"E-LEARNING RESOURCES IN MEDICAL EDUCATION: A STUDY ON THE EFFECTIVE UTILIZATION AMONG MEDICAL STUDENTS IN A PRIVATE SECTOR MEDICAL COLLEGE IN LAHORE, PAKISTAN"

Farrukh Sarfraz[1*], Harrison Daka[2], Rizwan Zafar Ahmad[3], Sehrish Liaqat[4], Tanweer Ahmed Qumar[5], Mudassir Shahbaz[6]

[1*]Associate Professor, Director Department of Medical Education, Sahara Medical College, The Sahara University, Narowal
[2]Consultant, Postgraduate Program Coordinator, School of Education, University of Zambia
[3]Professor & Head of Department, Medical Unit 2, Akhtar Saeed Medical and Dental College/Farooq Hospital Lahore
[4]Consultant Physician at HOWASHAFI Family Clinic, Lahore
[5]Senior Demonstrator, Department of Community Medicine, Rahbar Medical College, Lahore
[6]Associate Professor, Department of Anatomy, Sahara Medical College, The Sahara University, Narowal

*Correspondence Author: Farrukh Sarfraz
*Email: drfarrukhsarfraz@gmail.com, Cell: +92 322-9111000

Abstract
Introduction:
For centuries, teaching and learning have been an integral part of human existence, and will continue to be so. However, the field has undergone significant transformations in recent decades, with the introduction of e-learning being the latest development. Several factors have driven the growth of e-learning, including shifting student needs and behaviors, cost reduction, quality improvement, and increased accessibility. The use of e-learning tools in medical education has grown dramatically, particularly after the COVID-19 pandemic.
As the number of geographically dispersed learners continues to rise, and technology-based services become more diverse, the adoption of e-learning is likely to expand in the future.
Objective:
To explore the resources used by medical students to keep themselves updated with the latest global changes in medical science.
Material and Methods
A cross-sectional study of 262 participants was conducted at Azra Naheed College Medical College Superior University Lahore. After obtaining consent, a validated questionnaire was completed to collect data on students' demographic characteristics, academic level, and online resource usage patterns. The study involved 262 participants, of which 106 (40.5%) were male and 156 (59.5%) were female.
Results:
The study finds the resources used and affecting their day to day activities by e-learning for medical students. Frequency percentage mean and standard deviation was determined. Descriptive statistics

indicate that the mean for all the variables is over three indicating an overall positive response. A p-value of 0.00 typically indicates that the observed result is extremely statistically significant.

Conclusion:
This research finds that effectiveness of e-learning rests in development of skills related to independent learning.

Keywords: E-learning, medical students, higher education, effective utilization, online learning

Introduction:
As internet access and internet-enabled devices become increasingly widespread, e-learning providers have a unique opportunity to revolutionize the way we learn. By shifting the focus from formal, institutionalized learning to informal, independent, and lifelong learning, e-learning can empower individuals to take ownership of their educational journey. To achieve this, e-learning providers should prioritize teaching students the skills they need to become autonomous learners, such as critical thinking, information literacy, and expert interaction. By doing so, e-learning can expand its reach and have a profound impact on society. For providers and policymakers, this approach will help cultivate a knowledge-seeking and informed society, where individuals are equipped to navigate the complexities of the modern world[1, 2].

Education is the cornerstone of nation-building, and access to knowledge has always been a top priority. Traditionally, physical book libraries have been the primary source of information for those seeking knowledge. However, with the advent of the internet, the game has changed. Now, vast collections of books and resources are readily available online, accessible through mobile devices, tablets, and computers, making knowledge easily accessible at our fingertips. Moreover, new educational materials are now available online in a remarkably short time, making traditional books and libraries less accessible and less convenient. The internet has become the go-to substitute for physical libraries, offering round-the-clock access and eliminating the need to carry multiple books, making it an ideal solution for modern learners[3, 4].

As the number of geographically dispersed learners continues to grow, and technology-based solutions become increasingly available, e-learning is likely to become a more prominent choice over time. However, critics question its effectiveness in terms of learning outcomes and highlight the need to weigh the advantages and disadvantages of e-learning compared to traditional classroom-based learning. While e-learning offers cost-effectiveness, accessibility, and convenience, concerns remain about its quality and viability. Moreover, e-learning may lack interactivity and instructional depth, which can make it inferior to traditional classroom learning. Interactivity and instructional method have a significant impact on individual learning, and the need for interactivity creates a gap that affects the quality of learning delivered through e-learning channels. Despite these challenges, e-learning is gaining recognition as a viable alternative to traditional instruction, and its popularity is growing due to several reasons[5, 6].

A significant obstacle to effective e-learning is the limited familiarity with online learning platforms among secondary school students, particularly compared to their counterparts in Western nations. This lack of experience can pose a double challenge for students, as they must not only grasp complex subject matter but also navigate an unfamiliar learning format. As a result, teachers play a crucial role in facilitating the learning process and must possess both subject expertise and the ability to foster constructivist learning. Moreover, teachers need to be well-versed in leveraging e-learning resources to create engaging and effective learning experiences. However, many experienced teachers in higher education institutions may not possess the necessary skills to effectively integrate e-learning into their teaching practices, presenting a significant professional development challenge[7].

The term 'effectiveness' is often used but lacks clarity, as its meaning can vary depending on the stakeholder's perspective. In essence, effectiveness refers to the successful attainment of goals. In the context of e-learning, effectiveness can be defined as the extent to which a system achieves its short-term and long-term objectives[8]. To evaluate e-learning effectiveness, it's essential to consider both short-term and long-term benefits, as proposed by Reeves and Hedberg[8]. This study adopts a comprehensive view of effectiveness, encompassing not only subject knowledge but also self-directed learning skills. The researcher believes that e-learning has the potential to empower individuals with the skills and resources needed for independent learning, leading to significant benefits for human resource development in today's society.

Material and Methods:
A cross-sectional study was conducted at Azra Naheed Medical College, Superior University Lahore, employing a sample of 262 participants. Informed consent was obtained from all participants prior to data collection. A validated questionnaire was administered to gather data on demographic characteristics, academic level, and online resource utilization patterns among students. Additionally, the questionnaire assessed students' perceptions regarding e-learning. Simple random sampling was employed, ensuring equal probability of selection for each participant in the population. Descriptive statistics, including frequencies, percentages, mean, and standard deviation, were calculated. Inferential statistics were used to determine significant differences, with p-values noted. A p-value of ≤ 0.05 was considered statistically significant.

Results:

Table: 1

No.	Parameter		Frequency	Percentage
1	**Gender**	Male	106	40.5%
		Female	156	59.5%
2	**Age Group**	18-22 years	153	58.4%
		23-26 years	72	27.5%
		27-30 years	37	14.1%
3	**Level of Study**	Ist year MBBS	61	23.3%
		2nd year MBBS	40	15.3%
		3rd Year MBBS	57	21.8%
		4th Year MBBS	58	22.1%
		5th Year MBBS	46	17.6%
4	**How do you rate your experience with e-learning**	Novice	53	20.2%
		Intermediate	108	41.2%
		Experience	101	38.5%
5	**Frequency of Use**	Daily	190	72%
		Weekly	72	28%
6	**Challenges in using E-learning tool**	Internet connectivity	25	9.5%
		High cost digital device	160	61%
		Lack of motivation	71	27%
		Lack of guidance	6	0.02%
7	**Prefer learning method**	Online	150	57%
		Face to face	70	27%
		Combine (Online & face to face)	42	16%
8	**Awareness & effective utilization of e-learning tools**	You tube	182	69%
		Zoom/ Google meet	50	19%

		Medical apps	10	4%
		LMS (learning management system)	20	8%

Mean of all learning Domains Mean

- Acessibility: 4.38
- Learning Utilization: 4.12
- Learning Outcome: 4.56
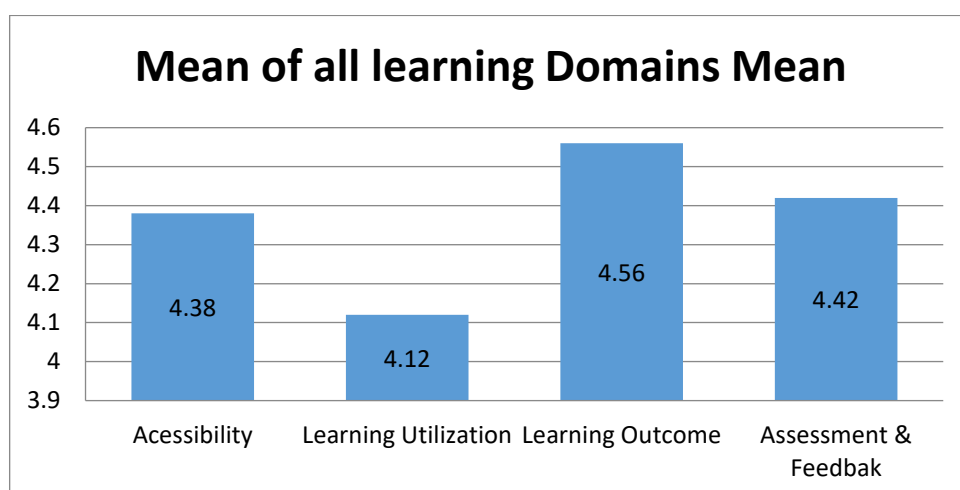- Assessment & Feedbak: 4.42

Figure: 1 showing mean of all learning domains

There were 262 participants in the research in which 106(40.5%) were males and 156(59.5%) females. There were three age groups identified. In this first group 18-22 years in which most of the students 153(58.4%) were participated, other age group was 23-26 years in which 72(27.5%) students were participated and last group include 27-30 year of age in which 37(14.1%) students were participated. There were five levels of study from which students participated for e learning activities that include 1st to 5th year MBBS in which 23.3% from Ist year, 15.3% from 2nd year, 21.8% from 3rd year, 22.1% from 4th year and 17.6% medical students from 5th year MBBS. Out of 262 medical students 20.2% novice, 41.2% intermediate and 38.5% experienced when relate to the usage of e-learning as shown in table 1. Students use e learning regularly on daily basis counted 190 students (72%) and 72 (28%) students on weekly basis as learning tool. While doing e-learning most of the student's not facing ant connectivity issue however 25 (9.5%) students reported connectivity issue. The main issue regarding e-learning usage is high cost of digital device which reportedly by 160 (61%) of the students. The students showing lack of motivation reported as 71 (27%) and 6 students (.02) having lack of guidance. The prefer medium for learning is online reported by 150 (57%) of the students, 70 (27%) students prefer face to face learning and 42 (16%) students used combine i.e. online and face to face both methods for learning. The students used various platforms and are aware regarding effective utilization of e-learning tools as 182 (69%) of the students used you-tube for learning, 50 (19%) of the students used Zoom or Google meet, 10 (4%) of the students used medical applications and 20 (8%) of the students used learning management system for e-learning.

The study finds the resources used and impacting their day to day activity by e-learning for medical students. Descriptive statistics indicate that the mean for all the variables is over three indicating an overall positive response. Learning Utilization has a slightly lower mean score. Standard deviations are relatively low, indicating consistent responses. A p-value of 0.00 typically indicates that the observed result is extremely statistically significant. The majority of respondents find online resources accessible. Learning outcomes are perceived positively. Assessment feedback is considered effective hence learning utilization could be improved.

Discussions:
The findings of this study reveal that e-learning resources are widely used and recognized by medical students for their role in enhancing education. However, the full potential of these tools

remains underutilized due to existing challenges, particularly in developing regions like Pakistan. E-learning offers flexibility, accessibility, and a vast array of resources for self-directed learning. Students reported that platforms such as YouTube, Zoom, and medical apps help simplify complex medical concepts, improve exam preparation, and provide visual learning opportunities.

The most significant challenge reported was poor internet connectivity. Improving infrastructure, particularly high-speed internet access, is essential to address this issue. This research examines various forms of human interaction and provides insights into how people communicate differently. There are number of suggestions on how to make e-learning better and improve its quality overall. This study agrees with previous research that found interaction is important. The important thing for reaching e-learning goals[9] found that the way things are taught can have a big impact on what students learn[10].

In this study regarding domain of high accessibility the mean score of 4.38 indicates that participants find online resources easily accessible. Secondly positive learning outcomes mean score of 4.56 suggests that participants perceive online learning as effective in achieving desired learning outcomes and Effective assessment and feedback mean score of 4.42 indicates that participants consider assessment feedback to be constructive and helpful.
This study also highlighted that there is a room for improvement in learning utilization as it slightly lower mean score of 4.12 for learning utilization suggests that participants may not be utilizing online resources to their full potential.

This research finds that interactivity is essential for learners to engage with the e-learning system in both personal and technical terms. In other words, interactivity is critical for learners to learn from the teachers and other student and at the same time interactivity is essential for the learners to utilize the content and the system. This research, thus, supports the claim of Rochester and Pradel (2008) that interactivity has a significant influence on the overall learning satisfaction of the e-learners[11]. This research also supports the claim of Croxton (2014) that interaction allows active engagement of the learner which is essential for not only his knowledge of the subject but also for the development of independent learning skills[12].

Implications:
1. Increased Adoption: High accessibility and positive learning outcomes may encourage more students to adopt online learning.
2. Improved Resource Utilization: Strategies to enhance learning utilization, such as training or incentives, may be necessary.
3. Continuous Feedback: Regular assessment feedback is crucial for student success.
4. Institutional Support: Institutions should ensure continued accessibility and effectiveness of online resources.

Conclusion:
This research finds that effectiveness of e-learning rests in development of skills related to independent learning. With increased adoption of internet and ubiquity of internet enabled devices most individuals have access to e-learning content online. Amidst such a technologically empowered environment e-learning providers should strive to increase the focus of learning and transform it from formal and institutionalized process to informal, independent and life long process. This can be achieved by focusing broadly on teaching the students skills to become independent learners. For example, by teaching them how to ask the right questions, how to search for the information, how to access and assimilate the information independently and how to interact with experts from the field.

References

1. Wang R, Lowe R, Newton S, Kocaturk T. Task complexity and learning styles in situated virtual learning environments for construction higher education. Automation in Construction. 2020;113:103148.
2. Kumar Basak S, Wotto M, Belanger P. E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. E-learning and Digital Media. 2018;15(4):191-216.
3. Alqahtani AY, Rajkhan AA. E-learning critical success factors during the covid-19 pandemic: A comprehensive analysis of e-learning managerial perspectives. Education sciences. 2020;10(9):216.
4. Mehta A, Morris NP, Swinnerton B, Homer M. The influence of values on E-learning adoption. Computers & Education. 2019;141:103617.
5. Hoi SC, Sahoo D, Lu J, Zhao P. Online learning: A comprehensive survey. Neurocomputing. 2021;459:249-89.
6. Nambiar D. The impact of online learning during COVID-19: students' and teachers' perspective. The international journal of Indian psychology. 2020;8(2):783-93.
7. Biwer F, Wiradhany W, Oude Egbrink M, Hospers H, Wasenitz S, Jansen W, et al. Changes and adaptations: How university students self-regulate their online learning during the COVID-19 pandemic. Frontiers in psychology. 2021;12:642593.
8. Chen W, Reeves TC. Twelve tips for conducting educational design research in medical education. Medical teacher. 2020;42(9):980-6.
9. Bayrak F, Altun A. Development of online course satisfaction scale. Turkish Online Journal of Distance Education. 2020;21(4):110-23.
10. Lei J, Lin T. Emergency online learning: The effects of interactional, motivational, self-regulatory, and situational factors on learning outcomes and continuation intentions. The International Review of Research in Open and Distributed Learning. 2022;23(3):43-60.
11. Rochester CD, Pradel F. Students' perceptions and satisfaction with a web-based human nutrition course. American Journal of Pharmaceutical Education. 2008;72(4).
12. Croxton RA. The role of interactivity in student satisfaction and persistence in online learning. Journal of online learning and teaching. 2014;10(2):314.