Medical Education - Original Article **Open Access**

Prospects and Challenges of e-learning among Medical Students in Lahore, Pakistan

Shamaila Hassnain

ABSTRACT:

Objective: The main objective was to assess the perception regarding the effectiveness of online learning and factors that affect the education of medical students.

Study design & setting: A cross-sectional study was conducted at Central Park Medical College, Lahore, Pakistan.

Methodology: 386 medical students from the first to final year of MBBS were included in the study by using a simple random sampling technique. A self-designed questionnaire was used. Cronbach's alpha was 0.72. Exploratory factor analysis was used to observe the structure of items in the questionnaire. Responses were given in the form of frequency and percentages. Data was analyzed using SPSS 26.

Results: The mean age of the participants was 22.29 + 1.92. More than half of the medical students who participated in the study favoured online teaching as effective. A statistically significant association was found between the number of hours daily spent on-screen use with self-directed learning and the number of hours spent on Internet Explorer with feelings of confidence about e-learning.

Conclusion: The perception regarding the effectiveness of online learning was found to be moderately effective among the majority of medical students.

Keywords: Learning effectiveness, Medical students, Online learning & teaching.

How to cite this Article:

Hassnain S, Prospects and Challenges of e-learning among Medical Students in Lahore, Pakistan. J Bahria Uni Med Dental Coll. 2025;15(3):225-31 DOI: https://doi.org/10.51985/JBUMDC2024487

INTRODUCTION:

Since late 2019, the novel Coronavirus (SARS-CoV-2) has drastically altered global dynamics, posing significant challenges to nearly all aspects of life. The pandemic, which manifested its devastating impact in early 2020, disrupted physical socialization, affecting sectors such as business, education, healthcare, and the general security of citizens. [1] Multiple safety measures and potentially innovative alternatives have been adopted to cope with the losses and sustain essential operations. [2] Among the most affected sectors, education underwent transformative changes, particularly in medical teaching, where the abrupt and extensive transition from face-to-face learning to e-learning methodologies became essential to ensure academic continuity. [3]

To mitigate these disruptions, innovative strategies and safety measures were adopted, with a notable transformation seen in the educational sector. Medical education, in particular, faced unprecedented challenges, prompting an abrupt and extensive shift from conventional face-to-face learning to e-learning methodologies to continue the academic curricula. [4] This shift, though necessary, demanded significant adaptation by educators and learners. The educational transformation was achieved through technological modernization and digitalization.[5]

E-learning has emerged as a crucial alternative during the pandemic, offering a solution to maintain educational continuity while ensuring safety. It facilitates the efficient dissemination of information to large audiences, leveraging digital platforms to bridge gaps between learners and institutions. [3] However, e-learning has inherent limitations, particularly in its inability to replicate the practical and interactive experiences central to medical education. Evaluating student performance and ensuring hands-on learning opportunities remain significant challenges. [6] The nature of online learning also differed fundamentally from traditional classroom settings. Online learning is more student-centred, focusing on individual engagement and self-directed efforts, whereas traditional classroom learning emphasizes instructor-led teaching. [7] The transition, while accelerating technological adoption, highlighted the importance of developing robust digital infrastructures within academic frameworks. E-learning fostered flexibility and allowed students to progress at their own pace. On the other hand, it lacked the immediacy and direct communication inherent to physical classrooms, often leaving students feeling isolated.

In Pakistan, the adoption of e-learning faced resistance from

Shamaila Hassnain
Associate Professor, Department of Community Medicine
Fatima Memorial College of Medicine & Dentistry, Lahore
Email: sash_04@yahoo.com

Received: 09-12-2024 1st Revision: 06-01-2025
Accepted: 29-06-2025 2nd Revision: 27-06-2025

both faculty and students, primarily due to infrastructural, technological, and socio-cultural barriers. Educational institutions, particularly in resource-constrained settings, were hesitant to transition from their established traditional approaches. Faculty members, while recognizing the potential benefits of e-learning, expressed concern about the lack of fair evaluation techniques and practice opportunities available to students. [8] Students, on the other hand, acknowledged the flexibility and accessibility of e-learning but highlighted several issues, including unreliable internet connectivity, high dependency on self-motivation, and a lack of direct interaction with instructors and peers. [5] These challenges were further compounded by socioeconomic disparities in access to technology, particularly in underprivileged areas of Pakistan.

The pandemic also highlighted the critical role of a conducive learning environment in shaping educational outcomes. A positive and supportive environment fosters student engagement, enhances comprehension, and equips learners to face future challenges with confidence. Conversely, a negative or resource-deficient environment can impede academic performance and demotivate students. [9] Educational institutions responded to these challenges by integrating advanced technologies, adopting new digital platforms, and providing faculty training to enhance the effectiveness of online education. [10] Many academic institutions that were previously hesitant to advance their traditional pedagogical approach were completely switched to online teaching and learning during the pandemic. [11] However, a lot of institutions faced many difficulties in the implementation phase of online learning, either in the form of accessibility, lack of prior experience, internet connectivity issues, insufficient infrastructure, or lack of computer availability by both teachers and learners. [12]

Globally, e-learning was embraced to ensure uninterrupted education during the pandemic, but socioeconomic disparities significantly influenced its effectiveness. Students of high socioeconomic status faced fewer barriers as compared to middle- or low-socioeconomic status countries [13] due to better access to resources, including high-speed internet, advanced gadgets, and conducive learning spaces. In contrast, learners from middle- and low-income countries experienced greater challenges, such as financial constraints, lack of technological access, and less robust internet infrastructure. These disparities contributed to the resistance and hesitancy among educators and learners to fully adopt online learning systems. Despite these obstacles, the pandemic underscored the importance of integrating e-learning into traditional education systems as a complementary approach. The experience also paved the way for the development of hybrid models, combining the strengths of both conventional and online learning to address the limitations of each approach. This blended approach holds particular promise for medical education, where theoretical knowledge and practical skills must be balanced. Hybrid models can harness the strengths of both methods to address their respective limitations, paving the way for a more resilient and adaptive educational framework.

The challenges associated with e-learning also spurred innovations in teaching methodologies, such as the use of interactive online tools, virtual simulations, and multimedia content to enhance student engagement. These methods aimed to compensate for the lack of physical interaction and practical training inherent in e-learning systems. Additionally, efforts to provide equitable access to technology became a priority, with some institutions offering subsidized devices and internet packages to students in need. Despite these initiatives, long-term solutions are necessary to ensure sustainable and inclusive education.

The pandemic also spurred innovations in teaching methodologies. Interactive online tools, virtual simulations, and multimedia content were increasingly employed to enhance student engagement and compensate for the lack of physical interaction. These innovations not only enriched the e-learning experience but also demonstrated the potential of technology to transform education. For instance, virtual reality (VR) and augmented reality (AR) technologies enabled students to participate in simulated clinical scenarios, bridging the gap between theoretical knowledge and practical application. Similarly, collaborative tools such as discussion forums and group projects foster peer interaction and teamwork in virtual settings. In Pakistan, the pandemic acted as a catalyst for a broader conversation about the future of education. Policymakers and educators began exploring the potential of blended learning models, which integrate the personalized interaction of face-to-face instruction with the scalability and flexibility of online platforms. These models are particularly relevant in medical education, where practical skills and theoretical knowledge must be balanced. By combining the best aspects of both approaches, blended learning has the potential to address the limitations of each while preparing students for dynamic and technologically advanced professional environments. These discussions emphasized the need for a strategic vision to integrate digital technologies into educational systems sustainably. The experience of the pandemic highlighted the importance of institutional resilience, adaptability, and inclusivity in shaping the future of education.

Additionally, the pandemic underscored the importance of institutional support in facilitating the e-learning transition. This included providing consistent technical support, fostering a collaborative learning atmosphere, and addressing the mental health challenges faced by both students and educators. Many learners reported increased stress and anxiety due to isolation, lack of peer interaction, and uncertainty about academic performance. The lack of physical cues and immediate feedback in virtual classrooms added to their stress, necessitating mental health support and capacity-

building programs. To address these issues, educational institutions implemented several supportive measures. Workshops on digital pedagogy and mental health were conducted to equip educators with the skills and resilience needed to navigate the transition. For students, institutions offered counselling services, peer support groups, and virtual interactive sessions to mitigate feelings of isolation and enhance engagement. These initiatives emphasized the need for a holistic approach to education that considers both academic and psychological well-being. In response, some institutions provided subsidized devices and internet packages to students in need, demonstrating the potential of targeted interventions to bridge digital divides. However, these efforts remain insufficient in addressing the systemic barriers to education in resource-constrained settings. Long-term solutions, such as investments in digital infrastructure and policies promoting universal access to technology, are essential to ensure sustainable and inclusive education. Similarly, educators faced the dual challenge of adapting to new technology while maintaining the quality of education. Workshops and mental health support services were critical in mitigating these issues, emphasizing the need for holistic approaches to education during crises.

This study intends to explore the perceptions of medical students from diverse backgrounds and residential locations regarding the effectiveness of online learning and the factors influencing their educational experiences during the COVID-19 pandemic at Central Park Medical College (CPMC), Lahore. A questionnaire-based survey was employed to capture insights into the challenges and opportunities associated with educational transformations prompted by the pandemic. The findings of this study will contribute to a deeper understanding of how educational systems can better adapt to crises and leverage e-learning to enhance medical training. Furthermore, the study seeks to provide evidence-based recommendations for improving e-learning practices and integrating them effectively into traditional educational frameworks, ensuring resilience in the face of future disruptions. By investigating the experiences of medical students during this unprecedented period, the study aims to shed light on the broader implications of e-learning for educational equity, quality, and sustainability. It emphasizes the need for a comprehensive approach to education that balances technological innovation with human-centred pedagogy, preparing students to navigate the complexities of a rapidly evolving professional landscape.

METHODOLOGY:

A cross-sectional study was conducted at a private medical college from October 2021 to March 2022 to observe the effectiveness of the online learning program. The data was collected from 386 medical students enrolled before 2020. The minimum sample size was calculated as 320 using the WHO sample size calculator by taking a 5% margin of error and 29.5% as the percentage of students who find online programs effective in a study. [14] The data was collected using a simple random sampling technique. All students from the first to the final year of MBBS were included in the study. Only those who did not give consent were excluded.

For the data collection purpose, a self-designed questionnaire was used. After obtaining informed consent, the data were collected by using a questionnaire with two distinct sections. The first section collects demographic and academic information, including the academic year, age, gender, internet availability, and use of the internet, time duration for the screen, modes of assessing online education, and various emotional or health issues as a consequence of e-learning. The other section considered the main section of the questionnaire, in which twelve statements were asked about comfort, participation, effective communication, and motivation during online lectures.

The questionnaire was pretested to ensure its reliability, achieving an overall Cronbach's alpha of 0.72. The initial draft was based on twelve statements measured on a Likert scale with responses ranging from "strongly disagree" to "strongly agree." The scores were calculated by coding "strongly agree" equals 5 and "strongly disagree" equals 1. Before proceeding with the final data collection, the first section of the questionnaire was reviewed and expanded to reflect students' attitudes and interests in online learning.

SPSS version 26.0 was used for data analysis purposes. The results are given in the form of frequencies and percentages. Crosstabulations analyzed the relationship between the number of hours spent each day on-screen activities and the perception of online learning. A chi-square test of association was applied to assess the association. Exploratory Factor Analysis (EFA) was performed to examine the factor structure of the questionnaire. Additionally, effectiveness scores were categorized into four levels, ranging from least effective to very effective. Graphical representation through line charts for academic years and box plots for individual responses was also given. The study protocol, including ethical considerations, was approved by the institutional ethical review board (CPMC/IRB-No/1306), ensuring adherence to research standards. Data confidentiality and participant anonymity were maintained throughout the study.

RESULTS:

The data was collected from 386 students enrolled in a private medical college, in Lahore, Pakistan. Data was collected using a self-designed questionnaire to measure the effectiveness of online learning. The mean age of the participants was 22.29 + 1.92. Approximately 50% of the students on average explore the internet or use the screen for 1-5 hours a day (Table: 1). The most common mode was mobile phone among students. More than half of students said that using screens and exploring the internet for long hours is harmful to their health. Most of the students favored that method of learning become more self-directed. Learning

method to become more self-directed was significantly associated with number of daily hours screen used (Table 2). Comparatively more students were not confident in applying skills they learned online in hospitals. Exploratory factor analysis (EFA) was used to see the factor structure of the designed statements. Significance of KMO and Bartlett's test of sphericity allowed for factor analysis. Principal Component Analysis (PCA) was used with varimax rotation. The threshold for Eigenvalues was set at 1.0. EFA extracted four factors with reasonable explained variance. The extracted factors were named as comfortable effective learning, environment, motivation, and teaching methodology. More than half of the medical students who participated in the study favored that online teaching was effective considering environment, communication, and teaching methodology are building concepts (Table 3). Scores were calculated for each participant that ranged from strongly disagree **(=1)** to strongly agree **(=5).** The code was reversed for negative statements. The actual score was obtained by adding the codes for the particular response. The scoring system was used to assess the effectiveness of online learning through items. More than one-third of the students favored that online learning was moderately effective (Table: 4). Nearly one-fourth of the students said it was least effective. About 62.7% of the students said that online learning is mild/ moderately effective. Most of the students in final year find online learning moderately effective. Comparatively more students from third-year MBBS said that online learning is least effective among all years (Figure 2). A small proportion of advanced-level students favoured that online learning is very effective. Most of the students agreed with the effectiveness of online learning.

Table 1: Frequency Distribution of Gender and Factors related to the use of the Internet

Variables	Categories	n	Percentage
Gender	**Male**	194	50.3%
	Female	192	49.7%
Availability of internet	**No**	28	7.2%
	Yes	358	92.8%
Mode	**Laptop**	132	34.2%
	Mobile Phone	233	60.4%
	Desktop	21	5.4%
Estimated hours for screen use	**< 1 hour**	92	23.8%
	1-5 hours	191	49.5%
	6-10 hours	86	22.3%
	> 10 hours	17	4.4%
Estimated hours for exploring internet	**< 1 hour**	53	13.7%
	1-5 hours	205	53.1%
	6-10 hours	90	23.3%
	> 10 hours	38	9.9%
Total		386	100%

DISCUSSION:

During this pandemic of COVID-19, e-learning and its effectiveness for possible integration into the education system as a reliable learning method are raising challenges and opportunities. One of the main advantages of e-learning observed among respondents of our survey was the ease of access to education from the comfort of their homes. This flexibility has been a game-changer for many, enabling uninterrupted learning despite global disruptions. The

Figure 1: Exploratory Factor Analysis of Online Effectiveness

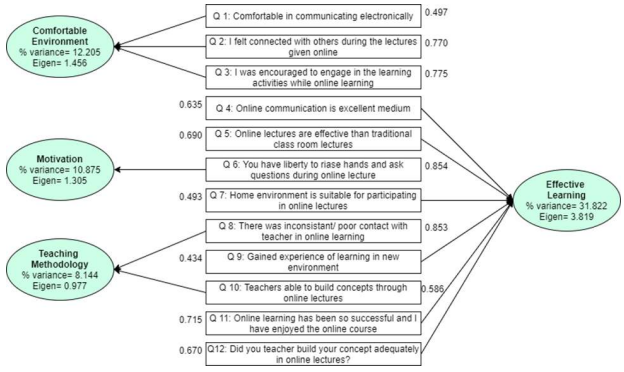


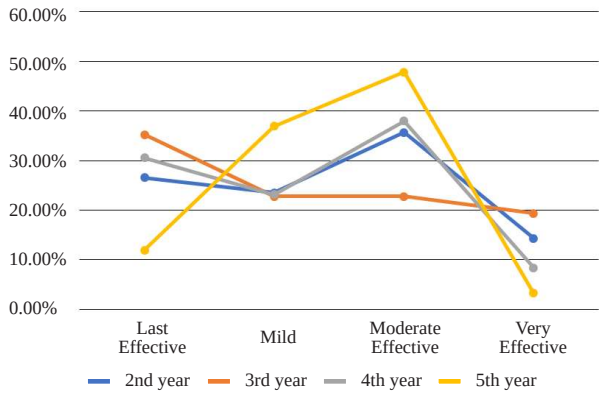
Table 2: Crosstab of the estimated number of hours spent each day on-screen use and exploring the internet with perception about online learning

Factor	Category	Less than 1	1-5	6-10	More than 10	p-value	Less than 1	1-5	6-10	More than 10	p-value	Total
Self-directed	Yes	36	110	56	18	0.22	51	118	44	07	0.02	220
	No	08	32	16	07		09	29	22	03		63
	May be	09	63	18	13		32	44	20	07		103
Feel confident	Yes	21	68	29	15	0.05	25	69	34	05	0.57	133
	No	20	89	28	19		38	76	34	08		156
	May be	12	48	33	04		29	46	18	04		97
Effect to health	Yes	26	122	56	18	0.38	53	111	47	11	0.97	222
	No	16	42	15	12		19	42	20	04		85
	May be	11	41	19	08		20	38	19	02		79

Table 3: Frequency and Percentages of the responses for scaled items

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am comfortable in communicating electronically.	56 (14.5%)	38 (9.8%)	74 (19.2%)	93 (24.1%)	125 (32.4%)
In general, I felt connected with others during the lectures given online.	37 (9.6%)	28 (7.3%)	56 (14.5%)	191 (49.5%)	74 (19.2%)
I felt I was encouraged to engage in the learning activities while online learning.	50 (13.0%)	39 (10.1%)	59 (15.3%)	172 (44.6%)	66 (17.1%)
Online communication is an excellent medium for learning.	68 (17.6%)	38 (9.8%)	66 (17.1%)	140 (36.3%)	74 (19.2%)
Online lectures are effective than traditional/ live class room lectures.	69 (17.9%)	51 (13.2%)	59 (15.3%)	115 (29.8%)	92 (23.8%)
Were you given the liberty to raise hands and ask questions to clear your doubts during online lecture?	43 (11.1%)	58 (15.0%)	62 (16.1%)	124 (32.1%)	99 (25.6%)
Home environment is suitable for participating online lectures.	59 (15.3%)	43 (11.1%)	78 (20.2%)	100 (25.9%)	106 (27.5%)
There was inconsistent/ poor contact and communication with teachers.	43 (11.1%)	36 (9.3%)	66 (17.1%)	114 (29.5%)	127 (32.9%)
Gained experience of learning in a new online environment.	58 (15.0%)	71 (18.4%)	96 (24.9%)	72 (18.7%)	89 (23.1%)
I feel that face-to-face contact with teacher is necessary to learn.	46 (11.9%)	31 (8.0%)	67 (17.4%)	134 (34.7%)	108 (28.0%)
Overall, online learning has been successful and I have enjoyed the online course.	78 (20.2%)	60 (15.5%)	86 (22.3%)	78 (20.2%)	84 (21.8%)
Did your teachers able to build your concepts adequately through online lectures?	46 (11.9%)	96 (24.9%)	84 (21.8%)	86 (22.3%)	74 (19.2%)

Figure 2: Effectiveness of Online Learning across Various Years of MBBS



majority of students accessed online lectures via mobile phones, which have proved to be the most preferred and convenient means of communication in comparison to laptops and desktops, as observed in other studies conducted in India, China, and other countries as well,[15] perhaps owing to the general prevalence of usage of phones among the average age group of 23 years taken into consideration in these studies.

Surprisingly, students demonstrated confidence in their ability to effectively apply the obtained clinical knowledge through online platforms in their practice as well. This positive outlook existed despite acknowledging the shortcomings and challenges posed by the new system vis-a-vis satisfactory student-teacher interaction, [16] personal engagement, conceptual certitude, and fair assessment techniques. [17] This finding was inconsistent with studies

Table 4: Scores of Effectiveness of online learning

Effectiveness	Least Effective (12-28)	Mild Effective (29-36)	Moderate Effective (37-44)	Very Effective (45-60)	Total
No. of students fall	101 (26.2%)	102 (26.4%)	140 (36.3%)	43 (11.1%)	386

conducted in medical schools in Jordan, Poland, and other countries, [18] where students expressed grave concerns regarding the lack of hands-on interaction with patients, which they deemed crucial for their professional training. This discrepancy highlights the diverse perceptions and adaptations of e-learning across different educational and cultural contexts.

Another critical aspect of e-learning is internet accessibility. In our study, internet service was accessible to 92.75% of students, which proves the general implementation of e-learning is plausible, considering it could be a major inconvenience encountered in different geographical areas, especially in developing countries like Pakistan and their rural areas. [19] Limited internet connectivity in such areas can hinder the equitable implementation of online education and must be addressed to ensure inclusivity.

We observed a statistically significant trend in students' inclination towards self-directed learning [20] and its positive relation to their tendency of increased duration of exposure to phone screens and internet surfing [19] for educational purposes, averaging to about 1-5 hours daily in these activities. The majority of students, as also observed in a study done in India, albeit at the cost of adverse health effects [21] including eye strain, reported findings of increased motivational challenges and psychological fatigue. [22]

Recent findings by Peine et al. found that self-directed e-learning can outperform traditional face-to-face learning in some contexts. [23] This is probably a major contributory factor to students' self-confidence [20] and the growing acceptance of e-learning. [24] However, the success of e-learning is not solely attributed to technology but also to the adaptability of students and educators, along with the integration of innovative pedagogical methods. Nevertheless, these developments should not obscure the inherent limitations of e-learning. Despite its advantages, e-learning cannot replicate the tangible experiences and interpersonal connections of the classroom, hands-on training, and clinical learning environments.

The study also highlighted the necessity for comparative studies to evaluate the outcomes and performances of students trained through online education versus those trained through traditional methods. [25] Such studies could provide valuable insights into the effectiveness of e-learning and guide its strategic integration into educational systems. While e-learning offers several benefits, including flexibility and accessibility, its absolute effectiveness remains debatable. Practical considerations, such as the need for hands-on training, suggest that e-learning should be viewed as a complementary rather than a replacement method for classroom learning, and claims of its absolute effectiveness could be misleading. [26]

To ensure the sustainable integration of e-learning, it is crucial to address the identified challenges. These include enhancing interactive components, providing equitable access to digital resources, and developing hybrid models that combine the strengths of both online and traditional learning. By doing so, education systems can harness the potential of e-learning while preserving the irreplaceable value of face-to-face interactions and experiential learning.

In conclusion, e-learning has proven to be a viable and innovative approach to education during the COVID-19 pandemic, particularly for its accessibility and adaptability. However, its limitations must be carefully considered, and efforts should be made to create a balanced and inclusive educational framework. Future research should focus on long-term implications, comparative effectiveness, academic outcomes, and professional competence gained through e-learning versus traditional methods. Such insights could guide the strategic integration of e-learning into educational systems. Additionally, fostering a supportive learning environment and addressing mental health concerns remain paramount for the success of e-learning.

CONCLUSION:

The perception of e-learning's effectiveness was moderately positive among most medical students. While most students found the system accessible and adaptable, certain groups, such as 3rd-year MBBS students, reported comparatively lower satisfaction. Mobile phones emerged as the primary tool for e-learning, demonstrating their utility and convenience. The findings underscore the need to refine e-learning systems, ensuring they complement traditional teaching while addressing existing challenges.

Authors Contribution:
Shamaila Hassnain: Concept of article and design, Drafting the article, Review of article critically, Final changes of the version and submission

REFERENCES:

1. Altig D, Baker S, Barrero JM, Bloom N, Bunn P, Chen S, et al. Economic uncertainty before and during the COVID-19 pandemic. J Public Econ. 2020;191:104274. DOI: https://doi.org/10.1016/j.jpubeco.2020.104274
2. Kumari A, Ranjan P, Vikram NK, Kaur D, Sahu A, Dwivedi SN, et al. A short questionnaire to assess changes in lifestyle-related behaviour during COVID 19 pandemic. Diabetes Metab Syndr Clin Res Rev. 2020;14(6):1697–701. DOI: https://doi.org/10.1016/j.dsx.2020.08.020
3. Rose S. Medical Student Education in the Time of COVID-19. JAMA - J Am Med Assoc. 2020;323(21):2131–2. Available from: https://www.aamc.org/
4. Soni VD. Global Impact of E-learning during COVID 19. SSRN Electron J. 2020;(June).
5. McFarlane AE. Devices and desires: Competing visions of a good education in the digital age. Br J Educ Technol. 2019;50(3):1125–36.
6. Online technology use in physiotherapy teaching and learning: a systematic review of effectiveness and users' perceptions | Enhanced Reader [I. [cited 2021 Apr 29].

7. Narayanan H. e-Learning Dependency and its Influence during COVID-19 with respect to Higher and Tertiary Education. International Journal of Enhanced Research in Educational Development. 2020;8(5).
8. Singh F, Saini M, Kumar A, Ramakrishna S, Debnath M. Perspective of educational environment on students' perception of teaching and learning. Learning Environments Research. 2023 Jul;26(2):337-59.
9. Zafar U, Daud S, Shakoor Q, Chaudhry AM, Naser F, Mushtaq M. Medical Students'perceptions Of Their Learning Environment At Lahore Medical And Dental College Lahore. Journal of Ayub Medical College Abbottabad. 2017 Oct 15;29(4):595-8.
10. Jarelnape AA, Omer S, Hassan M, Fadlala A, Ali Z, Dinar N, Ali M, Mohammed K, Abdalla YH, Abdelazeem E, Sagiron EI. Challenges and Barriers of E-Learning in Medical Education during the COVID-19 Pandemic from the Viewpoint of Teaching Staff. Bahrain Medical Bulletin. 2024 Mar 1;46(1).
11. Dhawan S. Online learning: A panacea in the time of COVID-19 crisis. Journal of educational technology systems. 2020 Sep;49(1):5-22.
12. Abbas U, Parveen M, Sahito FS, Hussain N, Munir S. E-learning in medical education: a perspective of pre-clinical medical students from a lower-middle income country. BMC Medical Education. 2024 Feb 20;24(1):162.
13. Cheema KH, Ahmad MR, Idrees M, Asif A, Zahra FT, Sarwar A, Ghafoor BA. E-Learning among Medical students of Pakistan: Challenges and Opportunities. Esculapio - JSIMS 2023;19(01):86-90 DOI: https://doi.org/10.51273/esc23.2519118
14. Oparaugo UI, Uzokife GC, Nwanguma VC, Ufearo FN, Chikwe BC. Perceived Effectiveness Of Online Learning On Self-Efficacy And Academic Satisfaction Of Undergraduate Students In Tertiary Institutions In Anambra State. Unizik Journal of Educational Research and Policy Studies. 2025 May 31;19(3).
15. Chowdhury S, Chakraborty P pratim. Universal health coverage - There is more to it than meets the eye. J Fam Med Prim Care. 2017;6(2):169–70.
16. Mancin S, Sguanci M, Pipitone V, Testori A, De Marinis MG, Piredda M. Efficacy of active teaching methods for distance learning in undergraduate nursing education: a systematic review. Teaching and Learning in Nursing. 2025 Jan 21.
17. Gray JA, DiLoreto M. The Effects of Student Engagement, Student Satisfaction, and Perceived Learning in Online Learning Environments This. NCPEA Int J Educ Leadersh Prep. 2016;11(1):98–119.
18. Al-Balas M, Al-Balas HI, Jaber HM, Obeidat K, Al-Balas H, Aborajooh EA, et al. Correction to: Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives (BMC Medical Education, (2020), 20, 1, (341), 10.1186/s12909-020-02257-4). BMC Med Educ. 2020;20(1):1–7.
19. Salemink K, Strijker D, Bosworth G. Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. J Rural Stud. 2017;54(October):360–71.
20. Venkatesh S, Rao YK, Nagaraja H, Woolley T, Alele FO, Malau-Aduli BS. Factors Influencing Medical Students' Experiences and Satisfaction with Blended Integrated E-Learning. Med Princ Pract. 2020;29(4):396–402.
21. Gon S, Rawekar A. Systematic Review on Utilization of Whatsapp in Education. MVP J Med Sci. 2017;4(June):19–25.
22. Aboagye E, Yawson JA, Appiah KN. COVID-19 and E-Learning: the Challenges of Students in Tertiary Institutions. Soc Educ Res. 2020;2(1):109–15.
23. Peine A, Kabino K, Spreckelsen C. Self-directed learning can outperform direct instruction in the course of a modern German medical curriculum - Results of a mixed methods trial. BMC Med Educ. 2016;16(1):1–11. DOI: http://dx.doi.org/10.1186/s12909-016-0679-0
24. Khadija Alhumaid S. COVID-19 & Elearning: Perceptions &Attitudes Of Teachers Towards E-Learning Acceptancein The Developing Countries. Multicult Educ. 2020;6(2):10–0.
25. Nahid Khalil Elfaki, Itedal Abdulraheem, Rashida Abdulrahim. Impact of e-learning vs traditional learning on student's performance and attitude. Int J Med Res Heal Sci. 2019;24(3):225–33.
26. Vaona A, Banzi R, Kh K, Rigon G, Cereda D, Pecoraro V, et al. E-learning for health professionals. Cochrane Database Syst Rev. 2018 Jan 21;1(1):CD011736. DOI: 10.1002/14651858.CD011736.