REVIEW ARTICLE

# Changing methods of teaching and learning, and assessment in the new normal in undergraduate medicine

Gominda G. Ponnamperuma[1], Dujeepa D. Samarasekera[2]

[1] Department of Medical Education, Faculty of Medicine, University of Colombo, Sri Lanka
[2] Centre for Medical Education, National University of Singapore, Singapore

**Article Information**

Authors have no conflicts of interest to declare.

*Keywords:* COVID-19, Hybrid learning, Online learning, Faculty development, Learning design

**Author responsible for correspondence:**
Gominda Ponnamperuma
Department of Medical Education
Faculty of Medicine,
University of Colombo, Sri Lanka
Email: gominda@medarc.cmb.ac.lk

DOI: https://doi.org/10.4038/cjms.v58i2.5048

## Abstract

The COVID-19 pandemic has radically changed the way we live and work, including the way we educate and train medical students. In the new normal, it is important for medical schools to adapt their methods of teaching and assessments to ensure that students are prepared for their future role as clinicians providing effective and empathetic care to their patients and communities. The paper discusses the ways in which the learning environment has changed for medical students as well as some of the challenges and ways forward in the new normal. The use of online platforms to conduct virtual lectures, seminars, and tutorials enabling students to learn from anywhere, at any time, and at their own pace is one of the major changes we saw; which also saw poor quality learning material being developed. We also saw some schools employing simulation-based learning to provide students with hands-on training in a safe and controlled environment. Both virtual platforms and simulation were used in student assessments in a few healthcare training institutions during the pandemic. The key to successful learning in the new normal is to anchor teaching-learning activities in a systematic way using best evidence medical education. A blended learning approach can provide students with the benefits of both online and in-person learning, while also accommodating the needs of students who cannot attend in-person classes in the new normal. Learning from the mistakes and if we consider some of the approaches adopted during the pandemic as pilots, educators can build a robust learning environment to ensure that medical students receive the best possible education and training, while also reducing the risk of exposure to future pandemics and ensure the continuity of learning.

## Background

The COVID-19 pandemic led to major changes in both educational and clinical practices. In education, the shift from face-to-face student interactions to an online or distant format was forced; and was a formidable challenge for many educators. The other shift was the use of not-so-familiar infrastructure, mostly digital and open-sourced, to deliver education in an alien learning environment [1]. Due to the profound impact of these shifts on learning and the seriousness of COVID-19, the institutions, programmes and faculty members had no choice but to adapt rapidly to the fluid situation [2]. By now, it is quite evident that no institution will want to revert back entirely to the education system that prevailed during the pre-COVID era. For sure, face-to-face learning would return, but the newfound digital tools that both the learners and teachers are now familiar with will stay side by side with face-to-face learning. So, it is reasonable to presume that COVID-19 has strengthened blended learning.

Considering the rapid changes and major education reforms that happened during the pandemic, institutions are presently re-evaluating how best they should develop their student learning environments to better prepare graduates for the future. In that sense, since the current norms of educational practices do not conform to either the pre-COVID or the COVID days, it is sensible to categorize them as a brand of education in the new normal. At present, evidence of learners' experience in the novel learning environment created by the pandemic is emerging. Their learning effectiveness seems very varied based on the context in which these were operationalized [3,4]. The exposition of the reasons for this mixed response by learners to learning during the COVID days would enable the institutions to draw up a template as to how best the post-COVID learning should be shaped in the new normal. This article first explores the reasons behind the mixed learner response to the educational experiences in the COVID-era and recommends an educational template to follow in the delivery of education in the post-COVID new normal.

**Why did teaching and learning practices during COVID days brought in a mixed learner response?**

Most institutions were ill-prepared for the delivery of learning, especially during the initial phases of the pandemic. This was mainly due to the mental shift that the learners, teachers and institutions had to make and the lack of or weak digital infrastructure to shift from a face-to-face to a remote and distance learning environment. However, the ill-preparedness was not only due to the two easily identified paradigm shifts stated above, i.e., the mental and the learning environment-related paradigm shifts, but also due to a third. That is the educational paradigm shift. This was not apparent, especially during the initial stages of the pandemic period. The major changes to the way we conceptualise, operationalise and evaluate student learning was no doubt the most significant shift that occurred during the pandemic.

To understand the educational paradigm shift, it is necessary to appreciate the limitations of our thinking when we digitalised learning during the COVID days. Even with poor information technology infrastructure facilities, compounded by a lack of knowledge and skills in developing and delivering online teaching-learning material by most of the faculty, there was no other choice but to shift to digital learning. This had its advantages and disadvantages.

Initially, due to the limitations shared before, teachers started directly converting (i.e., with little or no modification) their face-to-face lectures to an online web-based platform. This, unfortunately, was akin to fitting a jet engine to a ship and expecting the ship to fly. Except for the engine, all other infrastructure in the ship has not been made for flying. The total design of creating a digitalised learning environment, where one gets the students engaged and motivated with links to other online interactive material was ignored [1]. So, failure in such a situation is a foregone conclusion. Barring the lesson content, which goes unchanged no matter how it is taught, if everything else has been tailor-made for face-to-face learning, then changing such a lesson to e-learning is like changing the engine of the ship to a jet engine.

Therefore, it is important to note that e-learning is not only a delivery mode but an educational strategy that demands a change in the entire design of the learning environment. In education, this is known as the education systems design [5]. Due to situational and institutional pressures, many changed from delivering the same lecture face-to-face to online using ZOOM or other such web-based formats. We would like to emphasise that the online method of teaching and learning demands a different skill set from the teacher in planning, developing and delivering a lesson. So, e-learning is not a technological challenge, as often portrayed; it is an educational challenge [6].

**How can the teaching and learning challenges of e-learning be overcome?**

The most important step in overcoming e-learning challenges is to stop considering e-learning as a delivery mode and consider it more as a strategy for education system design. The moment that happens, e-learning becomes a pedagogical approach that can be enriched by many other learning activities. The term 'blended learning' was coined, precisely to accommodate this proposition [7]. Simply put, blended learning is inter-weaving a series of learning experiences requiring different activities from both the learner and the teacher. This, however, does not mean putting together a random collection of learning and teaching activities. Instead, there are two key prerequisites for such a collection of teaching and learning activities. First, the teaching and learning activities should be underpinned by a theoretical model that would promote deep and active learning, i.e., student-centred learning. Second, the sequencing and delivery (online or otherwise) of these activities within an overall curriculum (or the constructive alignment) should make sense to the learner as to why they should engage in these activities in that sequence [8]. The latter is often the hardest to achieve, as learners postpone activities partly to suit their schedules and partly due to a lack of understanding of the importance of the sequence of learning events.

Since lectures are still the commonest method of teaching and learning, they were the most commonly converted learning events to e-learning during the COVID days. It would thus be opportune to see how lectures could be converted to e-learning while adhering to the above principles of learning. The most frequent issues, both the

faculty and students complained about as many institutions shifted to online learning were not knowing whether the learners were engaged in learning, the difficulty of speaking to a faceless audience, the difficulties in engaging in a dialogue with the audience, and the problems due to low bandwidth and loss of connectivity. These issues surrounding engagement occurred despite all the smart facilities that online platforms offered such as video conferencing, raise-hand function, polling, chat function, document sharing, whiteboard, breakout rooms, etc., designed to avoid the said complaints. It is also worth noting that most of the complaints raised came about when a synchronous, real-time session was conducted over an extended period of time. So, one way to overcome these complaints is to focus on the overall learning system design where consideration should have been given to shortening the synchronous, real-time sessions with interspersed asynchronous activities. This would have ensured that the learners had to engage in and report back to the teacher, increasing the interactivity as well as rapport building with students. Furthermore, these are best practices in education since they demand the students' attention only for short durations, thus effectively addressing the well-known short attention span and cognitive load of the learner [9]. So, what is the theoretical model that allows the stacking up of short activities for the learner to engage in, interspersed by teacher-learner interactions? Such a model would be the most appropriate theoretical model when converting face-to-face lectures to online learning.

An appropriate theoretical model that caters to the above requirements would be the flipped classroom model [10]. This is also very appropriate for engaging students in a face-to-face classroom situation. When using the flipped classroom model, unlike in traditional lectures, the learners are not provided with knowledge during the lecture. Rather, the assimilation of the required knowledge for the learning activity is gained by the learner before the formal flipped learning activity with the teacher. This way, losing the learner's attention due to the online delivery of information is averted, since the knowledge that is required for the learning activity is provided as a self or group learning activity prior to the online flipped classroom. Also, the flipped classroom model, often used to deliver team-based learning [11], can intersperse short learner activities in-between short spurts of teacher-learner and learner-learner interactions. This will allow student-centred learning leading to active and deep learning. Such learning reduces the cognitive load of the student, promotes understanding instead of rote learning, and above all would be enjoyable both to the learner and teacher. So, this clearly shows that the solutions to issues related to e-learning lie not with technology but with sound educational practices.

**Why did assessment practices during COVID days brought in a mixed learner response?**

Many features of technology have been incorporated into assessment even prior to COVID. These features include item banking, automated marking of multiple-choice questions (MCQs), and post-exam psychometric analysis. However, the administration of summative, high-stakes written assessments almost always was an onsite activity. Even when such assessments were delivered online, they were delivered when the candidates were in an examination hall. This was mainly due to the inability to address issues related to the verification of candidate identity that may lead to impersonations and the inability to prevent or monitor potential cheating opportunities such as copying when the candidates take the test remotely. To address these, the technological solutions that were offered such as remote proctoring, eye-ball tracking, and biometric verification of identity were considered too expensive to many institutions and programmes, cumbersome, or not fully fool-proof. So, here again, the real solutions seem to be lying in sound educational practices rather than in technology.

The above issues were mainly for written assessment. The advent of COVID necessitated the need to administer clinical assessments also online. Hence, exam boards tried out electronic clinical examinations such as e-OSCEs [12]. However, most of these were knowledge assessments rather than true clinical assessments. That said, the pandemic pushed the authorities to try out remote history taking stations, where the candidate, patient or simulated patient, and examiners were in separate rooms, all connected with each other online [13]. These history taking stations, by and large, served the purpose, though the ability to maintain eye contact, pick up non-verbal cues such as facial expressions and exchange information effectively were often cited as limitations of e-OSCE history taking stations. However, counter-arguments to these limitations were that electronic consultations may be the future and the candidates should be trained on such consultations. So, with regard to history taking, the pandemic was instrumental in pushing boundaries and moving the delivery of e-clinical examinations forward. The same, however, did not hold for physical examination and practical procedure stations. Administration of these stations remotely was almost a near impossibility. This was so, even with modern simulators that allow certain practical procedures on screen [14], as those simulators need to be housed onsite and their remote accessibility was almost impossible. Use of standardised patients, hybrid simulation-based skills testing with the onsite candidate and a remote examiner were used by several institutions with mixed success [15]. However, for this type of hybrid assessment, the candidate must be in contact with a simulated patient or a mannequin.

**How can assessment practices be changed to deliver assessments remotely?**

At least for written assessment, the open-book examinations [16] are sometimes side-lined as they can lead to indiscriminate student copying and sharing of answers, especially when delivered online. However, it is the way that the assessment is set that leads to such possibilities of examination malpractices [17]. In other words, whether it is delivered online or not, open-book assessments should not be constructed in the same way that traditional written assessments are developed. At an open-book assessment, as the candidates can refer to books and notes, setting recall questions serves no purpose. So, open-book assessments should test knowledge at higher taxonomical levels, such as application, analysis and evaluation [18]. Answers to such questions are harder to copy from each other, especially if the timing of these questions is tight. Thus, it is the educational construction of the questions that is more to be blamed, rather than the technology that delivers the questions, if candidates copy the answers from each other.

A common complaint against online multiple-choice questions (MCQs) is the potential they offer candidates to share their answers while answering, through social media and through other such technologies. A common fix for this, often practised by examination boards, is to randomly change the order of options for each candidate. So, the positioning of the correct option for a question and the question-order would change from candidate to candidate. That may be a technologically easy fix that any examination board can resort to. However, a more educational solution for the same issue is to convert the MCQs to very short answer questions. With good answer keys fed into a software system, there is emerging evidence that very short questions are as good as MCQs [19]. More importantly, some of the issues of online delivery such as candidates copying and sharing answers to online MCQs can be everted when the candidates are allowed to construct an answer, rather than selecting an answer from a menu.

From a more educationally advanced standpoint, if the concerns related to the remote delivery of assessment are to be addressed, there needs to be a shift in the way we conceive assessment. Traditionally, assessments are designed to be delivered uniformly to all candidates. It is believed that it is then and only then that the ability of candidates could be compared. That, however, is comparative or relative ability. If 'ability' is an absolute construct, as opposed to a relative construct, then with the aid of modern technology and modern psychometrics one could deliver equivalent forms of the same assessment with minimal overlap of questions, so that each candidate receives a unique examination. This will resolve the issues related to candidates sharing answers and copying from each other.

A further advancement of this concept would be to determine the next question that a candidate is given based on the candidate's answer to the previous question. This is also possible using modern psychometrics and technology. So, this way, a unique assessment blueprint would be created for each candidate. That personalised blueprint would closely match the ability of the candidate. Such a process would lead to each candidate's ability level being measured more accurately. Once such an ability level is calculated for each candidate, it is fairer to compare between candidates. However, all this would be future. While reaching there may take time, until such time, even at present a lot could be done to partially automate the assessment blueprinting process, where the examination board specifies the question specifications for an examination, and an item-banking software provides all the possible questions for the examination board to select from. This is of course a step short of the item banking software providing equivalent forms of the same assessment with different item combinations. Even if the latter option seems too daunting at present, at least using electronic blueprinting in a manner explained in the former option would be a useful step to creating sound assessments.

Finally, for clinical assessment, the advances made during the pandemic such as carrying out e-OSCE stations for history taking may not be necessary during the post-pandemic times. However, such OSCE stations should be commonplace in the post-pandemic new normal, for formative purposes. Assisted by artificial intelligence with chatbots as simulated patients such history-taking e-OSCE stations could assist learners in practising history-taking at leisure. However, such stations could be extended to cover physical examination and practical procedures, only if a way of remote sharing of screens of some of the advanced simulators with haptic functionality could be introduced [20]. Although none of these, would replace real-life patient encounters [21,22], they certainly should add value as an adjunct form of learning or formative assessment.

## Conclusion

Throughout this article, it is evident that some of the teaching and learning, and assessment methods that educational institutions were forced to try out during the pandemic would prevail even during the post-pandemic era. However, it is likely that they would evolve into more educationally sound methods, where their inherent shortcomings found during the COVID days would be fixed with more educationally defensible redesigning of these teaching and learning, and assessment methods. Such redesigning would no doubt use modern technology but the solution itself will lie in designing educationally meaningful learning environments as opposed to just the use of technology. A key requirement for such educational

redesigning of these methods is the shifting of one's mindset from the entirely face-to-face practices of the past to introducing a blended learning environment where some materials are digitalised to complement face-to-face learning, with a view to improving interaction and engagement. This would enable the faculty and the students to envision the core purposes of these educational strategies by matching the pedagogical and assessment principles underpinning them with the technological know-how available today. This should help developing competent and effective future health practitioners.

**References**


1. Moore JL, Dickson-Deane C, Galyen K. e-Learning, Online Learning, and Distance Learning Environments: Are They the Same? *The Internet and Higher Education* 2011; 14(2): 129-35.
2. Samarasekera DD, Goh DLM, Lau TC. Medical school approach to manage the current COVID-19 crisis. *Academic Medicine* 2020; 95(8): 1126-27.
3. Bashir A, Bashir S, Rana K, Lambert P, Vernallis A. Post-COVID-19 Adaptations; the Shifts Towards Online Learning, Hybrid Course Delivery and the Implications for Biosciences Courses in the Higher Education Setting. *Frontiers in Education* 2021; 6.
4. Sharma A, Alvi I. Evaluating pre and post COVID-19 learning: An empirical study of learners' perception in higher education. *Education and Information Technologies* 2021; 26(6): 7015-32.
5. Donaldson G. Towards a learning education system? In: B Hudson, M Leask, S Younie (Eds). Education system design: foundations, policy options and consequences. London: Routledge, Abingdon. 2020: 1-17.
6. Ponnamperuma G. Medical education amidst a pandemic: possibilities, pitfalls and way-outs. *Journal of the Dow University of Health Sciences (JDUHS)* 2020; 14(3): 99-101.
7. Jowsey T, Foster G, Cooper-Ioelu P, Jacobs S. Blended learning via distance in pre-registration nursing education: A scoping review. *Nurse Education in Practice* 2020; 44: 102775.
8. Ali L. The Design of Curriculum, Assessment and Evaluation in Higher Education with Constructive Alignment. *Journal of Education and e-learning Research* 2018; 5(1): 72-8.
9. Bannert M. Managing cognitive load-recent trends in cognitive load theory. *Learning and Instruction* 2002; 12: 139-46.
10. Wu WCV, Hsieh JSC, Yang JC. Creating an Online Learning Community in a Flipped Classroom to Enhance EFL Learners' Oral Proficiency. *Journal of Educational Technology and Society* 2017; 20 (2): 142-57.
11. Burgess A, van Diggele C, Roberts C, Mellis C. Team-based learning: design, facilitation and participation. *BMC Medical Education* 2020; 20(2): 1-7.
12. Shorbagi S, Sulaiman N, Hasswan A, Kaouas M, Al-Dijani MM, El-hussein RA, Daghistani MT, Nugud S, Guraya SY. Assessing the utility and efficacy of e-OSCE among undergraduate medical students during the COVID-19 pandemic. *BMC Medical Education* 2022; 22: 156.
13. Shaban S, Tariq I, Elzubeir M, Alsuwaidi AR, Basheer A, Magzoub M. Conducting online OSCEs aided by a novel time management web-based system. *BMC Medical Education* 2021; 21: 508.
14. Wright DJ, Uong J. Establishing Validity of a Comprehensive Hand Surgical Training and Educational Platform (STEP), ASSH Surgical Simulation Taskforce. *The Journal of Hand Surgery* 2020.
15. Cartledge S, Ward D, Stack R, Terry E. Adaptations in clinical examinations of medical students in response to the COVID-19 pandemic: a systematic review. *BMC Medical Education* 2022; 22(1): 1-18.
16. Eurboonyanun C, Wittayapairoch J, Aphinives P, Petrusa E, Gee DW, Phitayakorn R. Adaptation to Open-Book Online Examination During the COVID-19 Pandemic. *Journal of Surgical Education* 2020; S1931-7204(20): 30346-9.
17. Durning SJ, Dong T, Ratcliffe T, Schuwirth L, Artino AR Jr, Boulet JR, Eva K. Comparing Open-Book and Closed-Book Examinations. *Academic Medicine* 2016; 91(4): 583-99.
18. Johanns B, Dinkens A, Moore J. A Systematic Review Comparing Open-book and Closed-book Examinations: Evaluating effects on development of critical thinking skills. *Nurse Education Practice* 2017; 27: 89-94.
19. Sam AH, Westacott R, Gurnell M, Wilson R, Meeran K, Brown C. Comparing single-best-answer and very-short-answer questions for the assessment of applied medical knowledge in 20 UK medical schools: Cross-sectional study. *British Medical Journal Open* 2019; 9(9): e032550.
20. Yovanoff M, Pepley D, Mirkin K, Moore J, Han D, Miller S. Personalized Learning in Medical Education: Designing a User Interface for a Dynamic Haptic Robotic Trainer for Central Venous Catheterization. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*. 2017; 61(1): 615-19.
21. Bleakley A, Bligh J. Students learning from patients: Let's Get Real in Medical Education. Advances Health Sciences *Education Theory and Practice* 2008; 13: 89107.
22. Rowland P, McMillan S, Martimianakis MA, Hodges BD. Learning from Patients: Constructions of Knowledge and Legitimacy in Hospital-based Quality Improvement Programmes. *Studies in Continuing Education* 2018; 40(3): 337-50.