EXPLORING THE SYNERGY OF SYNCHRONOUS AND ASYNCHRONOUS LEARNING APPROACHES IN MEDICAL EDUCATION

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Abstract
Advancements in technology have revolutionized medical education, offering new opportunities for exploration. The integration of innovative pedagogical strategies, accelerated by the COVID-19 pandemic, has extended beyond traditional classroom boundaries. Synchronous and asynchronous learning have emerged as dynamic approaches to enhance medical instruction. Synchronous learning fosters real-time engagement and interaction, promoting active participation and immediate feedback. Asynchronous learning encourages flexibility and self-paced exploration, enabling learners to access resources at their convenience and promoting autonomy and reflective learning. Both approaches have advantages and challenges. Challenges in synchronous learning include fixed schedules and technical disruptions, whereas asynchronous learning faces issues of limited interaction and self-motivation. By harmonizing these two modes through a blended approach, a seamless continuum of education unfolds. The integration of these methods creates a symphony of pedagogical innovation, catering to the diverse needs of medical learners. By skillfully orchestrating these modalities, educators can curate meaningful learning experiences aligned with the evolving landscape of medical education.

Keywords: synchronous learning; asynchronous learning; online learning; hybrid teaching models; self-paced learning; personalized instruction; blended learning

Background

Over the past few decades, advancements in technology have catalyzed transformative changes in medical education, offering ample opportunities for exploration in diverse fields [1]. The digital revolution has brought about a remarkable shift in the educational sector, rendering learning more adaptable than ever before. Amidst the dynamic shifts catalyzed by technology, the integration of innovative pedagogical strategies has extended beyond traditional classroom confines in the domain of medical education. This transition has been further accelerated by the unprecedented challenges posed by the COVID-19 pandemic, which resulted in the most significant disruption to education ever recorded, necessitating an embrace of technological interventions like online learning [2,3]. This timeframe was viewed as an opportunity for medical educators and students to equip themselves for the future of education. As institutions swiftly transitioned to hybrid teaching models, educators were trained to navigate this new landscape and ensure the continuation of enriching educational experiences in a post-lockdown scenario [4,5].

Medical education places a strong emphasis on fostering independent learning among students, seeking to cultivate self-improvement, independence, and individual initiative. In this context, two prominent paradigms, synchronous and asynchronous learning, have emerged as dynamic strategies to enhance medical instruction. These approaches offer distinct characteristics that differentiate them from traditional and e-learning methods, creating a rich tapestry of options for educators and learners [6].

In practice, both synchronous and asynchronous learning have their respective advantages and disadvantages that can affect the efficiency and effectiveness of online learning for students. Therefore, it is important to investigate how students perceive synchronous and asynchronous learning in education, as there is a lack of research in this area. This article examines the distinct functions of both methods in medical education, analyzing their advantages, challenges, and the potential synergy that arises from strategically combining them.

Synchronous Learning: Fostering Real-Time Engagement and Interaction

Synchronous learning entails simultaneous interaction between participants, facilitated by tools such as online chat, file sharing, instant messaging, audio and video conferencing [7-10]. It thrives on real-time educator-learner interactions through avenues like live lectures, virtual classrooms, webinars, and interactive discussions. The integration of various software features like, polling questions, chat-box windows and live feedback has proven invaluable to both educators and students [11]. Synchronous learning, however, necessitates meticulous preparation, including organizing teaching materials, scheduling class sessions, maintaining decorum, and attendance tracking [12]. The advancement of software in modern times, incorporating novel elements like chat-box interfaces, polling inquiries, real-time feedback, surveys, and more, has proven immensely beneficial for both educators and students [11]. Scholars such as Murphy et al. suggest that media aids synchronous e-learning by facilitating interaction between faculty and students [13]. The efficacy of this approach warrants exploration to identify optimal strategies and tools that maximize its impact on online learning outcomes [14].

Advantages of Synchronous Learning

Synchronous learning offers a range of valuable benefits within the context of medical education. To commence, its real-time nature empowers students to promptly seek clarifications on intricate medical concepts, thereby fostering a comprehensive understanding of the subject matter. This immediacy in receiving feedback, especially for inquiries or remarks, also contributes to the development of students' comfort and proficiency in active participation over time [15,16]. Furthermore, the interactive nature of synchronous sessions plays a pivotal role in promoting active engagement among learners. Through real-time discussions and dynamic activities, students are encouraged to foster critical thinking skills, engage in collaborative learning endeavors, and cultivate meaningful interactions with their peers [17]. Notably, Tsuei (2012) observes that synchronous learning provides an invaluable opportunity for face-to-face tutoring, enhancing students' attitudes and boosting their overall learning morale [18]. An intriguing insight from Murphy et al.'s research in 2011 underscores the unique benefits of synchronous learning, including heightened motivation, increased participation, and the establishment of significant social relations [13]. These distinctive advantages, as noted by Murphy et al., remain less attainable through the asynchronous learning approach.

A notable aspect of synchronous learning in medical education lies in its capacity to facilitate clinical simulations. By utilizing synchronous platforms, instructors can effectively replicate intricate clinical scenarios, conduct comprehensive case discussions, and simulate patient interactions. This pedagogical strategy serves as a bridge to narrow the gap between theoretical medical knowledge and its practical application, offering students a valuable opportunity to hone their skills in a realistic simulated environment [19].

Finally, one of the key advantages within synchronous learning lies in the accessibility of instructor expertise. Students are afforded immediate access to insights from expert faculty members, thereby enriching their exposure to a wide array of medical perspectives and contemporary practices [20].

Challenges and Considerations in Synchronous Learning:

Synchronous learning, while advantageous, faces challenges. Fixed schedules can stress students due to prolonged screen time [21]. Time zone differences and scheduling conflicts hinder participation [22]. Technical disruptions like poor connectivity disrupt the flow. Ensuring inclusive engagement, especially in larger groups, proves complex, with passive participation noted [23]. Also, due to the physical separation between teachers and students, it becomes challenging for

instructors to accurately assess the genuine learning progress of their students. Most live streaming platforms do not provide the capability to adequately monitor learning data effectively [24]. Addressing these challenges is essential for0020enhancing the effectiveness of synchronous learning experiences. Flexibility in scheduling, technological support, and strategies for active participation can mitigate these issues, fostering a more holistic learning environment.

Asynchronous Learning: Encouraging Flexibility and Self-Paced Exploration

Conversely, asynchronous learning gives learners access to pre-recorded lectures, reading materials, and resources at their convenience, promoting self-paced learning [25]. This traditional mode utilizes discussion boards, email, multimedia content, and other tools to facilitate communication over an extended time frame. Asynchronous learning facilitates communication occurring across extended timeframes rather than in real-time simultaneity. It demands individual self-discipline and generally offers less interactivity compared to synchronous learning. Methods of asynchronous learning encompass platforms such as discussion boards, web blogs, email, streaming audio, video streaming, narrated slideshows, web-based training, databases, web books, surveys, shared calendars, and website links. The benefits commonly associated with asynchronous learning comprise unrestricted access to information and resources, collaboration among geographically dispersed groups, and communal knowledge sharing.

Advantages of Asynchronous Learning

Asynchronous learning offers notable benefits. It offers learners a remarkable degree of flexibility, allowing them to mold their educational experience around their unique schedules, accommodating a diverse range of commitments and individual preferences. This accessibility to learning materials at any time and from any location holds the potential to draw even introverted students into active participation, fostering a more inclusive learning environment [26]. Furthermore, reflective learning encourages in-depth understanding, fostering autonomy without heavy instructor dependence [27]. Students access diverse learning materials like videos, e-books and research articles, enriching their learning journey. This empowers students to pursue knowledge with autonomy and discernment, reducing their dependence on traditional instructor-led approaches. According to Vonderwell et al. (2007), asynchronous learning cultivates students' self-discipline and self-regulatory capabilities, fostering independent learning and cognitive growth [28]. Multiple scholars assert that asynchronous learning encourages students to invest time and effort into researching, learning, and acquiring knowledge independently, resulting in enhanced discipline and exposure to diverse domains of knowledge [8, 29-31].

Global accessibility transcends geographical limitations, broadening medical education's reach to a diverse audience. Moreover, asynchronous learning proves cost-effective as it requires less constant instructor attention [32-33]. These advantages collectively enhance the versatility and effectiveness of asynchronous learning.

Challenges of Asynchronous Learning

Asynchronous learning comes with challenges. The lack of immediate interaction hampers quick clarifications and feedback due to missing visual cues. Self-motivation becomes crucial as learners manage their progress independently, potentially causing feelings of disconnection and procrastination [34-35]. Moreover, limited opportunities for dynamic peer interactions and discussions can affect collaborative learning. Addressing these challenges entails promoting effective communication, motivation, and peer engagement in asynchronous learning setups.

Harmonizing Synchronous and Asynchronous Learning: A Blended Approach

Numerous studies suggest that online education is comparable to classroom learning [36-37]. Nonetheless, some published studies have also highlighted that students didn't readily embrace online education during the COVID-19 outbreak [38-39]. A prevailing viewpoint among students was that real-time, in-person teaching couldn't be replaced by technology.
In the realm of medical education, the conventional face-to-face teaching approach effectively addresses learners' demand for systematic knowledge assimilation within short timeframes and immediate clarification [40]. This does not change the fact that the immediacy and directness inherent to this method do not invariably imply consistent high efficiency and equitable outcomes [41]. The offline, in-person educational model, characterized by concentrated and instant knowledge transfer, tends to overlook the varying receptivity levels among different learning groups [42]. Compelled by the constraints of limited class duration and the spectrum of students' knowledge absorption rates, offline education yields disparate real-time information distribution among learners [43]

On the other hand, the online teaching paradigm, bolstered by the repeatability of instructional resources, effectively compensates for the immediacy shortfall associated with traditional classrooms. Leveraging features such as live playback and repeated engagement with online course materials, students with diverse cognitive capacities access a more level learning experience. This mode of instruction ensures that learning is equitable, catering to students' individual learning speeds and styles [44].

The amalgamation of Synchronous and Asynchronous Learning, termed Balanced Learning, has emerged as an imperative, offering uninterrupted and continuous education [45]. The optimization of both synchronous and asynchronous learning modalities hinges on their seamless fusion [46]. Employing prerecorded lectures to establish foundational understanding, followed by synchronous sessions for collaborative discussions and real-time engagement, fosters a dynamic and comprehensive learning environment. Educational institutions should deliberate on combining

synchronous and asynchronous learning approaches, a synergy that proves advantageous for both students and educators [47]. Approaches to understanding synchronous and asynchronous learning vary, with tools like threaded discussions, blogs, and instant messaging creating a classroom dynamic where communication extends not only between instructors and learners but also among peers [31].

Conclusion: Orchestrating a Symphony of Learning Modalities

Understanding students' acceptance and utilization of synchronous and asynchronous online learning systems as effective and practical methods is crucial. Evaluating the degree of acceptance for each modality is equally vital. While online learning gains prominence, ongoing inquiry into students' reception of synchronous and asynchronous methods continues. The pivotal role of teachers in motivating and supporting online learning activities is evident. Studies emphasize that students' attitudes towards synchronous online learning are shaped by organizational and technical support, warranting integrated online platforms and accessible learning resources. Technological advancements in medical education should foster user-friendly learning to bolster students' acceptance of synchronous online learning.

The interplay of synchronous and asynchronous components can be contextualized through exploration and exploitation paradigms. This perspective draws from the individual ambidexterity theory, highlighting the simultaneous pursuit of incremental and discontinuous innovation through contradictory structures within an organization. When students engage in activities, they navigate between exploration and exploitation, amassing meaningful knowledge. This process enables resourceful capitalization in the future. The capacity to balance these pursuits relies on individual competence [48-50].

In conclusion, synchronous and asynchronous learning in medical education are not opposing forces but rather complementary components. When skillfully orchestrated, they harmonize to create a symphony of pedagogical innovation, tailored to meet the diverse needs and aspirations of digital-age medical learners. Utilizing both course construction and live broadcast platforms, an integrated approach to online education is the need of the hour, encompassing both asynchronous and synchronous elements. This model effectively addresses the imperative of real-time teacher-student communication. Simultaneously, through leveraging AI and big data aggregation within the online education context, educators gain the ability to monitor learners' progress, enabling tailored teaching strategies and personalized instructional plans. The evolution of these courses undoubtedly holds the potential to greatly enhance future student learning outcomes. Through the skillful integration of these methods, educators can curate meaningful learning experiences that resonate with learners and align with the evolving landscape of medical education.

Reference

[1]. Shelke T. To Study the Impact of Innovations in Education. International Journal of Advance Research, Ideas and Innovations in Technology. 2018;4(3):10-12. Available at: https://www.ijariit.com/manuscripts/v4i3/V4I3-1142.pdf
[2]. Elangovan S, Mahrous A, & Marchini L. Disruptions during a pandemic: gaps identified and lessons learned. J Dent Educ. 2020, 84: 1270–1274. doi: 10.1002/jdd.12236.
[3]. Theoret C, & Ming X. Our education, our concerns: the impact on medical student education of COVID-19. Med Educ. 2020, 54, 591-592. doi: 10.1111/medu.14181.
[4]. Lucey CR, & Johnston SC. The transformational effects of COVID-19 on medical education. JAMA. 2020, 324:1033-1034. doi: 10.1001/jama.2020.14136.
[5]. Rose S. Medical student education in the time of COVID-19. JAMA. 2020, 323:2131-2132. doi: 10.1001/jama.2020.5227.
[6]. Hrastinski S. (2008). Asynchronous and synchronous e-learning. Educause quarterly, 31(4), 51–55. Retrieved from https://er.educause.edu/articles/2008/11/asynchronous-and-synchronous-elearning
[7]. Khan BH. (2007). Flexible learning in an information society. Hershey, PA: IGI Global. http://dx.doi.org/10.4018/978-1-59904-325-8
[8]. Chauhan V. Synchronous and asynchronous learning. Imperial Journal of Interdisciplinary Research. 2017, 3(2):1345-1348.
[9]. Ashley J. Synchronous and Asynchronous Communication Tools. ASAE and the Center for Association Leadership. Retrieved from http://www.asaecenter.org/PublicationsResources/articledetail.cfm?ItemNumber=13572
[10]. Cook DA, Levinson AG, Garside S, Dupras DM, Erwin PJ, & Montori VM. Internet Based Learning in the Health Professions. JAMA. 2008, 300(10):1181-96. doi: 10.1001/jama.300.10.1181
[11]. Cook DA, Artino AR Jr. Motivation to learn: an overview of contemporary theories. Med Educ. 2016;50(10):997-1014. doi:10.1111/medu.13074
[12]. Shukri A, Nordin L, Salleh FIM, Raidzwan SNM, & Ahmad R. UniKL students' perception on synchronous learning using ICT as learning tools to learn English. Journal of Critical Reviews. 2020, 7(8):793-796. doi: 10.31838/jcr.07.08.170.
[13]. Murphy E, Rodríguez-Manzanares MA, & Barbour M. Asynchronous and synchronous online teaching: perspectives of Canadian high school distance education teachers. British Journal of Educational Technology. 2011, 42(4):583-591. doi: 10.1111/j.1467-8535.2010.01112.x.
[14]. Park YJ, & Bonk CJ. Is online life a breeze? A case study for promoting synchronous learning. MERLOT Journal of Online Learning and Teaching. 2007, 3(3):307-323.
[15]. Sharp EA, Norman MK, Spagnoletti CL, Miller BG. Optimizing synchronous online teaching sessions: a guide to the "new normal" in medical education. Acad Pediatr. 2021, 21:11–15. doi: 10.1016/j.acap.2020.11.009.

[16]. Nunneley CE, Fishman M, Sundheim KM, Korus RE, Rosen RH, Streater BA, O'Donnell KA, Newman LR, Marcus CH. Leading synchronous virtual teaching sessions. Clin Teach. 2021, 18:231–235. doi: 10.1111/tct.13282.
[17]. Alamer A, Alharbi F. Synchronous distance teaching of radiology clerkship promotes medical students' learning and engagement. Insights Imaging. 2021, 12:41. doi: 10.1186/s13244-021-00984-w.
[18]. Tsuei M. Using synchronous peer tutoring system to promote elementary students' learning in mathematics. Computers & Education. 2012, 58(4):1171–1182. doi: 10.1016/j.compedu.2011.11.025
[19]. Issenberg SB, McGaghie WC, Petrusa ER, Lee Gordon D, Scalese RJ. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. Med Teach. 2005;27(1):10-28. doi:10.1080/01421590500046924
[20]. Roberts DH, Newman LR, Schwartzstein RM. Twelve tips for facilitating Millennials' learning. Med Teach. 2012;34(4):274-278. doi:10.3109/0142159X.2011.613498
[21]. Pappas C. Synchronous Learning Advantages and Disadvantages in Corporate Training. Retrieved from https://elearningindustry.com/asynchronous-learning-advantages-and-disadvantages-in-corporate-training.
[22]. Teng DCE, Chen NS, Kinshuk & Leo T. Exploring students' learning experience in an international online research seminar in the Synchronous Cyber Classroom. Computers & Education. 2012, 58(3), 918–930. http://dx.doi.org/10.1016/j.compedu.2011.10.018
[23]. Perveen A. Synchronous and asynchronous E-language learning: a case study of virtual university of Pakistan. Open Praxis. 2016, 8(1):21-39. doi: 10.5944/openpraxis.8.1.212.
[24]. Robert M, Bernard PC, Lou Y, Borokhovski E, Wade A, Wozney L, Huang B. How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. Rev Educ Res. 2004, 74:379–439. doi: 10.3102/00346543074003379.
[25]. Malamed C. Synchronous and asynchronous learning explained: virtual classroom learning or self-paced instruction? Retrieved from https://theelearningcoach.com/elearning_design/group-or-self-paced-instruction/.
[26]. Wind Kofoed D. (2020). Synchronous vs asynchronous learning: what's more effective? Retrieved from https://www.eduflow.com/blog/synchronous-vs-asynchronous-learning-whats-more-effective.
[27]. Sandars J. The use of reflection in medical education: AMEE Guide No. 44. Med Teach. 2009;31(8):685-695. doi:10.1080/01421590903050374
[28]. Vonderwell S, Liang X, Alderman K. Asynchronous Discussions and Assessment in Online Learning. Journal of Research on Technology in Education. 2007, 39(3):309-328. doi: 10.1080/15391523.2007.10782485. Available at: https://www.learntechlib.org/p/100757/. Accessed June 24, 2023.
[29]. Plesec Gasparic R, Pecar M. Analysis of an asynchronous online discussion as a supportive model for peer collaboration and reflection in teacher education. Journal of Information Technology Education: Research. 2016, 15:369-393.
[30]. Ellaway RH, Masters K. AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. Med Teach. 2008;30(5):455-473. doi:10.1080/01421590802108331
[31]. Shahabadi MM, Uplane M. Synchronous and asynchronous e-learning styles and academic performance of e-learners. Procedia - Social and Behavioral Sciences. 2015, 176:129-138. doi: 10.1016/j.sbspro.2015.01.453.
[32]. Lawless, C. (2020). Synchronous vs. Asynchronous learning: which is right for your learners? Retrieved from https://www.learnupon.com/blog/synchronous-learning-asynchronous-learning/.
[33]. Tucker, C. (2020). Asynchronous vs. Synchronous: How to Design for Each Type of Learning. Retrieved from https://catlintucker.com/2020/08/asynchronous-vs-synchronous/.
[34]. Barbara B, Levin YH, Robbins HH. Comparative analysis of preservice teachers' reflective thinking in synchronous versus asynchronous online case discussions. J Technol Teach Educ. 2006, 14:439–460.
[35]. Swan, K. Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. Distance education. 2001, 22(2):306–331. http://dx.doi.org/10.1080/0158791010220208
[36]. Stack S. Learning outcomes in an online vs traditional course. Int J Scholarsh Teach Learn. 2015, 9:5.
[37]. Ward ME, Peters G, Shelley K. Student and faculty perceptions of the quality of online learning experiences. Int Rev Res Open Distrib Learn. 2010, 11:57–77. doi:10.19173/irrodl.v11i3.867
[38]. Kumari S, Gautam H, Nityadarshini N, Das BK, Chaudhry R. Online classes versus traditional classes? Comparison during COVID-19. J Educ Health Promot. 2021, 10:457. doi: 10.4103/jehp.jehp_317_21.
[39]. Totlis T, Tishukov M, Piagkou M, Kostares M, Natsis K. Online educational methods vs. traditional teaching of anatomy during the COVID-19 pandemic. Anat Cell Biol. 2021, 54:332–339. doi: 10.5115/acb.21.006.
[40]. He L, Yang N, Xu L, Ping F, Li W, Sun Q, Li Y, Zhu H, Zhang H. Synchronous distance education vs traditional education for health science students: a systematic review and meta-analysis. Med Educ. 2021, 55:293–308. doi: 10.1111/medu.14364.
[41]. Lopata C, Wallace NV, Finn KV. Comparison of academic achievement between Montessori and traditional education programs; the MOOC model: challenging traditional education. J Res Child Educ. 2005, 20:5–13. doi: 10.1080/02568540509594546.
[42]. Parker J, Maor D, Herrington J. Authentic online learning: Aligning learner needs, pedagogy and technology. Issues Educ Res. 2013, 23.2: 227-241.
[43]. Biel R, Brame CJ. Traditional versus online biology courses: connecting course design and student learning in an online setting. J Microbiol Biol Educ. 2016, 17:417–422. doi: 10.1128/jmbe.v17i3.1157.

[44]. Wang P, Ma T, Liu LB, Shang C, An P, Xue YX. A comparison of the effectiveness of online instructional strategies optimized with smart interactive tools versus traditional teaching for postgraduate students. Front Psychol. 2021, 12:747719. doi: 10.3389/fpsyg.2021.747719.
[45]. Picciano, A.G. Blending with purpose: the multimodal model. Journal of Asynchronous Learning Network. 2009, 13(1). doi: 10.24059/olj.v13i1.1673.
[46]. Fabriz S, Mendzheritskaya J, Stehle S. Impact of synchronous and asynchronous settings of online teaching and learning in higher education on students' learning experience during COVID-19. Front Psychol. 2021, 12:733554. doi: 10.3389/fpsyg.2021.733554.
[47]. Hope DL, Grant GD, Rogers GD, King MA. Virtualized gamified pharmacy simulation during COVID-19. Pharmacy (Basel). 2022, 10:41. doi: 10.3390/pharmacy10020041.
[48]. Papachroni, A., & Heracleous, L. Ambidexterity as practice: individual ambidexterity through paradoxical practices. J Appl Behav Sci. 2020, 56(3), 366-386. doi: 10.1177/0021886320913048.
[49]. Gibson, C.B., & Birkinshaw, J. The antecedents, consequences, and mediating role of organizational ambidexterity. Acad Manag J. 2004, 47(2), 209-226. doi: 10.2307/20159573.
[50]. Barrot, J.S., Llenares, I.I., & Del Rosario, L.S. Students' online learning challenges during the pandemic and how they cope with them: the case of the Philippines. Educ. Inf. Technol. 2021, 26, 7321–7338. doi: 10.1007/s10639-021-10589-x.