

Educational Forum

Online Teaching in Medical Training: Establishing Good Online Teaching Practices from Cumulative Experience

Abstract

Online teaching has the potential to transcend geographical boundaries, is flexible, learner centered and can help students develop self-directed learning skills. The recently introduced competency-based curriculum has also advocated e-learning as an indispensable tool for self-directed learning. For effective online learning, good online teaching practices should be adopted. These include alignment of online teaching and learning with delivery of curriculum and objectives, synchronous, and asynchronous interaction between teacher and student, encouraging the development of higher-order thinking skills, active learning, and self-directed learning in students. In addition, good online teaching practices should have an inbuilt component of feedback and provide for effective time management, respect for diverse talents and ways of learning with continuous monitoring and mentoring of the learners. Online assessments, both formative and summative should also aim to ensure student involvement in the process. Capacity building of faculty through faculty development programs for the development of specific competencies such as social competency, pedagogical competency, managerial competency, and technical competency in the times of COVID-19 is now recognized as the need of the hour. Although online teaching and learning in medical education is new, it has the potential to become mainstream in future.

Keywords: *Online assessment, online teaching, student learning, teaching practices*

Introduction

The basic concept of online learning is more than 150 years old. Attempt of learning was initiated through correspondence courses to facilitate learning beyond geographical and time barriers. Actual online learning began as intranet in 1960, where linked computer terminals were used to provide academic material to students.^[1] With the advent of internet in 1994, digital literacy spread its wings in academics paving way for formal, accredited online courses and modules. Easy availability of mobiles, internet services, web, and social media provided opportunities to learners for personalized learning experiences.^[2]

Online learning has advantages of transcending time and geographical boundaries. Learners can use it according to their own pace of learning and it provides ample opportunity of self-directed learning. Another strong attribute of online learning is adaptive learning-delivery of customized learning resources to address unique needs of learner.

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Medical education today is very different from what it was 20 years ago when the internet was not such a powerful tool in medical education. Earlier, online learning served as a mere fringe to the main provision of learning, which was in classrooms. But with changing trends, online learning in medical training has come a long way from correspondence courses to computerized virtual patient simulation. By 2012, many massive open online courses in medical sciences were developed.^[3] Recent is telelearning, in which students and teachers interact through virtual patient room and students can even be assessed for knowledge, skills, and attitudes.

Online Teaching–Learning: Basic Concepts

Online teaching–learning, often referred to as e-learning, internet-based learning or web-based learning is the use of the internet for the purpose of education. Online teaching and learning hold distinct advantages over the traditional didactic ways of instruction, including; delivery of

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the newest evidence-based content to learners. It has been demonstrated to be as effective as traditional didacticism and can be instrumental in promoting self-directed learning.^[4] The learner can have greater control over their learning due to the allowed flexibility (convenience) over content and pace. At the same time, the teacher can evaluate competencies through online assessments, enabling learners to receive feedback for self-improvement.^[5]

Online learning by itself can be demanding since the quality and nature of the learner experience shifts in online learning environments to a greater reliance in the virtual modes of communication. Interactions also occur through a variety of methods vis-à-vis learner-to-content, learner-to-instructor, and learner-to-learner or peer interaction [Table 1] which necessitates a more proactive, self-directed, self-regulated approach where students can put to use their meta-cognitive skills to plan, implement, and reflect on their learning. Active engagement in academic materials, and with instructors and peers, has been emphasized as a core component of successful learning with better academic achievements.

In online learning, it is crucial to know whether the predominant focus should be on virtual content or on the virtually mediated process. Do keep in mind that technology is not a replacement for pedagogy, if there is a choice; opt for learning rather than technology. The clarity on these differing perspectives helps us determine the purpose of a course. If the primary function is to provide access to content (resource material); then, the focus lies on repositories, aligning content between the teachers and their students, and sorting of content with the help of metadata.

On the other hand, if the course is primarily about interactive engagement of students in active learning, then the focus is on planning, interactive discussion and pursuing student engagement, with content management as a subset of the virtual learning experience. In simple terms, online learning for some may imply “accessing material” while some may see it as an “activity or performance” in pursuit of education.^[5]

Rationale for Online Teaching in Medical Training

Results of online teaching in medical training have been encouraging. It is well documented in literature that use

Table 1: Type of student interactions with currently available online teaching-learning tools

Type of interaction	Online tools
Learner-content	Online videos, power point presentations, virtual simulations, webcasts, webinars, video-conferencing
Learner-teacher	Online lectures/seminars/discussions
Learner-learner	E-portfolio, e-mails Social media (Facebook, WhatsApp, YouTube), online seminars/group work

of e-learning resources can supplement medical learning, as e-learning resources are easily accessible and facilitate flexible, on-demand training.^[6] Interactive web-based tutorials were found to be better for cognitive learning compared to traditional teaching methods.^[7] Learners using virtual patients and blended learning performed better than traditional teaching methods in skills domain.^[8] Nowadays, more than 90% of students have access to internet and students try to access web for medical studies.^[9] We need to exploit this tech savvy attribute of learners for online teaching learning.

Newly introduced, outcome-based, competency-based curriculum in India advocates e-learning as a tool for self-directed learning in learners. Furthermore, due to rapid advancement of information technology, health care is advancing by leaps and bounds. To keep up with all these changes, online learning promises to play a major role.

Technology, in the wake of COVID-19 has forced us to examine and explore more fundamentally the purpose and process of teaching; what constitutes valid knowledge, and how best medical students can acquire it. In such crisis time, where there are geographical and time barriers to education, technology can be used in innovative way to maintain learning. This crisis has given us opportunity to divulge into unexplored areas of technology based medical education. When COVID 19 resolves, transformative changes are expected in medical education through the use of emergent technology.^[10]

Developing countries like India have lack of infrastructure, in terms of sufficient classrooms, medical educators, and other academic resources. Online learning can bridge the gap and strengthen quantity and quality of medical education as it is flexible and adaptable. There is no evidence that online learning was less effective than onsite learning.^[11]

For effectiveness of online model certain attributes of online learning like design principles of digital learning, goals, and student's preferences should be taken into consideration. In spite of all the advantages, online learning is not the ultimate solution to all academic woes. It is just another new tool in toolbox of educators, just like MRI, which is just one of the diagnostic tools for clinicians. Just as every patient will not benefit from MRI, similarly, not every objective is deliverable by online learning.^[12]

Currently Available Online Teaching–Learning Tools and Platforms

Online learning platforms now offer many opportunities that are being widely used by medical colleges around the world, comprising of adaptive tutorials, online videos, webcasts, video-conferencing, and virtual models. The range extends from websites, discussions forums, and online discussion spaces to real-time online chat and

a variety of communication apps. Classroom lectures have been replaced by streamed online lectures, using technologies for screen capture, and online dissemination. Small group sessions and tutorials have been replaced with interactive Webinars using web conferencing platforms. All of these learning resources can also be easily accessed using smartphones.

Simple online platforms, such as websites and blogs, can help provide basic information and offer opportunities to host videos for demonstrating essential skills, such as procedural clinical skills and communication. Online teaching–learning can be implemented through synchronous and asynchronous modes. The synchronous teaching tools can be made use of for e-lectures, e-problem-based learning, e-labs, and virtual patients and asynchronous teaching through discussion forums and chat rooms can be used to enhance student engagement and interaction.^[13]

There are a variety of tools/platforms and learning management systems (LMSs) options that may be used for both synchronous and asynchronous online learning^[14-16] [Table 2] in addition to the simple, user-friendly social media tools such as WhatsApp, Telegram, or YouTube, all of which have demonstrated effectiveness as educational tools in medical education.^[17]

However, it is important to keep in mind that online learning is not like reading a newspaper where one can start or end anywhere or skip what is not interesting – rather it is a planned program aimed at attainment of predefined

objectives. Right tool, right learner, right dose, at the right time, and route should be the aim.^[12] Hence, for sustainable and effective outcomes of online teaching–learning, good teaching practices (GTP) have to be incorporated in online learning modes.

Good Online-Teaching Practices

Lack of scientific and evidence-based process for the development of online learning models can decrease their utility. Hence, online learning models should be based on GTP for sustainable impact. Many of us have nurtured the copy-paste method and see online mode as merely a delivery medium, through which traditional lectures can be delivered. Unfortunately, this is not true. The need for interactivity, monitoring, feedback, and learner support is many times more in online learning compared to conventional classrooms. It will not be an exaggeration to say that for successfully using online instructions, teachers need expertise in content, technology, and pedagogy. The famous adage of Chickering and Gamson (1979) that learning is not a spectator support is equally, if not more, applicable to online instruction.^[18]

Vyas *et al.* reviewed^[19] seven principles of GTP^[18] and applied them in the context of an online faculty development program (FDP). This shows that if GTP is adopted for any learning program, including online learning programs, it can be effective and sustainable. It may be worth mentioning that online learning does not have a “theory” of its own and relies on general pedagogical principles

Table 2: Common online teaching-learning tools/platforms

Mode	Tools/platforms	Link
Asynchronous (discussion boards, quizzes, polls, email, recorded audio or video, recorded slides with narration)	Blackboard Moodle Slack Schoology Edmodo Flock	https://www.blackboard.com/ https://moodle.org https://slack.com/ https://www.schoology.com/ https://www.edmodo.com/ https://flock.com
Synchronous (virtual classroom, live presentation, live text chat, instant messaging, live audio or video chat, live quizzes)	Zoom Microsoft Office 365 Blackboard Collaborate Ultra Skype Google suite GoToMeeting Go webex Bluejeans Loom Teamviewer Join.me GoToWebinar Saynamaste	https://zoom.us/ https://www.microsoft.com/ https://help.blackboard.com/Collaborate/Ultra https://www.skype.com/ https://gsuite.google.com/products/meet/ https://www.gotomeeting.com/ https://www.webex.com/ https://www.bluejeans.com/ https://www.loom.com/ https://www.teamviewer.com/ https://www.join.me/ https://www.gotowebinar.com/ https://www.saynamaste.in/

for instruction.^[20] Accordingly, principles of GTP and pedagogic principles for effective online teaching–learning have been suitably adopted here to recommend principles of good online teaching practices^[18,21](GOTP) [Figure 1]. These principles of GOTP are briefly discussed below.

Principle 1: Teaching–Learning methods must match curriculum and objectives

Online pedagogy must be matched with and aligned to the appropriate curriculum through clear learning objectives; meaningfulness of content covered; the appropriateness of student activities; and the type of assessment. Learning outcomes, online learning processes, and assessment strategies should be in alignment.

Principle 2: Must encourage synchronous and asynchronous teacher–student interaction

Teaching in an online environment should not mean simply posting resources or information. Teacher–student interaction is a critical factor for motivating students toward peak performance. Supportive and nonthreatening online classrooms and open synchronous as well as asynchronous communication channels encourage students to complete their work resulting in higher levels of achievement.

Principle 3: Promote higher order thinking skills and communication skills

Online pedagogy should include learning strategies that encourage demonstration of higher order thinking skills (analysis, synthesis, evaluation) and communication skills (writing, reading, speaking, listening).

Principle 4: Must encourage teamwork and cooperation among students

Online pedagogy must motivate students to be collaborative and social. Working with other students often enhances

involvement in learning. Improved thinking and deeper understanding occur when students have the opportunity to share and respond to each other's ideas.

Principle 5: Must encourage active learning

Students seldom learn by merely sitting in classes listening to teachers. For effective learning to take place, it is important that they must interact and relate their learning to past experiences and apply it to their daily lives. Teachers must incorporate audio, video, and links to other virtual worlds and create authentic, interactive problem-solving activities that augment student efforts to actively construct meaningful knowledge.

Principle 6: Must encourage development of self-directed learning

Online pedagogy should offer meaningful opportunities to students to bridge the transactional gap by motivating and instilling responsibility in them. Resultantly, students will embark on significant self-directed learning opportunities for gathering and constructing knowledge through independent and collective learning activities.

Principle 7: Must provide opportunities for online summative and formative assessment

Online pedagogy should have provision for giving timely feedback with ample opportunities for learners to reflect on their progress and have provision for valid and reliable summative assessments.

Principle 8: Must have an inbuilt mechanism for prompt feedback

Students need appropriate and timely student-centric feedback on their performance. Online pedagogy must provide for such chances so that students can reflect on what they have learned, what they still need to know, and how to assess themselves.

Principle 9: Must encourage effective time management and timely task completion

Learning to use one's time well is critical for students, more so in an online environment as there is no substitute for time on task. Due emphasis should be given to defining time expectations for students to establish the basis for high performance.

Principle 10: Must communicate high expectations from each stakeholder

In an online setting, it is pertinent to set clear expectations for quality student performance. Clear and high expectations provide students with precise guidelines about the type and quality of work essential for proficient and timely assignment completion. When teachers and institutions hold high expectations for themselves and make extra efforts, students too tend to perform well.

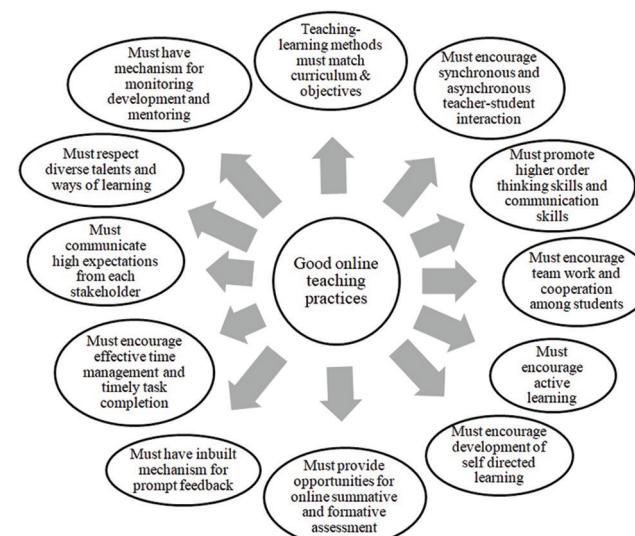


Figure 1: Recommended Principles of good online teaching practices (as adopted from Chickering and Gamson's; Anderson and McCormics)

Principle 11: Must respect diverse talents and ways of learning

Students have a wide variety of learning styles and needs. Online pedagogy should carefully consider prior knowledge, cognitive processing, personality styles, beliefs about learning, and demographics. Learning activities should allow multiple opportunities for demonstrating knowledge and skill proficiencies to address the diverse range of learning preferences and skills.

Principle 12: Must have mechanism for monitoring development and mentoring

Online pedagogy must support continuous monitoring and mentoring so as to facilitate achievement of intended outcomes of online learning. Effective mentoring calls for setting standards for students, facilitation, guiding, setting boundaries, giving effective feedback, and thus, help students to optimize their learning.

Online Assessment: Important Attribute of Good Online Teaching Practices

The need and utility of assessment is much higher in online learning, where it acts as a surrogate for a live teacher. In addition to serving traditional function of formative and summative assessment, online assessment helps to ensure

learner involvement in the process. Main characteristics^[22] establishing validity and reliability in online formative assessment have shown in Figure 2.

Formative assessments are multifaceted and can take the form of peer assessment, co-assessment, self-assessment, and/or teacher feedback. Online-assessment can support knowledge-based assessment (e.g., multiple choice or extended matching items), performance-based assessment (e.g., OSCE stations or virtual patient cases), practice-based assessment (e.g., portfolios or logbooks), or behavior/attitude-based assessment (contributions to discussion boards or peer assessment of project work using tools such as wikis, reflections) and these can all be modified into formative or summative assessments to document student learning based on the purpose and needs of the educational experience.^[23]

Open book examination (OBE) and open-book, open-web (OBOW) examination have also been advocated. The distinguishing attribute^[24] of the OBE/OBOW approach is a commitment to authentic assessment. It encourages understanding of learning processes in terms of real-life performance as against a display of inert knowledge, as learners are presented with unstructured problems that require the application of relevant skills and knowledge, and not simply a selection from predetermined choices as is the case with MCQs. This model, in fact, lays stress on the importance of learner-directed discovery of knowledge, or what Dalgarno refers to as “endogenous constructivism,”^[25] originating with the learner’s internal cognition that makes use of the mental lens to shape their understanding of the external environment. Such an approach engages students, which, in turn, induces deeper learning.^[26]

Online Teaching: Specific Roles and Competencies for Faculty

Faculty roles and competencies for online learning are different compared to traditional teaching–learning. Faculty need to develop competency in three major areas: technology, pedagogy, and content knowledge.^[27] Other issues which may need modification are administrative issues, technical skills, time and support to online teaching, designing, and managing online learning modules. If these are not taken care of, they can act as barriers for online learning leading to low quality learning and wastage of time and resources.^[11] Hence, a targeted institutional goal, aim, and objectives are essential for successful outcome of any online program.

In their study,^[28] Grant and Thornton also identified three themes regarding the best practices for online instruction: course design, instructional effectiveness, and interactivity. For online teaching–learning, some specific roles like-content facilitator, technologist, designer, manager/administrator, process facilitator, advisor/counselor, assessor, researcher are also required by faculty.^[29] Chickering and Gamson’s

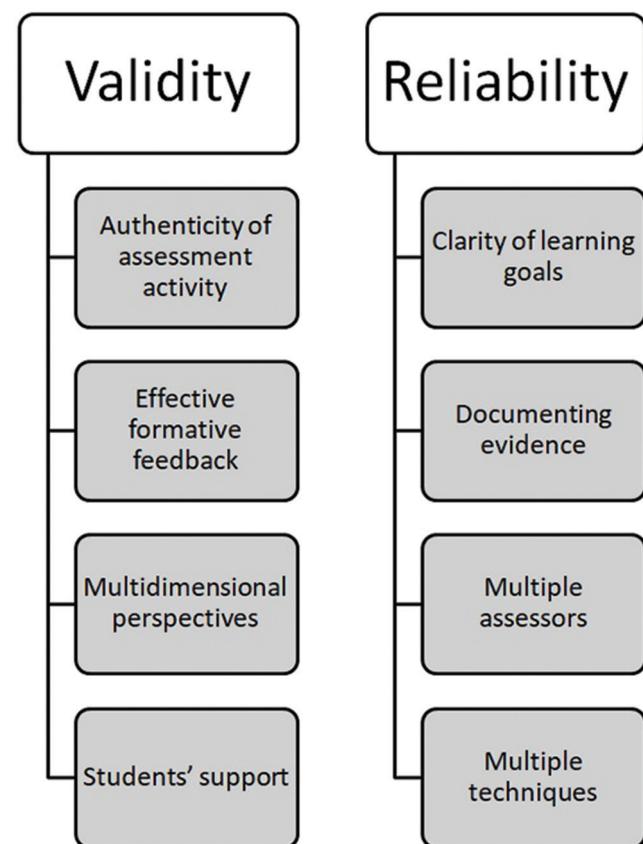


Figure 2: Main characteristics establishing validity and reliability in online formative assessment

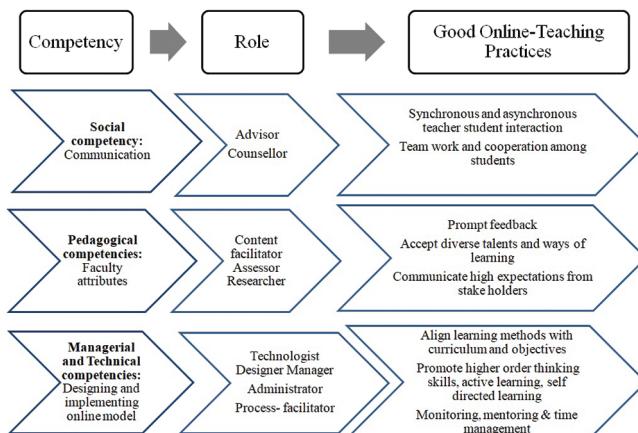


Figure 3: Process delivery supporting development of good online teaching practices

practices can be grouped in three broad areas with respect to online learning: communication, faculty attributes, and designing, and implementing online model. Each of these broad areas requires specific competencies on the part of the faculty. These specific competencies are social competency, pedagogical competency, managerial competency, and technical competency.^[30] Interaction and inculcation of these roles and competencies at the process delivery level results in the development of good online teaching practices [Figure 3].

Since online learning needs the development of different attributes by faculty, in addition to subject knowledge, structured faculty development workshops (FDP) are need of the hour. FDP are planned activities to enhance knowledge, skills and attitudes of faculty and to keep them updated regarding scholarship of teaching–learning. Without effective FDP's institutional goals and objectives for online learning modules cannot be met. FDPs are effective for enhancing and guiding faculty for achieving competencies and new roles for online learning, which can help in the implementation of online project by administrator.^[31] While developing FDP for online learning, various factors need to be taken care of like pedagogical, technological, interface design, evaluation, management, resource support, ethical and institutional.^[32]

Specific areas for online learning and assessment such as LMS, creation and maintaining virtual learning classrooms, digital literacy, simulation technology, telemedicine, web-based standardized patient training, synchronous as well as asynchronous can be included in FDPs.

Challenges and the Way Forward

The technological transition has opened a variety of online modalities to augment teaching and learning across the continuum of medical education. However, it will be worthwhile to remember that the use of technology in medical education is not bereft of challenges which need due consideration to realize its desired outcome and impact.

These challenges^[33] range from technical issues related to inadequate technical infrastructure and unreliable internet

connectivity for smooth conduct of online teaching and learning, absence of institutional strategies to facilitate online teaching, recurring financial costs, pedagogical insecurity, insufficient preparedness of faculty in effective use of online teaching tools and LMSs, time constraints, lack of appropriate tools for clinical teaching, and lack of direct contact between teachers and learners. Rising to these challenges requires us to take a relook at the teaching and learning process in medicine. These constraints have forced us to reflect on the immediate needs of both the teacher and the student in medicine.

Looking ahead, the transition to a high quality, pedagogically sound, engaging, and collaborative online learning within the context of recently implemented CBME model and the COVID-19 pandemic can be realized if the medical education regulatory body (Medical Council of India), institutions and medical educators accept its need and make available-accessible and dependable digital infrastructure and technical support at institution level; training opportunities for medical educators in the use of available online teaching–learning modalities and pedagogical competence; and facilities and time for medical educators to structure and develop pedagogically sound online teaching and learning activities by aligning learning objectives, content, activities, and assessment while ensuring optimal virtual contact with learners.

Conclusion

Online teaching, learning, and assessment in medical education are still relatively new; however, it has the potential to become mainstream in the near future. Delivering the required and desirable outcomes adopting innovative ways will continue to remain a challenge for medical educators. In the midst of the COVID-19 crisis, it is crucial that the medical educators' community puts its academic experience into practice and prioritizes a forward-thinking and scholarly vision to bring out practical solutions for the benefit of medical students. It is no longer a matter of when this will pass. Now, it is about the challenge of adapting to the new normal; that is the virtual world, till we get back to physically being available in our educational institutions again.

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Conflicts of interest

There are no conflicts of interest.

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