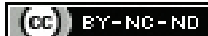# Need Based Role of E-Learning in Current Medical Education Environment: Skepticism to Acceptability

PRERNA AGARWAL[1], AARTI SOOD MAHAJAN[2]

ABSTRACT

E-learning has taken centre stage during this period of social distancing and lockdowns, in the current pandemic, by enabling education to continue. There are perceptibly no limitations to the utility of e-learning tools in the cognitive domain of learning. It complements traditional learning in other domains, namely, psychomotor, affective and communication skill, fairly well. Not only does it ease learning in terms of availability and accessibility, but with the options of asynchronous learning and personalisation of content, it also empowers learners with more autonomy. Despite the limitation of lack of 'hands-on' training and experience with e-learning, it has been accepted quite well, although initially both teachers and learners had been skeptical about its applicability and quality. In the ongoing pandemic period, e-learning may assume a bigger role as blended learning in medical education. While this transition may be smooth for the better resourced nations who already have the required infrastructure and resources ready, the resource limited nations may first have to develop the same before being able to implement it. Ensuring the availability of cheap and high-speed internet, computers in various forms (desktops, laptops, tablets and smartphones) within reach of every learner, will enable them to go online.

INTRODUCTION

The concept of e-learning is well known in medical education [1]. Technological advancements have brought in an attractive array of e-learning resources, varying from simple internet sources to the highly advanced augmented reality and telemedicine, these are undergoing innovations and may provide various opportunities in future [2,3]. In the current pandemic, when universities had to suddenly go online for enabling education to continue during 'lockdown' gave an opportunity for e-learning to not only meet the emergency need, but also unleashed its tremendous potential and before the word. In the postpandemic period, e-learning is likely to be a definite teaching-learning strategy assuming a bigger role in medical curriculum [4-6].

However, there are questions that come to mind, which need to be addressed before we begin to rely more on technology. Does e-learning match up to the standards of traditional learning, taking place in classrooms, using chalk and board, books, etc.,? Can it replace traditional teaching and learning? If not, what are the limitations and challenges? What could be done to enrich it?

This paper is an appraisal of the e-learning methods and experiences with it, of both teachers and learners, as perceived by the authors from recently published literature on the same, with respect to its application in a resource-limited medical education environment, where there is paucity of financial support as well as technological advancement.

NEED AND OPPORTUNITIES OFFERED BY E-LEARNING

E-learning has enriched learning and complements the traditional method. It fulfils the unmet needs of learning opportunities that remain unaccomplished by traditional learning methods, including the following:

Overcoming the barriers of time and distance- E-learning has bridged the distance between the learner and teacher. It has, thereby, made possible even real time teaching-learning when the learner and the teacher may be located on different sites on the world map in different time zones, or in remote areas [3,7].

Overcoming resource limitation- Access to numerous resources of the web, online availability 24×7, are some options that adress the issue of limitation of resources [1]. Limitations of space, infrastructure, manpower and finance are taken care of by enabling virtual educational institutions and modules, instead of a physical college or classrooms, libraries and labs [2,7].

Empowering the potential learner- Asynchronised learning, repeated use of learning modules (reusable e-learning object) and storage of prepared modules so that learners can take their own time to learn without the constraint of time, with any number of repetitions and at their own pace [2,7,8].

Enriching the teaching-learning modules: Incorporation of animations, videos, audios, complicated diagrams, virtual hands-on training, augmented reality, etc., have all been made possible with utilisation of various electronic resources [1,3,4,7].

Enabling continued education- E-learning is at the dispense of learners at all stages of life, at all places and at all times. College dropouts, those keen for higher qualifications, those eager to keep abreast with advances in their field of education can easily avail e-learning opportunity without compromising their current employment [2].

Learning opportunity during undesirable circumstances- With e-learning, education and skill development can continue amidst undesirable conditions like that of disease outbreak, unforeseen natural or manmade calamities like violence and war. Both teacher and learner need not expose them to environmental threats and rather continue their endeavour. It may be the only option available as in the times of a pandemic [4,5].

TOOLS FOR E-LEARNING

Any electronic medium that enables imparting educational resources makes a potential tool for e-learning. The medium may be interactive or non interactive and may or may not enable real time e-learning opportunities [1,3].

[Table/Fig-1] summarises the various e-learning tools that are available. E-learning resources are applicable in all domains of learning, including cognitive, psychomotor, affective and communication skills domains [9,10]. There are perceptibly no limitations to the utility of e-learning tools in the cognitive domain of learning [1]. However, the same cannot be said to be equally valid for learning in other domains [1-3,7,8,11,12,13].

All these e-learning modules may be classified as static, advanced, interactive online and class modules. Static online modules include online textbooks, video-based teaching, flashcards, etc., [1]. The interactive online modules webinars, virtual video classrooms, chat rooms, conference transmission etc. [3]. Online teaching-learning tools may be further classified as synchronous and asynchronous activities [5,8].

The choice of e-learning modality is determined by the learning objectives of the course content, whether they can be effectively achieved using the modality or not. Implementing the e-learning tool will require redesigning of the content such that it is deliverable as well as learnable through the e-learning tool. The institute may want to adopt a Managed Learning Environment (MLE) or a Virtual Learning Environment (VLE), 'Learning Management System' (LMS) or 'Course Management System' (CMS) as a platform for regulating the teaching learning activities. This may be commercial, proprietary ones like Web CT or blackboard or open source like moodle or sakai. The LMS utilises a single window application software to dispense the medical curriculum [8,12]. Besides internet based, local area network based and non networked computer-based e-learning interventions can also be used. Once both the course content and delivery system are decided, an additional requirement

is assessment of activities and exercises. The e-assessments could be done for knowledge, using Multiple-Choice Question (MCQ) and extended matching questions, and quizzes. Evaluation of skills or performance-based assessment can be done using Objective Structured Clinical Examination (OSCE) and using virtual patients. Similarly, attitude can be tested by discussions or peer assessment. Logbooks and portfolios are generally used for practice-based assessments.

The common modes of e-learning being used in the recent pandemic situation have been webinars and virtual classrooms, which are explained as [Table/Fig-2,3]. For using an appropriate e-learning modality: target audience is identified; a relevant topic is selected, and most appropriate learning and assessment tools are chosen that may be used with the e-learning modality, resource personnel are identified, and communicated to (subject experts, administrative staff, technical assistants), floating of the learning modality is planned- date, time, schedule, resource material is collected and rehearsed, the audience and resource persons are formally notified and given timely reminders, audience is enrolled, the modality is put to use as per plan/schedule and assessment of learning of audience is done and a feedback of the e-learning activity is collected from them for further improvisations. Setting up virtual classroom using LMS requires: setting up an e-learning facilitation team having technical and academic committees; developing a road map with time line, identifying learning model and goals, identifying target learners and teachers to deliver the learning resource materials, identifying both learning and teaching needs to fulfil with the e-learning experience, identifying the appropriate e-learning tools, selecting the appropriate learning system management to

Tool	Utility	Limitations
Virtual classroom [3]	Replaces physical classrooms, enables recorded and real time lectures, tutorials, discussions, and problem-based learning. Offer utility as modes for assessment and feedback [3,8].	Limited interaction between the teacher and learners and between learners in a large group [2,7].
Audio, video clips, animations, images [3]	Recording of various procedures, documentaries aid in learning and visualising the steps and details of any procedure. Rare findings can be recorded and shown. Videos of doctor patient interactions depict the affective part of the relationship. Communication with patients and how the medical personnel interact and relate with each other can be shown. The learners can imbibe the non verbal components of medical curriculum (hidden learning in clinical practice) from these [1,3]. Animations complement and clarify cognitive domain learning extremely well. Animations evoke interest of learners.	Objectives of the learning activity need to be stated in the beginning [1,2]. A teacher must be available at the same time or another for discussions for clarity and answering queries. Lack of hands-on component without which any psychomotor, affective or communication skill learning can only be carried out till 'knows how' level. Discussions among the learners are limited [7].
Virtual skill labs, simulation labs and mannequins, virtual and simulated patients, augmented reality [1]	Provide a 'virtual hands-on' training that contributes to cognitive and psychomotor learning. Assessment and feedback may be incorporated parallel to the teaching learning activity [8].	Cannot replace supervised training in actual scientific environment and face to face interactions. No amount of virtual training can inculcate confidence with skills that is obtained with real hands on experience [7,8].
Telemedicine, Web- based video conferencing consultations [2]	Learners can 'virtually accompany' the teacher/specialist during their online medical, surgical practices, gain knowledge and experience. Both assessment and feedbacks may be incorporated [2].	For practice of skill component like robotic surgeries and others in medical sciences, prior hands on training of the skill is essential [2,7].
Databases and digital libraries, e-books, e-journals and e-atlas [8,12,13]	Authentic sources for enriching knowledge [8].	Guidance is required [2]. Limited scope of assessment and feedback, with chance of cheating and plagiarism [7].
Internet-web pages, newsrooms, programmes and apps including mobile e-learning on smart phones [1,8]	Good, vast and easily accessible sources to complement and enrich curricular and extra-curricular learning. Artificial intelligence helps both teachers and learners alike; enhances cognitive application. A ready handy source of guidance/reference [1].	Authenticity of source and validity of information must be established.
Digital gaming [3]	Learning while being entertained; helps to maintain learner interest and promote creativity.	May be a distractor. Limited application.
Discussion forums (for example, reddit, quora, Research gate, e-health, webMD, facmedicine, medstudentsonline, studentdoctor, etc.,) [1]	Platform for exchange of information between learners themselves and between learners and teachers. Invoke critical thinking. New ideas and knowledge may emerge to guide future e-learning.	Steering of the direction of discussions is essential otherwise the whole activity may be led haywire [2].
Social Communication platforms like emails, facebook, twitter, skype and WhatsApp [8]	Platforms for informal communication. Connect the learners and teachers. Allow collaborations. Provide a partial compensation for the lack of human contact on e-learning platforms. Useful for reaching out to leaners at a short notice of time.	May be a distractor. Potential source of abuse-misleading. information, source of anxiety, bullying. Assessment and feedback are not applicable.

[Table/Fig-1]: E-Learning Tools [1,2,3,7,8,12,13].
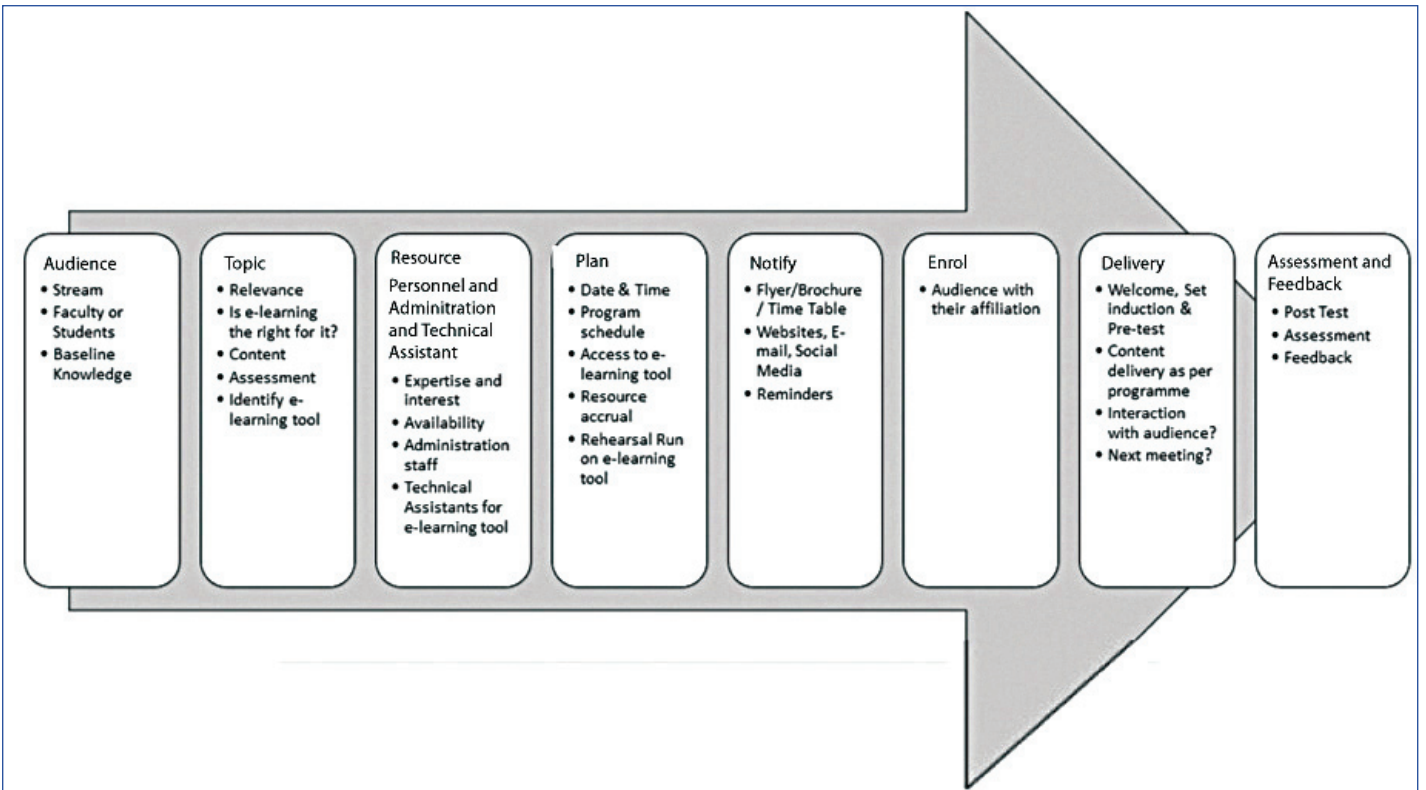
[Table/Fig-2]: Implementing an e-learning modality.
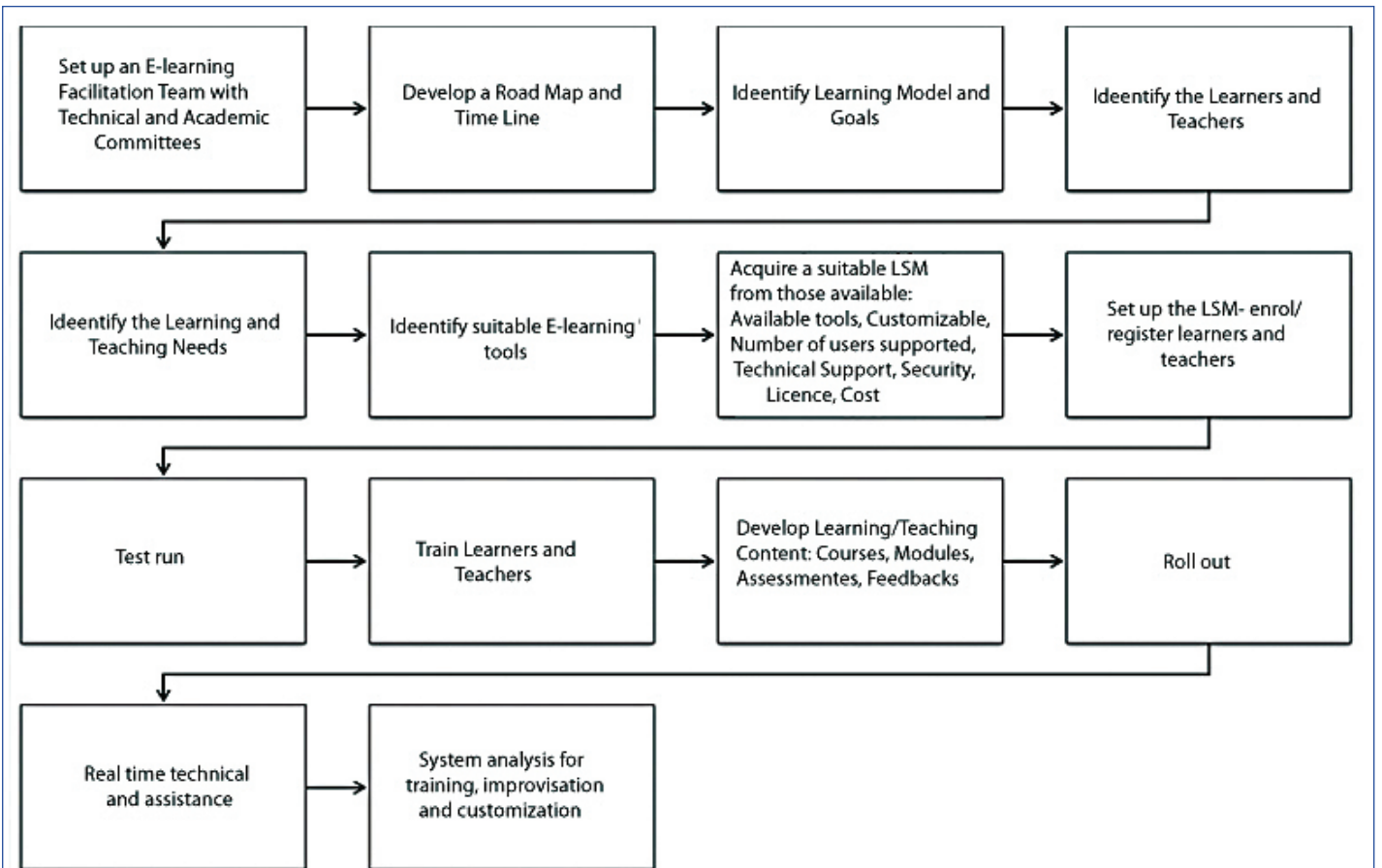
[Table/Fig-3]: Setting up the Virtual Classroom Platform- using Learning Management System (LMS).

deploy the tools as per customisation options, technical support and security provided, licensing needs, cost, user load, etc, setting up the LMS and registering the users; having a test run of the LMS before the actual use, training the faculty and students in using the LMS, developing the learning resource material for use with available teaching learning tools at LMS, roll out of the LMS with, parallel technical support; and system analysis for further training, improvisations and more customisations as may be required.

IS E-LEARNING BETTER THAN TRADITIONAL CLASSROOM LEARNING?

Benefits offered by e-learning are very lucrative and seem to be the answer to every limitation and criticism of the traditional learning. But is that really so? The two modes of learning, traditional learning and e-learning, are compared in [Table/Fig-4] [1,2,5,7,8,13-15]:

Studies comparing traditional learning and e-learning have found mixed results, some conclude e-learning to be at par or even superior

Dimension of Learning	Traditional Learning	E-learning
Availability and accessibility	Immovable infrastructure. Familiar method. Limited accessibility and availability.	Many tools are portable-learning activity becomes accessible at all places and at any time [1,2,5,13]. Technology dependent [1,2,13].
Content	Classroom sessions dependent on availability of teacher/facilitator and learning through other physical sources like library, labs, etc., may be carried out independently [8]. Offer only few repetitions and revisions [2]. Variable learning content. Hands-on training and skill learning are best learned through traditional means- learning achieves the highest level of competence.	Few tools dependent on teacher/ facilitator, few independent of them. Any number of repetitions possible with recorded sessions and other tools independent of facilitators [2,13]. Less variability in learning content [2,8]. Hands-on training not possible [8].
Personalisation	Teacher centred. Limited personalisation. Pace of learning activity may not be suitable for all learners.	Learner centered [8]. Self-directed and may be easily personalised Pace and scope of learning may be modulated [8,13].
Participation of learners and teachers	Learners are more disciplined. Abundant teacher-learner face-to-face interaction.	Difficult to ensure participation and attendance of learners: Inspiration is required [5,7]. Chat facility and access to internet are distractors [8].
Assessment of learning	More variety of assessment tools including hands on skill assessment. In-depth judgement. Surveillance is easy. May be subjective and biased.	Limited variety of tools for assessment. Less variability, more consistent assessment. Surveillance is difficult [7]. More objective, less bias.
Feedback	Feedback more likely to be anonymous and more reliable.	Feedback may not be anonymous.
Resource input vs learning output	Cost, time and manpower requirement is directly proportional to the number of learners [8].	Being technology dependent initial costs may be high [5,8]. Initial designing of e-learning activities may require more time resource but thereafter time requirement decreases [8].
All round professional development	Complete professional development. Team works together to achieve a common goal. Learning empathy, communication skills, team spirit, interpersonal skills. Provides continuous motivation to students. Establishes a good student- teacher relationship. Lays the foundation of patient- doctor relationship. Non verbal signs of students are picked by teachers- important for assessment and feedback. Training and participation ensure confidence development in the future doctors.	Limited contact with others- as learner as well as resource person. Meagre training may be detrimental to build confidence in the future doctors. Lack of development of student- teacher and patient-doctor relationships. Restricted professional development [8].
Health of the individuals, safety and security	Mental and physical health issues directly related to the profession- stress, burnout, etc., Occupational health hazard risk- contracting infections, exposure to chemicals, radiation exposure [14]. Physical and mental fitness programs easily incorporable into the curriculum.	More prone to stress [5], mental and physical health issues and some of them are exclusive to e-learning like Digital eye strain [15]. Less risk to some occupational health hazards of health care industry due to limited direct contact with the environment. Difficult to ensure compliance with physical and mental health programs and assessment of impact is also as difficult. Threat from cybercrime and plagiarism [7].

[Table/Fig-4]: Traditional Learning vs E-learning [1,2,5,7,8,13-15].

[16] and some caution against it [11]. E-learning appears to have a clear edge in 'information dissemination' in any domain of medical education-cognitive, psychomotor, affective and communication. Various interactive artificial intelligence-based tools of assessment effectively analyse theoretical learning and comprehension. Virtual skill labs may be useful in imparting cognition related skills. But traditional learning with hands-on experience is indispensable for actually putting that information to use in patient care and advancement of medical science [8].

ACCEPTABILITY OF E-LEARNING

In the present-day context of competency-based curriculum, the computer aided course instructions are required to meet the expectations of a medical graduate [17,18]. In one study, students perceived that e-learning was used more by students who were self-regulated but it needs to be ascertained if it was associated with deep learning [19]. Similarly, another review has suggested e-learning to be superior to traditional learning for both knowledge gained and skill learning, although the review highlights that there are many contradicting views of the studies done for this evaluation [20]. A recent systematic meta-analysis and review supports the advantage of e-learning over the traditional methods in terms of enhancing undergraduate knowledge and skills and its analysis did not find any study reporting that offline was better than online method of learning [16].

What puts E-learning on the Back Foot?

Simulation may compensate for but never replace utilisation of three senses, namely smell, touch and taste. The smell of the dissection room, stains in labs, disinfectants, operation theatre, wards and OPD, all which incorporates into the aura of a medical student, is missing and cannot be compensated for. Also, the touch of patient's skin, while doing examination, how the enlarged liver feels, and all palpatory and percussion procedures cannot be effectively learnt. Attitude and communication can be learnt but its practice, assessment and feedback require a real time environment. Hands-on training of practical exercises and operative procedures cannot be compared to the traditional method and will always be insufficient [7,11].

So 'E-learning' alone is 'not competent enough'. What about Blended Learning?

The solution to overcoming the limitations of both e-learning and traditional learning lies in blended learning, which involves the use of the various tools of the two modes in an appropriate manner to an advantage to achieve the e-learning outcomes with promising results [20]. However, there are contradictory reports whether blended learning is favourable compared to traditional method of teaching with points for and against it and a lot depends on the motivation of both students and faculty, digital literacy and infrastructure [21-24].

Present Status of E-Learning

E-learning tools have yet not been incorporated formally into the medical curriculum in many parts of the world [25], although in

the face of the current pandemic, medical education across the globe had to switch to virtual classroom teaching. Many analyses and feedbacks conclude achieving partial success in continuing medical education by using the e-learning during the pandemic [26-28]. Few studies highlight that students are keen to adopt e-learning tools as supplemental tools to traditional learning but are skeptical about the infrastructure and training professionals in their university [29, 30]. Models for e-learning should be evaluated for their knowledge gain, time frame and convenience and financial viability [31]. With the availability of cheap and high-speed internet, and smart phones, tablets and laptops within reach of every learner, they are all set to go online.

Barriers to Adopt E-Learning in Medical Education
Postpandemic, we may look forward to e-learning tools being incorporated into medical education curriculum; however we need to overcome the barriers to increase its feasibility. These include inadequate technological infrastructure in institutions, limited availability of continuous power supply and high-speed internet at certain locations. Current curriculum designs and course content may not include e-learning tools in its teaching methods. Faculty training is another issue and learners, teachers and other stakeholders are still sceptical about reliability and validity of e-learning. The entire cost-effectiveness in terms of time, efforts and money has to be worked out for its economic viability and this may be more of an issue in low and middle income group countries [5,7,10,20,29,32].

Future of E-learning
Recent research also upholds the role of e-learning in competency based medical education [33]. E-learning is here to stay and medical education institutes should upgrade their information and technology departments to facilitate it. The faculty too should develop their training tools. It is important to understand that this involves remodeling of the current medical curriculum and faculty development [1,9,20,32]. A recent publication has highlighted that, in Korea, many schools are collaborating to develop learning resource material [34]. The concept of personal learning environment is also coming up, whereby an individual uses the e-learning platform to direct his/her own learning goals [35].

CONCLUSION(S)
E-learning is a need today. Not only shall it upgrade, standardise and universalise medical education, provide more autonomy to the learner, but it shall also make us prepared for any other future pandemics and disasters. For quality assurance, the infrastructure preparation in medical colleges, development of teaching-learning modules and validation of assessment tools with a good utility is what is needed in present circumstances. The students shall accept the e-learning activities once we as faculty and our institutions are ready.

REFERENCES
[1] Ellaway R, Masters K. E-Learning in Medical Education Teaching and Learning. AMEE Guides in Medical Education. 2008.
[2] Masic I. E-Learning as New Method of Medical Education. Acta Informatica Medica. 2008;16(2):102. Doi: 10.5455/aim.2008.16.102-117.
[3] Schneider M, Binder T. E-Learning in medicine: Current status and future developments. Hamdan Medical Journal. 2019;12(4):147. Doi: 10.4103/hmj.hmj_74_19.
[4] Almarzooq Z, Lopes M, Kochar A. Virtual Learning during the COVID-19 Pandemic: A Disruptive Technology in Graduate Medical Education. Journal of the American College of Cardiology. 2020. Doi: 10.1016/j.jacc.2020.04.015.
[5] Dhawan S. Online learning: A panacea in the time of COVID-19 crisis. Journal of Educational Technology Systems. 2020;49(1):05-22. Doi: 10.1177/0047239520934018.
[6] Potaliya P, Ghatak S. New trends in medical education during and post COVID-19 pandemic. European Journal of Medical and Health Sciences. 2020;2(3). Doi: 10.24018/ejmed.2020.2.3.275.
[7] Arkorful V, Abaidoo N. The role of e-learning, the advantages and disadvantages of its adoption in Higher Education. International Journal of Education and Research. 2014;2(12).
[8] Dhir SK, Verma D, Batta M, Mishra D. E-learning in medical education in India. Indian Pediatrics. 2017;54(10):871-77. Doi: 10.1007/s13312-017-1152-9.
[9] Choules AP. The use of e-learning in medical education: A review of the current situation. Postgraduate Medical Journal. 2007;83(978):212-16. Doi: 10.1136/pgmj.2006.054189.
[10] George PP, Papachristou N, Belisario JM, Wang W, Wark PA, Cotic Z, et al. Online eLearning for undergraduates in health professions: A systematic review of the impact on knowledge, skills, attitudes and satisfaction. Journal of Global Health. 2014;4(1). Doi: 10.7189/jogh.04.010406.
[11] Vaona A, Banzi R, Kwag KH, Rigon G, Cereda D, Pecoraro V, et al. E-learning for health professionals. Cochrane Database of Systematic Reviews. 2018. Doi: 10.1002/14651858.cd011736.pub2.
[12] Back DA, Behringer F, Haberstroh N, Ehlers JP, Sostmann K, Peters H. Learning management system and e-learning tools: An experience of medical students' usage and expectations. International Journal of Medical Education. 2016;7:267-73. Doi: 10.5116/ijme.57a5.f0f5.
[13] Al-Shorbaji N, Atun R, Car J, Majeed A, Wheeler E. E-learning for undergraduate health professional education- A systematic review informing a radical transformation of health workforce development. 2015.
[14] Izadi N. Occupational Health Hazards among Health Care Workers. Public Health Open Access. 2018;2(1). Doi: 10.23880/phoa-16000120.
[15] Sheppard AL, Wolffsohn JS. Digital eye strain: Prevalence, measurement and amelioration. BMJ Open Ophthalmology. 2018;3(1):e000146. Doi: 10.1136/bmjophth-2018-000146.
[16] Pei L, Wu H. Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis. Med Educ Online. 2019;24(1):1666538.
[17] Ruiz JG, Mintzer MJ, Leipzig RM. The impact of E-Learning in medical education. Academic Medicine. 2006;81(3):207-12.
[18] Felder E, Fauler M, Geiler S. Introducing e-learning/teaching in a physiology course for medical students: Acceptance by students and subjective effect on learning. Advances in Physiology Education. 2013;37(4):337-42.
[19] Guy R, Byrne B, Dobos M. Optional anatomy and physiology e-learning resources: Student access, learning approaches, and academic outcomes. Advances in Physiology Education. 2018;42(1):43-49. Doi: 10.1152/advan.00007.2017.
[20] Regmi K, Jones L. A systematic review of the factors- enablers and barriers-affecting e-learning in health sciences education. BMC Medical Education. 2020;20(1):91.
[21] Harwood KJ, McDonald PL, Butler JT, Drago D, Schlumpf KS. Comparing student outcomes in traditional vs intensive, online graduate programs in health professional education. BMC Medical Education. 2018;18(1):240.
[22] Munro V, Morello A, Oster C, Redmond C, Vnuk A, Lennon S, et al. E-learning for self-management support: Introducing blended learning for graduate students- A cohort study. BMC Medical Education. 2018;18(1):219.
[23] Okaz AA. Integrating blended learning in higher education. Procedia- Social and Behavioral Sciences. 2015;186:600-03.
[24] Turk B, Ertl S, Wong G, Wadowski PP, Löffler-Stastka H. Does case-based blended-learning expedite the transfer of declarative knowledge to procedural knowledge in practice? BMC Medical Education. 2019;19(1):447.
[25] Barteit S, Guzek D, Jahn A, Bärnighausen T, Jorge MM, Neuhann F. Evaluation of e-learning for medical education in low- and middle-income countries: A systematic review. Computers & Education. 2020;145:103726. Doi: 10.1016/j.compedu.2019.103726.
[26] Olum R, Atulinda L, Kigozi E, Nassozi DR, Mulekwa A, Bongomin F, Kiguli S. Medical education and E-Learning during COVID-19 pandemic: Awareness, attitudes, preferences, and barriers among undergraduate medicine and nursing students at Makerere University, Uganda. J Med Educ Curric Dev. 2020;7:2382120520973212. Doi: 10.1177/2382120520973212. PMID: 33283049; PMCID: PMC7682244.
[27] Kaur N, Dwivedi D, Arora J, Gandhi A. Study of the effectiveness of e-learning to conventional teaching in medical undergraduates amid COVID-19 pandemic. National Journal of Physiology, Pharmacy and Pharmacology. 2020;10(7):1. Doi: 10.5455/njppp.2020.10.04096202028042020.
[28] Al-Balas M, Al-Balas HI, Jaber HM, Obeidat K, Al-Balas H, Aborajooh EA, et al. Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: Current situation, challenges, and perspectives. BMC Med Educ. 2020;20(1):341. Doi: 10.1186/s12909-020-02257-4. Erratum in: BMC Med Educ. 2020 Dec 16;20(1):513. PMID: 33008392; PMCID: PMC7530879.
[29] Frehywot S, Vovides Y, Talib Z, Mikhail N, Ross H, Wohltjen H, et al. E-learning in medical education in resource constrained low- and middle-income countries. Human Resources for Health. 2013;11(1). Doi: 10.1186/1478-4491-11-4.
[30] Obi IE, Charles-Okoli AN, Agunwa CC, Omotowo BI, Ndu AC, Agwu-Umahi OR. E-learning readiness from perspectives of medical students: A survey in Nigeria. Nigerian Journal of Clinical Practice. 2018;21(3). Doi: 10.4103/njcp.njcp_108_17.
[31] Ruggeri K, Farrington C, Brayne C. A Global model for effective use and evaluation of e-learning in health. Telemedicine and e-Health. 2013;19(4):312-21. Doi: 10.1089/tmj.2012.0175.
[32] Cecilio-Fernandes D, Parisi MCR, Santos TM, Sandars J. The COVID-19 pandemic and the challenge of using technology for medical education in low and middle income countries. MedEdPublish. 2020;9(1). Doi: 10.15694/mep.2020.000074.1.
[33] Kim S. The Future of e-Learning in medical education: Current trend and future opportunity. Journal of Educational Evaluation for Health Professions. 2006;3(3):3. Doi: 10.3352/jeehp.2006.3.3.

[34] Kim KJ, Kim G. Development of e-learning in medical education: 10 years' experience of Korean medical schools. Korean Journal of Medical Education. 2019;31(3):205-14. Doi: 10.3946/kjme.2019.131.

[35] Haworth R. Personal learning environments: A solution for self-directed learners. Tech Trends. 2016;60(4):359-64. Doi:10.1007/s11528-016-0074-z.

PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Physiology, Government Institute of Medical Sciences, Greater Noida, Uttar Pradesh, India.
2. Director Professor, Department of Physiology, Maulana Azad Medical College, New Delhi, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Prerna Agarwal,
Assistant Professor, Department of Physiology, Government Institute of Medical Sciences, Greater Noida-201310, Uttar Pradesh, India.
E-mail: dr.preranaagarwal@gmail.com

AUTHOR DECLARATION:
• Financial or Other Competing Interests: None
• Was informed consent obtained from the subjects involved in the study?   No
• For any images presented appropriate consent has been obtained from the subjects.   No