the tissue reactions during surgery [17]. At Columbia University, a medical case simulator has been developed for training health professionals, including medical and nursing students. The simulator, known as Electronic Medical Record (EMR) software, records patient information and creates virtual training

scenarios. Students and professionals can input patient data and new cases, using the system in real-world clinical settings. A web version of this software has also been introduced for use in universities [36, 37].

These systems have been recently developed and are now being implemented, with countries striving to enhance and optimize the efficiency of information recording systems [38]. One such example of a medical case simulator is the Second Life software, a 3D virtual learning environment that replicates real-world settings. At the University of London, for instance, a virtual hospital has been created in Second Life where students can interact with virtual patients, request X-rays, make diagnoses, and consult with colleagues. The virtual hospital includes various departments such as operating and surgery rooms, as well as patient rest areas. In the operating room, students are guided through the necessary steps for surgery preparation, such as dressing, wearing masks, and disinfecting. Additionally, they can explore the equipment in the room and read detailed explanations of each item. Other hospital sections are similarly replicated to provide a comprehensive learning experience [39, 40].

The UNC School of Pharmacy uses a similar virtual environment where pharmacy students can practice with simulated pharmaceutical devices and tools. These tools, which may be too costly for real-life use, are virtually modeled to help students learn their proper usage before working with actual equipment [39, 40]. Another notable example is patient simulation programs in medical schools across the US and Canada. These programs compile patient data from various medical institutions, allowing students to interact with the information and learn in a shared environment, which also promotes collaboration and knowledge exchange among healthcare professionals [41].

Training doctors and facilitating information sharing

Integrated education also plays a significant role in the continuous training of medical professionals. For instance, a study investigated the impact of web conferencing on the knowledge enhancement of family doctors over three years. In this study, doctors participated in weekly online conferences to share information and discuss the effectiveness of these sessions. Initially, the doctors preferred face-to-face communication, but they gradually grew more accustomed to online conferencing, realizing its benefits in terms of speed, cost-efficiency, and the ability to connect across distances. This led to an increased frequency of online conferences, facilitating greater information exchange and knowledge sharing among doctors [42-45].

Providing educational programs for the general public

In recent years, electronic education has significantly contributed to raising public awareness about health issues [46]. The use of digital tools and the development of knowledge-based databases enhance opportunities for people to access health education, particularly in developing nations [47]. For example, the Global Health E-learning Center has made public health education programs available online to improve community health literacy [47]. Similarly, a distance education initiative focused on preventing alcohol abuse has been developed. This program uses a web-based platform that incorporates 3D graphics, interactive games, and virtual conference rooms, providing crucial information about alcoholism and its associated risks, particularly targeting young people [48].

Conclusion

Studies from various medical universities highlight the growing recognition of integrated education programs in the field of medical sciences worldwide. At some universities, both fundamental theoretical and practical courses are taught using a combination of in-person and electronic methods. Research indicates that incorporating information and communication technologies (ICT) alongside traditional face-to-face classes significantly enhances students' learning outcomes. Additionally, simulated programs are being utilized in certain universities, offering a cost-effective and efficient method of teaching. These programs are favored by many educational planners due to their ability to reduce costs while accelerating the learning process.

Furthermore, integrated education is also being applied in the training of medical staff, particularly through virtual interactive platforms that facilitate faster and more effective communication among health professionals. This method greatly supports the exchange and updating of information. Additionally, virtual learning environments allow healthcare professionals to enhance their knowledge and skills according to modern scientific advancements, accessible from anywhere and at any time. Another critical aspect of integrated education is the provision of health education to patients

and the general public. While access to electronic information is increasingly available, organizing in-person classes for large groups remains difficult and expensive. Hence, digital methods and the creation of knowledge-based resources offer significant opportunities for health education, particularly in resource-limited settings.

Acknowledgments: None

Conflict of Interest: None

Financial Support: None

Ethics Statement: None

References

1. Moore MG, Kearsley G. Distance education: a systems view of online learning. Cengage Learning; 2011.
2. Alshammari ST, Turkistani HA, Almatar YI, Alhuraish AM, Hefni ST, Bagabir RA, et al. An overview on endodontic irrigation solution role in management. Int J Pharm Res Allied Sci. 2022;11(1):17-20.
3. Salbieva NG, Cheldieva AA, Plieva EG, Yusupova LA, Dunets DA, Shakhbieva RA. Evaluation of the treatment of pregnant women with COVID-19 using the drug baricitinib. J Biochem Technol. 2022;13(3):71-5.
4. Soboleva MS. The frequency and efficiency of the application of online sources for searching drug information and self-treatment. Pharmacophore. 2022;13(6):90-6.
5. Littlejohn A, Pegler C. Preparing for blended e-learning: Routledge; 2007.
6. Vinh NQ. The influence of personal resources on job engagement of employees in tourism companies. J Organ Behav Res. 2023;8(1):231-43
7. Parmar K, Desai A. Preparation and optimization of quick/slow-release bilayered tablets of prazosin HCL using doe and PCA. Pharmacophore. 2022;13(2):80-7.
8. Ruiz JG, Mintzer MJ, Leipzig RM. The impact of e-learning in medical education. Acad Med. 2006;81(3):207-12.
9. Mohanna K. The use of elearning in medical education. Postgrad Med J. 2007;83(978):211.
10. Choules AP. The use of elearning in medical education: a review of the current situation. Postgrad Med J. 2007;83(978):212-6.
11. Bhardwaj M, Kapila R, Neha A, Jain R, Mittal P, Suri M. Awareness, perceived risk, and protective behavior towards Covid-19 among undergraduate students of Delhi and NCR, India. Int J Pharm Res Allied Sci. 2022;11(3):71-80.
12. Duplaga M, Zieliński K, Ingram D, eds. Transformation of healthcare with Information Technologies. Ios Press; 2004:308-16.
13. Lau F, Bates J. A review of e-learning practices for undergraduate medical education. J Med Syst. 2004;28(1):71-87.
14. Childs S, Blenkinsopp E, Hall A, Walton G. Effective e-learning for health professionals and students, barriers and their solutions. A systematic review of the literature, findings from the HeXL project. Health Inf Libr J. 2005;22(2):20-32.
15. Vorobyeva NV. Physiological properties of platelets in Dutch calves during the dairy phase. J Biochem Technol. 2022;13(2):7-12.
16. Kamal Zoubi M, Mohammad ISSA M, Alqamaz S, Lababneh H, Yousef Kassawneh F, Atef Jaradat H. The impact of the Covid-19 pandemic on interior design students' performance in Jordanian Universities. Örgütsel Davranı ş Araştırmaları Dergisi, J Organ Behav Res. 2023;8(1):25-38.
17. Dargahi H, GhaziSaidi M, Ghasemi M. The role of e-learning in medical sciences universities. Payavard Salamat. 2008;2(1):20-9.
18. Sun PC, Tsai RJ, Finger G, Chen YY, Yeh D. What drives a successful e-learning? An empirical investigation of the critical factors influencing learner satisfaction. Comput Educ. 2008;50(4):1183-202.
19. Alavi S. Rapid e-learning in medical education. Educ Strategies J. 2009;2(1):13-24.
20. Ghamri KA. Coronavirus disease 2019 (COVID-19) and pregnancy: a review of the current knowledge. Int J Pharm Res Allied Sci. 2022;11(2):92-9.
21. Abd Allah HM, Abdo E, Elamin Abd Elkareem Elamin S, Abdelghani LB. Molecular screening for transfusion transmissible P. falciparum in asymptomatic blood donors in the non-endemic region. J Biochem Technol. 2021;12(1):6-10.
22. Della Corte F, La Mura F, Petrino R. E-learning as educational tool in emergency and disaster medicine teaching. Minerva Anestesiol. 2005;71(5):181-95.

23. Alaghemandan H, Ferdosi M, Savabi O, Yarmohammadian MH. Proposing a framework for accreditation of dental clinics in Iran. J Organ Behav Res. 2022;7(2):161-70.
24. Fredericksen E, Pickett A, Shea P, Pelz W, Swan K. Student satisfaction and perceived learning with on-line courses: principles and examples from the SUNY learning network. J Async Learn Net. 2000;4(2):41-7.
25. Qayumi A, Kurihara Y, Imai M, Pachev G, Seo H, Hoshino Y, et al. Comparison of computer-assisted instruction (CAI) versus traditional textbook methods for training in abdominal examination (Japanese experience). Med Educ. 2004;38(10):1080-8.
26. Sestini P, Renzoni E, Rossi M, Beltrami V, Vagliasindi M. Multimedia presentation of lung sounds as a learning aid for medical students. Eur Respir J. 1995;8(5):783-8.
27. Zolfaghari M, Negarandeh R, Ahmadi F. The evaluation of a blended e-learning program for nursing and midwifery students in Tehran university of medical sciences. Iran J Med Educ. 2011;10(4):398-409.
28. Emami H, Aghdasi M, Asoushe A. Electronic learning in medical education. Pejouhesh. 2009;33(2):102-11.
29. Bahadorani M, Yousefy A, Changiz T. The effectiveness of three methods of teaching medline to medical students: online, face to face and combined educational methods. Iran J Med Educ. 2006;6(2):35-43.
30. Vafamehr V. Comparing the effectiveness of two educational approaches of electronic learning and training in small groups and training only in small groups in teaching physical examination. Iran J Med Educ. 2010;10(1):11-8.
31. Rashidi B, Avizhgan M. Design, implementation and evaluation of electronic teaching of practical and theoretical histology courses: a new experience at Isfahan university of medical science. Iran J Med Educ. 2012;11(9):1214-22.
32. Shaffer K, Small J. Blended learning in medical education: use of an integrated approach with web-based small group modules and didactic instruction for teaching radiologic anatomy. Acad Radiol. 2004;11(9):1059-70.
33. Larvin M. E-Learning in surgical education and training. ANZ J Surg. 2009;79(3):133-7.
34. Sousa Eskenazi E, Arruda Martins M, Ferreira M. Oral health promotion through an online training program for medical students. J Dent Educ. 2011;75(5):672-8.
35. Zandi S, Abedi D, Changiz T, Yousefi A, Yamani N, Kabiri P. Electronic learning as a new educational technology and its integration in medical education curricula. Iran J Med Educ. 2004;4(1):61-70.
36. Joe RS, Otto A, Borycki E. Designing an electronic medical case simulator for health professional education. Knowl Manag E-Learn. 2011;3(1):60-73.
37. Borycki E, Joe RS, Armstrong B, Bellwood P, Campbell R. Educating health professionals about the electronic health record (HER): removing the barriers to adoption. Knowl Manag E-Learn. 2011;3(1):51-62.
38. Watanabe K, Okada M, Yamamoto K. EPR (Electronic patient record) laboratory, simulated environment to learn about a hospital EPR system. Knowl Manag E-Learn. 2011;3(1):35-50.
39. Lee A, Berge ZL. Second life in healthcare education: virtual environment's potential to improve patient safety. Knowl Manag E-Learn. 2011;3(1):17-23.
40. Danforth D, Procter M, Heller R, Chen R, Johnson M. Development of virtual patient simulations for medical education. J Virtual Worlds Res. 2009;2(2):1-11.
41. Huang G, Reynolds R, Candler C. Virtual patient simulation at US and Canadian medical schools. Acad Med. 2007;82(5):446-51.
42. MacDonald CJ, Archibald D, Puddester D, Whiting S. Managing disruptive physician behavior: first steps for designing an effective online resource. Knowl Manag E-Learn. 2011;3(1):98-115.
43. Cook DA, Levinson AJ, Garside S, Dupras DM, Erwin PJ, Montori VM. Internet-based learning in the health professions. JAMA. 2008;300(10):1181-96.
44. Househ MS, Kushniruk AW, Maclure M, Carleton B, Cloutier-Fisher D. Virtual knowledge production within a physician educational outreach program. Knowl Manag E-Learn. 2011;3(1):24-34.
45. Johnson CM, Corazzini KN, Shaw R. Assessing the feasibility of using virtual environments in distance education. Knowl Manag E-Learn. 2011;3(1):5-16.
46. Frenk J. The global health system: strengthening national health systems as the next step for global progress. PLOS Med. 2010;7(1):1-3.

47. Mwaikambo L, Avila M, Mazursky S, Nallathambi K. Utilizing eLearning to strengthen the capacity of global health practitioners and institutions around the world. Knowl Manag E-Learn. 2012;4(3):293-309.
48. Pereira CA, Wen CL. An interactive distance education model based on motivation for alcohol abuse prevention. J Telemed Telecare. 2009;15(3):160-70.