

Review

A systematic review on the potential of hybrid learning in higher education for healthcare workers in resource-constrained countries

Revisão sistemática sobre o potencial da aprendizagem híbrida no ensino superior para profissionais de saúde em países com recursos limitados

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Abstract: Technological advancement has increased access to education worldwide. However, most resource-constrained countries have faced challenges in adopting e-learning in health-related disciplines because they lack knowledge on how to apply it in their settings. The review evaluated the implementation and outcomes of blended learning in healthcare education across undergraduate and postgraduate levels. *PubMed Central*, *Google Scholar*, and *Scopus* databases were used to search literature by *PRISMA*, and thematic analysis was conducted. The systematic review identified 9,689 citations, with 104 articles initially deemed potentially eligible. Following full-text screening, 29 publications were reviewed, including 15 reviews and 14 studies. The studies spanned various healthcare disciplines, predominantly focusing on nursing and medicine undergraduate programs. However, most implementations were subject-specific rather than encompassing entire curricula. The review highlights significant geographical disparities, with most studies originating from high-income countries. The community of inquiry guided effective blended learning strategies, enhancing interaction, critical thinking, and instruction. Digital tools like *Moodle*, *Blackboard*, telehealth, and gamification were integral to the implementation process. Blended learning demonstrated effectiveness in improving knowledge, problem-solving abilities, and student satisfaction, offering flexibility and increased access compared to traditional methods. Despite technological, social, and organizational challenges, blended learning bridges the gap between face-to-face and online learning, presenting opportunities for enhanced educational strategies and reaching geographically dispersed students. Further research is needed to optimize blended learning implementation and address existing challenges, particularly in resource-constrained settings.

Keywords: Blended learning; Hybrid learning; Higher education; Healthcare professionals.

Resumo: O avanço tecnológico aumentou o acesso à educação a nível mundial. No entanto, a maioria dos países com recursos limitados tem enfrentado desafios na adopção do ensino electrónico em disciplinas relacionadas com a saúde, devido à falta de conhecimento sobre a sua aplicação nos respectivos contextos. Esta revisão avaliou a

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implementação e os resultados da aprendizagem híbrida no ensino das ciências da saúde, abrangendo os níveis de licenciatura e pós-graduação. Foram utilizadas as bases de dados *PubMed Central*, *Google Scholar* e *Scopus* para a pesquisa bibliográfica, de acordo com as diretrizes *PRISMA*, tendo sido realizada uma análise temática. A revisão sistemática identificou 9 689 citações, das quais 104 artigos foram inicialmente considerados potencialmente elegíveis. Após a triagem integral dos textos, foram analisadas 29 publicações, incluindo 15 revisões e 14 estudos. Os estudos abrangeram várias disciplinas da área da saúde, com destaque para os cursos de licenciatura em enfermagem e medicina. Contudo, a maioria das implementações incidiu sobre disciplinas específicas, em vez de abrangerem currículos completos. A revisão evidencia disparidades geográficas significativas, com a maioria dos estudos a ter origem em países de elevado rendimento. A comunidade de investigação orientou estratégias eficazes de ensino híbrido, promovendo a interação, o pensamento crítico e a instrução. Ferramentas digitais como *Moodle*, *Blackboard*, telessaúde e gamificação foram essenciais para o processo de implementação. A aprendizagem híbrida demonstrou eficácia na melhoria do conhecimento, das capacidades de resolução de problemas e da satisfação dos estudantes, proporcionando maior flexibilidade e acesso alargado em comparação com os métodos tradicionais. Apesar dos desafios tecnológicos, sociais e organizacionais, a aprendizagem híbrida reduz a lacuna entre o ensino presencial e o ensino à distância, apresentando oportunidades para estratégias pedagógicas mais avançadas e para alcançar estudantes geograficamente dispersos. São necessárias mais investigações para otimizar a implementação da aprendizagem híbrida e superar os desafios existentes, particularmente em contextos com recursos limitados.

Palavras-chave: Aprendizagem híbrida; Ensino híbrido; Ensino superior; Profissionais de saúde.

1. Introduction

The severe shortage of experienced and competent health professionals threatens to cripple the achievement of universal health coverage. WHO estimates a 10 million health workers shortfall by 2030, mostly in low- and middle-income countries. Without an accessible and competent health workforce, quality health care is compromised. Additionally, the shortage of health workers threatens health systems' response to disasters caused by natural disasters as well as related environmental, technological, and biological hazards and risks (WHO, 2024). Sustainable Development Goal 3c implores nations to substantially increase health financing and the health workforce's recruitment, development, training, and retention. However, efforts to scale up the education of health professionals must explore emerging teaching strategies while not compromising education standards. Evans *et al.* (2016) note that health professional training is primarily clinical and curricular and not aligned to the health needs of the health system. This is worrying as globally, there have been changes in disease patterns that have threatened face-to-face education. Thus, a paradigm shift in the health workforce education system is called for. In this vein, Kang and Kim (2021) recommend learner-centered education and active learner participation methods to address the limitations of traditional lecture methods.

During the recent COVID-19 pandemic, conventional ways of learning and assessment based on clinical examination were impossible in the face of global lockdowns. Online assessment, though, could be used in the evaluation of knowledge through multiple choice questions, assessment of skills using online objective structured clinical examination or virtual patients, and evaluation of competency and performance by using e-logbooks and e-portfolios (Mahajan *et al.*, 2021) but are not enough for experiential learning

as it has to be derived from direct interaction with patients. Raising concerns for students' clinical competence development.

Blended learning has become an alternative method in higher education, including medical education, as it combines online and face-to-face learning methods. Mastellos *et al.* (2018) state that previous systemic reviews have reported that blended learning demonstrated better effects on knowledge outcomes when compared with traditional face-to-face in healthcare education. Nevertheless, these studies were limited to general health education, and few looked at the effectiveness of blended learning in health-related disciplines at undergraduate and postgraduate levels. Therefore, this study aims to assess the implementation and outcomes of blended learning with undergraduate and postgraduate healthcare students.

2. Material and method

The study consisted of a systematic review based on the search terms 'blended learning' OR 'hybrid learning' AND 'higher education' AND 'healthcare professionals'. Verted commas Boolean operators AND and OR were used as truncation symbols for searching and were to create practical search strings respectively. Efforts were made to minimize bias by selecting studies from multiple databases (*PubMed*, *Scopus*, *Google Scholar*). Additionally, potential conflicts of interest of the study authors were considered when interpreting the findings. Limitations were applied to continued professional development workshops due to the volume of potentially relevant hits. Reference list scrutiny and searching of key journal articles were also undertaken. All studies were assessed by initial scanning of the title followed by viewing the abstract and, lastly, full-text viewing to determine the inclusion and exclusion criteria. The inclusion criteria incorporated publications between 2014 and 2024, conducted among health professional learners, and were randomized control trials or non-randomized studies. Exclusion criteria incorporated content unrelated to the topic, lack of original data, addressed pure e-learning instead of blended learning, and content not written in English. Conference papers and books were not reviewed.

3. Results and discussion

The review assessed the implementation and outcomes of blended learning in healthcare education, focusing on undergraduate and postgraduate levels. The search strategy identified 9689 citations with 10 duplicates removed. After scanning titles and abstracts, 104 articles were deemed potentially eligible, and 29 publications were ultimately reviewed.

3.1. Study selection and characteristics

Of the 29 publications, 15 were reviews, and 14 were studies. The studies reviewed are distributed as follows:

- Nursing undergraduate degree: 6 studies;
- Medical undergraduate degree: 3 studies;
- Other disciplines – 1 study each for Pharmacy undergraduate degree, Occupational Therapy degree, Master in Public Health in Public Health, Professional Master in Health Informatics, Master in Health Informatics, and PhD in Physical Therapy.

The findings support Leinster *et al.* (2021), who assert that blended learning applies to undergraduate and postgraduate degrees. However, most implementations were limited to individual subjects rather than the entire curriculum. For example, Galway *et al.* (2014) applied blended learning to specific modules like Anatomy, Histology, and Physiology for medical students, while Gil-Mateu *et al.* (2023) focused on Geriatric, Critical Care, Psychiatry, and Mental Health for nursing students.

3.2. Geographical distribution

Most studies were from high-income countries, with a notable absence of studies from low-income countries. The Table below summarizes the distribution of studies by government and discipline.

Table 1. Distribution of studies by country and discipline.

No	Country	Discipline	Reference
1	Saudi Arabia	Nursing undergraduate students	Al-Osaimi and Fawaz (2022)
2	Spain	Medical undergraduate students	Atwa <i>et al.</i> (2022)
3	Turkey	Nursing undergraduate students	Ayhan and Seki Oz (2021)
4	India	Pharmacy undergraduate students	Balakrishnan <i>et al.</i> (2021)
5	Kazakhstan	Medical undergraduate students	Bolatov <i>et al.</i> (2022)
6	United States	PhD in Physical Therapy	Denton (2020)
7	Canada	Master in Public Health	Galway <i>et al.</i> (2014)
8	Spain	Nursing undergraduate students	Gil-Mateu <i>et al.</i> (2023)
9	Argentina	Professional Masters in Health Informatics	Bordoni <i>et al.</i> (2019)
10	Spain	Medical undergraduate students	Iguacel <i>et al.</i> (2022)
11	South Korea	Nursing undergraduate students	Kang and Kim (2021)
12	United Kingdom	Master's degree in Oncoplastic Surgery	Leinster <i>et al.</i> (2021)
13	United Kingdom	Nursing undergraduate students	McCutcheon <i>et al.</i> (2018)
14	Spain	Nursing and Occupational Therapy undergraduate students	Sáiz-Manzanares <i>et al.</i> (2021)

Hege *et al.* (2020) define hybrid or blended learning as a meaningful combination of online and face-to-face teaching and learning. Vallee *et al.* (2020) add that blended learning combines traditional face-to-face and asynchronous or synchronous e-learning. Leinster *et al.* (2021) posit that blended learning draws on the advantages of each approach while mitigating their shortfalls. This is fundamental in clinical education, where hands-on contact with actual patients is essential in developing clinical skills (Leinster *et al.*, 2021). The same authors affirm that blended learning is effective in healthcare as it can be applied at undergraduate, postgraduate, and continuing professional development stages of training ranging from short target and specific skills modules to full-length degree courses. Similarly, Mahajan *et al.* (2021) reiterate that online assessment alone cannot be conducted for the entire undergraduate medical course but should be blended with learning since experiential learning is achieved through patient contact. Galway *et al.* (2014) view the flipped classroom instructional model or inverted classroom as a type of blended learning where in-class learning is integrated with an online learning experience. In this review, blended learning and hybrid learning will be used interchangeably.

Few studies have explored how the learning scenario should be designed; instead, discussions mainly focus on the proportion and interaction of online and face-to-face teaching activities (Hege *et al.*, 2020). However, Leinster *et al.* (2021) assert that blended learning can be adapted for short courses, skills-specific modules, and complete curriculums for degree courses.

3.3. Conceptual frameworks used in blended learning

Although educational literature identifies many theoretical models underpinning blended learning in higher education, limited studies identified theoretical models or frameworks adapted for their studies. Bloom's taxonomy theoretical framework has been used to direct blended learning among nursing and occupational health undergraduate

students in Burgosa (Sáiz-Manzanares *et al.*, 2021). This has been attributed to its ability to address cognitive, affective, and psychomotor domains in all levels of learning the sciences and art of healthcare disciplines. Literature also revealed that educators designed hybrid learning activities aligned with different Bloom's Taxonomy levels. For example, Kang and Kim (2021) observed that learners perform low-level cognitive tasks outside the class and high-level cognitive tasks such as knowledge application, problem analysis, and solving with colleagues in class.

Sáiz-Manzanares *et al.* (2021) use the Community of Inquiry framework to effectively foster interaction, critical thinking, and practical instruction. To maximize the framework's usefulness, learning strategies that have been used in literature include multimedia tools such as videos, simulations, and interactive case studies, leveraging virtual reality to create realistic clinical settings, combining in-person laboratory sessions with online theoretical modules, using reflective journals blogs and discussion forums to reflect on learning experience and clinical practice.

3.4. Implementation strategies

The review highlighted various digital tools and platforms that enhance blended learning, such as *Moodle* and *Blackboard*, such as centralized content, assignments, assessments, discussions, collaborations, and communication. Telehealth and gamification are emerging trends, with Sáiz-Manzanares *et al.* (2021) effectively utilizing game-based learning nursing and occupational therapy degrees.

Institutions have to create a conducive blended learning environment for effective learning processes to take place. Al-Osaimi and Fawaz (2022) highlighted that a conducive environment among nursing students encompasses high-quality online educational management technologies, engaging online and face-to-face instructional approaches, exploratory learning methods, instructor skills, and ability to communicate effectively with students, and practical educational tasks to motivate students to engage with blended learning.

Hege *et al.* (2020) strongly emphasize the need to train Faculties and students on blended learning, address accreditation issues, build a stable and modern technical infrastructure, and pilot the implementation of blended learning in higher institutions to assess the digital competency of learners and students. Training workshops for students and instructors ensure both are familiar with blended learning teaching processes.

3.5. Learning outcomes

Blended course-designed models were effective in teaching students in healthcare, offering flexibility in time and access compared to traditional or fully online methods. A review by Jowsey *et al.* (2020) asserts that the online component of blended offers opportunities for instructor-guided teaching and hands-on student engagement in virtual reality exercises, gaming (crossword, memory games, speak the words set), and augmented reality. At the same time, face-to-face interactions support social presence. However, although gamification reportedly facilitated the development of cognitive strategies, metacognitive strategies, and positive feelings towards learning with nursing and occupational therapy undergraduate students in Spain, the authors recommended further research on the use of gamification in the curricula of health sciences degrees (Sáiz-Manzanares *et al.*, 2021). Kang and Kim (2021) reported enhanced knowledge and problem-solving ability among nurses using blended methods.

3.6. Challenges and opportunities

Technical, social, and organizational factors have challenged integrating blended learning in healthcare education. Concerns have been raised about the lack of technological resources and infrastructure, the stability of the network, the learners' digital literacy, and the lack of standard regulatory policies to guide the design and implementation of

blended learning. The application of educational content on online and mobile platforms has raised issues regarding student engagement and support and the accessibility of the application (McCutcheon *et al.*, 2018). There is still a lack of evidence to support the blended learning approach in teaching healthcare skills in healthcare education.

Opportunities for blended learning have been identified in the literature as the ability to enhance teaching strategies, and this has been noted through its capabilities to bridge the gap between traditional face-to-face and online learning by reducing the shortcomings of both methods. For instance, the face-to-face sessions compensate for the lack of personal contact with peers and tutors cited in e-learning activities. While there is a lack of self-paced learning time in face-to-face learning, teaching is compensated for by the online environment. It has also been argued that blended learning helps bridge theory and practice. This is crucial in healthcare education, where learners' clinical competencies must be enhanced. Chaker *et al.* (2024) review also deduced that blended learning offers varied pedagogical formats from which designers can choose. Blended learning presents opportunities for learning communities for students in geographically dispersed settings who cannot access learning facilities, primarily in towns. Leinster *et al.* (2021) used blended learning strategies for the Master in Oncoplastic Breast Surgery program for international students studying at a university in Spain but located in the United Kingdom. The student viewed practical clinical procedures in virtual rooms before hands-on experience in a clinical skills laboratory. Blended learning is a new paradigm that is constantly being enhanced as new technologies become available.

4. Conclusions

Blended learning in healthcare is a promising avenue for addressing the critical shortage of skilled healthcare professionals, particularly in resource-constrained countries. Integrating online and face-to-face learning offers flexibility and accessibility to learning materials, essential for expanding and improving healthcare education. The COVID-19 pandemic underscored the need for adaptable education models, demonstrating that while online methods can supplement learning, hands-on clinical experience remains indispensable.

The systematic review highlighted the efficacy of blended learning in improving knowledge retention and practical skills among healthcare students. However, the success of these programs is contingent upon several factors, including technological infrastructure, faculty training, and supportive regulatory frameworks. The disparity in research from low-income countries suggests an urgent need for more localized studies to tailor blended learning strategies to these contexts.

Blended learning bridges the gap between theoretical knowledge and clinical practice and offers a scalable solution to training healthcare professionals in geographically dispersed areas. Further studies are needed to explore its implementation and address existing challenges, particularly in resource-constrained settings.

References

- Al-Osaimi, D. N., & Fawaz, M. (2022). Nursing students' perceptions on motivation strategies to enhance academic achievement through blended learning: A qualitative study. *Heliyon*, 8(7), e09818. <https://doi.org/10.1016/j.heliyon.2022.e09818>
- Atwa, H., Shehata, M. H., Al-Ansari, A., Kumar, A., Jaradat, A., Ahmed, J., & Deifalla, A. (2022). Online, face-to-face, or blended learning? Faculty and medical students' perceptions during the COVID-19 pandemic: a mixed-method study. *Front Med (Lausanne)*, 9, 791352. <https://doi.org/10.3389/fmed.2022.791352>
- Ayhan, D., & Seki Oz, H. (2021). Effect of assertiveness training on the nursing students' assertiveness and self-esteem levels: Application of hybrid education in COVID-19 pandemic. *Nurs Forum*, 56(4), 807-815. <https://doi.org/10.1111/nuf.12610>

- Balakrishnan, A., Nair, S., Kunhikatta, V., Rashid, M., Unnikrishnan, M. K., Jagannatha, P. S., Chandran, V. P., Khera, K., & Thunga, G. (2021). Effectiveness of blended learning in pharmacy education: An experimental study using clinical research modules. *PLoS One*, 16(9), e0256814. <https://doi.org/10.1371/journal.pone.0256814>
- Bolatov, A. K., Gabbasova, A. M., Baikanova, R. K., Igenbayeva, B. B., & Pavalkis, D. (2022). Online or blended learning: the COVID-19 pandemic and first-year medical students' academic motivation. *Med Sci Educ*, 32(1), 221-228. <https://doi.org/10.1007/s40670-021-01464-y>
- Bordoni, G., Baum, A., García, G., Moríñigo, P., Luna, D., Otero, P., Otero, C., & de Quirós, F. (2019). Change management in healthcare organizations: Soft skills training strategies through blended learning environments. In *MEDINFO 2019: Health and Wellbeing e-Networks for All* (pp. 1999-2000). IOS Press. <https://doi.org/10.3233/SHTI190754>
- Chaker, R., Hajj-Hassan, M., & Ozanne, S. (2024). The effects of online continuing education for healthcare professionals: a systematic scoping review. *Open Education Studies*, 6(1). <https://doi.org/10.1515/edu-2022-0226>
- Denton, D. J. (2020). *Examination of Student Learning Outcomes During a Musculoskeletal Spine Assessment Course: Hybrid Blended Model Versus Traditional Classroom Delivery in a Doctor of Physical Therapy Program*. Marshall University. <https://books.google.co.mz/books?id=kCAAdzwEACAAJ>
- Evans, T., Araujo, E. C., Herbst, C. H., & Pannenberg, O. (2016). *Addressing the challenges of health professional education: opportunities to accelerate progress towards universal health coverage*. World Innovation Summit for Health, Doha, Qatar. <https://wish.org.qa/research-report/addressing-the-challenges-of-health-professional-education-opportunities-to-accelerate-progress-towards-universal-health-coverage/>
- Galway, L. P., Corbett, K. K., Takaro, T. K., Tairyan, K., & Frank, E. (2014). A novel integration of online and flipped classroom instructional models in public health higher education. *BMC Med Educ*, 14, 181. <https://doi.org/10.1186/1472-6920-14-181>
- Gil-Mateu, E., Reverte-Villarroya, S., Albacar-Rioboo, N., & Barcelo-Prats, J. (2023). A Hybrid methodology for the evaluation of clinical practice in final year nursing students. *Nurs Rep*, 13(3), 1004-1015. <https://doi.org/10.3390/nursrep13030088>
- Hege, I., Tolks, D., Adler, M., & Härtl, A. (2020). Blended learning: ten tips on how to implement it into a curriculum in healthcare education. *GMS J Med Educ*, 37(5), Doc45. <https://doi.org/10.3205/zma001338>
- Iguacel, I., Abecia, B., Bernal, J. L., & Martínez-Jarreta, B. (2022). Changing attitudes towards occupational medicine with blended learning methods is possible among medical students in Spain: a longitudinal study. *International Journal of Environmental Research and Public Health*, 19(2), 878. <https://doi.org/10.3390/ijerph19020878>
- Jowsey, T., Foster, G., Cooper-Ioelu, P., & Jacobs, S. (2020). Blended learning via distance in pre-registration nursing education: A scoping review. *Nurse education in practice*, 44, 102775. <https://doi.org/10.1016/j.nepr.2020.102775>
- Kang, H. Y., & Kim, H. R. (2021). Impact of blended learning on learning outcomes in the public healthcare education course: a review of flipped classroom with team-based learning. *BMC Med Educ*, 21(1), 78. <https://doi.org/10.1186/s12909-021-02508-y>
- Leinster, S. J., Pereira, J. H., Down, S., & Simpson, A. D. (2021). Blended learning in healthcare education. *Medical Research Archives*, 9(8). <https://doi.org/10.18103/mra.v9i8.2527>
- Mahajan, R., Saiyad, S., Virk, A., Joshi, A., & Singh, T. (2021). Blended programmatic assessment for competency based curricula. *J Postgrad Med*, 67(1), 18-23. https://doi.org/10.4103/jpgm.JPGM_1061_20
- Mastellos, N., Tran, T., Dharmayat, K., Cecil, E., Lee, H. Y., Wong, C. C. P., Mkandawire, W., Ngalande, E., Wu, J. T., Hardy, V., Chirambo, B. G., & O'Donoghue, J. M. (2018). Training community healthcare workers on the use of information and communication technologies: a randomised controlled trial of traditional versus blended learning in Malawi, Africa. *BMC Med Educ*, 18(1), 61. <https://doi.org/10.1186/s12909-018-1175-5>
- McCutcheon, K., O'Halloran, P., & Lohan, M. (2018). Online learning versus blended learning of clinical supervisee skills with pre-registration nursing students: A randomised controlled trial. *Int J Nurs Stud*, 82, 30-39. <https://doi.org/10.1016/j.ijnurstu.2018.02.005>

- Sáiz-Manzanares, M. C., Martin, C. F., Alonso-Martínez, L., & Almeida, L. S. (2021). Usefulness of digital game-based learning in nursing and occupational therapy degrees: A comparative study at the university of burgos. *International Journal of Environmental Research and Public Health*, 18(22), 11757. <https://www.mdpi.com/1660-4601/18/22/11757>
- Vallee, A., Blacher, J., Cariou, A., & Sorbets, E. (2020). Blended learning compared to traditional learning in medical education: systematic review and meta-analysis. *J Med Internet Res*, 22(8), e16504. <https://doi.org/10.2196/16504>
- WHO. (2024). *Health workforce*. World Health Organization. https://www.who.int/health-topics/health-workforce#tab=tab_1

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