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The COVID-19 outbreak has profoundly influenced teaching pedagogies and assessment strategies of medical curricula worldwide. Clinical training and evaluations in hospitals and healthcare facilities face an unprecedented challenge due to the global lockdown, social distancing, and patients’ safety. At the onset of the COVID-19 pandemic, a great majority of medical schools postponed or aborted clinical clerkships of undergraduate and postgraduate students in order to flatten the curve and to minimise personal contact for mitigating the risk of exposure for medical students. Such contingency-based actions provoked stress and uncertainty among faculty, students, and medical educators. In addition, the absence of clear guidelines by healthcare authorities added to the complexity of this dilemma. On 13 March 2020, the Accreditation Council for Graduate Medical Education (ACGME) took the executive decision of postponing all accreditation site visits and in-campus educational and accreditation meetings worldwide. The ACGME has also recommended enhancing distance operational skills for the accomplishment of accreditation missions. On the same note, during the COVID-19 pandemic, the daunting task of framing a business continuity plan in medical schools has prompted medical educators to adapt apparently seamless educational transformation by developing institutional contingency plans. The obligatory and essential safety adaptations mandated the use of a wide range of technology-driven applications such as Telehealth, Zoom, Microsoft Teams, Blackboard, and ClickMeeting.

One of the modern instructional strategies that has gained popularity in medical education in recent years is the flipped classroom model. In sharp contrast to a teacher-centred apprenticeship model where students are considered as empty vessels that would passively absorb information, flipped classrooms offer student-centred peer-assisted learning. Using the standard flipped classroom pedagogy, students are supplied with pre-class information in the form of videos, recorded lectures, or short tutorials. This is followed by an in-class session where the topic is revisited while the instructor facilitates student-led small group discussions. At the College of Medicine University of Sharjah, United Arab Emirates, with an e-flipped classroom approach during the COVID-19 pandemic, the face-to-face teaching pedagogy was smartly transformed into a distance teaching module using Blackboard® and MS Teams® interfaces. As a first step, a pre-recorded video lecture by the instructor was sent online to students. This pre-recorded lecture primarily focused on a didactic, cognitive-based understanding of the subject. The lecture would end with a complex clinical scenario that was meant to trigger students’ learning as they were instructed to solve the problem during group discussions using Blackboard® or MS Teams®. Two to three days after the pre-class lecture, an in-class live interactive resource session was conducted on the same topic. This session would start by solving the same scenario where the pre-class lecture ended at. The instructor facilitated group discussions for solving the problem using a real-time interactive PollEverywhere® where the students’ responses were anonymously displayed in real time. This encouraged discussions and active learning, as students could avoid the risk of being embarrassed for wrong answers. Several other clinical scenarios were used during the in-class live resource session under the instructor’s supervision using a real-time response management system. Lastly, students were given post-session exercises for small group discussions, and their learning process was tutored via live chats. In summary, using the e-flipped classroom model, one topic was visited three times with increasing breadth and depth and substantial student engagement.
engagement under the direct guidance of the instructor using a real-time response system.

The aforementioned e-flipped classroom model illustrates a precedent of technology-enhanced active learning and offers a promising substitute for teaching theoretical parts of the curriculum during the COVID-19 outbreak restrictions. Although the e-flipped classroom experience is phenomenal, the enigma of clinical training using real patients remains unsolved. An attractive solution is offered by the Telehealth training interface where students and residents make initial online contact with patients for consultations. After gathering comprehensive information, students formulate a management plan as they normally would. This is followed by a discussion session among trainees and an attending physician over the phone. Finally, using a multiuser video conference portal, the healthcare team counsels the patient for a final management plan. Nevertheless, the system is in its infancy and mandates more efforts for it to be universally accepted and incorporated.

As it stands, there is an absence of professional training of faculty and students that can provide a seamless acceptance and integration of e-flipped classrooms and other technology-driven distance learning approaches into existing curricula. Rigorous training through faculty development programs and information-technology support, along with the allocation of resources, are mandatory. Besides, a series of mock sessions would help establish system security, connectivity, and confidence of stakeholders. A host of high-fidelity simulation-based courses in different fields and customised training programs during the COVID-19 era, which are tailored to match specific protective guidelines, can supplement active learning of students. At first, the newly introduced systems provoke stress and unrest among faculty and students. However, with progressive training and acquisitions of skills, faculty and students gain experience and enjoy this technology-enhanced active learning experience.

To conclude, during the unprecedented COVID-19 situation, the horizon of medical education and assessment is rapidly evolving with transformations toward technology-enhanced learning. This has significantly disrupted the clinical training of medical students and trainees. However, technological developments have allowed us to adapt effective teaching pedagogies such as the e-flipped classroom model that can facilitate the delivery of theoretical knowledge.

Source of funding

This research did not receive any specific grants from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

The author has no conflict of interest to declare.

References

1. Boursicot K, Kemp S, Ong TH, Wijaya L, Goh SH, Freeman K, et al. Conducting a high-stakes OSCE in a COVID-19 environment. MedEdPublish 2020; 9: 1–4.
2. Nasca TJ. ACGME’s early adaptation to the COVID-19 pandemic: principles and lessons learned. J Grad Med Educ 2020.
3. Rose S. Medical student education in the time of COVID-19. JAMA 2020.
4. Madhukumar S. Usage of teaching aids in A medical college-students perceptions. Indian J Public Health Res Dev 2017; 8(4): 89–93.
5. Betihavas V, Bridgman H, Kornhaber R, Cross M. The evidence for ‘flipping out’: a systematic review of the flipped classroom in nursing education. Nurse Educ Today 2016; 38: 15–21.
6. Sohrabi B, Iraj H. Implementing flipped classroom using digital media: a comparison of two demographically different groups perceptions. Comput Hum Behav 2016; 60: 514–524.
7. Forgione A, Kislov V, Guraya SY, Kasakevich E, Pugliese R. Safe introduction of laparoscopic colorectal surgery even in remote areas of the world: the value of a comprehensive tele-mentoring training program. J Laparoendosc Adv Surg Tech 2015; 25(1): 37–42.
8. Guraya SY, Chen S. The impact and effectiveness of faculty development program in fostering the faculty’s knowledge, skills, and professional competence: a systematic review and meta-analysis. Saudi J Biol Sci 2019; 26(4): 688–697.
9. Arroyo-Berezowsky C, Jorba-Elguero P, Altamirano-Cruz MA, Quinzaños-Fresnedo J. Usefulness of immersive virtual reality simulation during femoral nail application in an orthopedic fracture skills course. J Musculoskelet Surg Res 2019; 3(4): 326.
10. Almarshad AY, Alghamdi AM. Orthopedic trainees’ perspective on coronavirus disease 2019. J Musculoskelet Surg Res 2020; 4(3): 166.

How to cite this article: Guraya S. Combating the COVID-19 outbreak with a technology-driven e-flipped classroom model of educational transformation. J Taibah Univ Med Sc 2020;15(4):253–254.