SHORT COMMUNICATION

Role of Technology in Medical Education: SWOC Analysis

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Abstract

The traditional methods of medical education were dependent and restricted on the mainstays of printed textbooks, chalkboards, photographic projection-based classroom lectures, and cadaver dissection laboratories. Due to revolutionary changes in the medical curriculum of undergraduate and postgraduate training, there is a rapid transformation from knowledge-based to competency-based education patterns. In a very precise way, utilization of the modern teaching aids has led to optimization of medical students' engagement by acclimatization to the dynamic and exhaustive medical curriculum in the best way possible even in the unprecedented times of coronavirus disease-2019 (COVID-19). In conclusion, gradual and systematic digitalization of learning of medical students should be synchronized with the traditional didactic lectures to have maximum compliance with the current model of medical education. However, this could be only possible when both the learner and the faculty are competent enough to utilize modern teaching and learning aids of technology to get the best outcomes from the process of teaching, learning, and assessment.

Keywords: COVID-19, Medical education, Technology.

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Introduction

The passing of knowledge generation after generation is in existence in medical history since time immemorial in the earliest of human civilizations such as Mohenjo-Daro, Egyptians, Greeks, Chinese civilizations, and Mayans.[1] The traditional methods of medical education were dependent and restricted on the mainstays of printed textbooks, chalkboards, photographic projection-based classroom lectures, and cadaver dissection laboratories.[2] Due to revolutionary changes in the medical curriculum of undergraduate and postgraduate training, there is a rapid transformation from knowledge-based to competency-based education pattern and changing healthcare environment, with the movement of medical care from the traditional hospital setting to ambulatory medicine, has necessitated the ability to provide care in a much shorter period and requires changes in documentation with all information, including both health knowledge and medical records becoming digitalized.[3–5] Emphasis on cost-containment and evidence-based use of resources are a national imperative and changes in societal expectations so that patient safety is a focus at all levels of medical education have also raised the ethical issues of learning interactions and procedures on live patients, with the long-standing teaching method of "see one, do one, teach one" is no longer possible.[6] Podcasts, videos, flipped classrooms, mobile devices with apps, video games, simulations (part-time trainers, integrated simulators, virtual reality), and wearable devices (Google glass) are some of the techniques available to address the challenges of the changing educational environment in medical education.[6,7] There has been a growth of learning management system also known as the LMS platforms, Zoom and Microsoft team-based classes and conferences which played a crucial role in creating undisrupted process of teaching, learning, and assessment and played a crucial role even in the unprecedented times of quarantine and isolation during the times of coronavirus disease-2019 (COVID-19) pandemic.[7] It played a crucial role in updating the knowledge of not only the medical students but also the practicing medical professional.[8]

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Medical Education through Modern Techniques

In a very precise way, utilization of the modern teaching aids has led to optimization of medical students' engagement by acclimatization to the dynamic and exhaustive medical curriculum in the best way possible even in the unprecedented times of COVID-19. It has also made the teaching-learning process student-centric, highly personalized, without any restriction of age, learning capacity, and experience of the learner which has been made possible due to online conferences via various apps in collaboration with the leading institutes all across the globe. The adoption of modern equipment of teaching has bridged the gap between the student and the teacher.

It is also a way of standardizing the method of teaching for undergraduate and postgraduate students in a uniform manner; the topics are taught under the competency-based medical education (CBME) curriculum in the medical colleges of India.[8–12] To obtain a comprehensive picture of all the advantages and disadvantages

of learning by modern technical aids, it is essential to perform an analysis of all the strengths, weaknesses, opportunities, and challenges (SWOC).[4,5]

Strengths

The implementation of the model of education by modern methods of technology has created newer avenues of teaching and learning methods by making it more student-friendly and facilitating the learning of the student at their own pace and capacity of learning.[2] It has transformed a student from a recipient to a self-directed learner where the faculty facilitates the process of learning.[5] With a plethora of apps like WhatsApp, Telegram, MEDISAGE, TedEx, NPTEL, and other apps of learning of reputed institutes, a medical student has easy access to E-books, online conferences, and online courses with no restrictions of time constraints, and the student can learn according to their comfort in a personalized manner.[7] This has helped in updating of latest skills and credentials under the continuing medical education of practicing medical professionals along with their usual medical practice.[5]

Integrating computer-assisted learning with a conventional teaching format improves students' understanding and performance for a specific topic like the rabbit eye drug testing which provides maximum accuracy without performing any animal-based experiments which raises ethical issues as the software perfectly mimics the animal experiments with absolute precision.

The potential of the metaverse and virtual patient series for clinical case-based discussion as an educational environment is suggested to be as follows: a space for new social communication; a higher degree of freedom to create and share; and the provision of new experiences and high immersion through virtualization in the field of medical education.

Weaknesses

Inaccessibility to these resources due to unequal distribution of financial aids of government and lack of skilled and trained teaching professionals are the major weaknesses to the optimum utilization of these aids of teaching leading to a compromised teaching and learning environment for both the teacher and the student.[13] Students with financial challenges and special needs may not have equal opportunities to access technology.[14] The key barriers which affect the development and implementation of online learning in medical education include time constraints, poor technical skills, inadequate infrastructure, absence of institutional strategies and support, and negative attitudes of all involved.[15] The commonly perceived weaknesses of using online teaching platforms included family distraction and poor internet connection.[16]

It has led to reduced compliance with the traditional methods of teaching and learning due to the extremely high dependence on modern technological learning aids and gadgets leading to noncompliance and dissatisfaction with the traditional methods of teaching, learning, and assessment if it is not integrated with modern methods of teaching in a synchronized manner.[17]

It cannot provide the best clinical training that can be obtained through clinical practice and clinical case-based discussions on the clinical posting, self-directed learning, and the self-directed learning sessions that could be possible by traditional clinical sessions as suggested in a study.

Opportunities

Implementation of modern technology in the process of teaching instills the concepts in the mind of students from a nascent stage, more compliant with the current pattern of medical education, and better orientation of the student with clinically oriented situations as the theoretical topics could be reinforced with self-directed learning, small group discussion sessions, and LMS platforms uninterruptedly.[7]

For maximum compliance with the effectiveness of online learning, the design principles of digital learning materials, learning goals, and students' preferences and characteristics should be rigorously evaluated which makes it more student-friendly in comparison with other traditional methods of learning.[13]

The use of computer-assisted learning, virtual case presentation, online clinicopathological correlation museums, mannequins, and hologram-based dissection laboratories has made it possible to learn and reinforce the concepts in the medical education field with absolute accuracy without any ethical issues in a personalized manner even during the times of COVID-19 in an uninterrupted manner.[16–19]

Challenges

High risk of creating an economic divide among the students, noncompliance with the traditional aids of teaching, learning, and assessment, and without the presence of trained and competent faculties and students would lead to a disruption in the learning of students and improper utilization of modern learning aids.[10,12]

The other challenges to online medical education during the COVID-19 pandemic included issues related to communication, student assessment, use of technology tools, online experience, pandemic-related anxiety or stress, time management, and technophobia.[15]

The major challenge is that the best outcomes obtained through the personalized face-to-face method of teaching could not be replaced by the online education method because of its complicated and expensive nature which creates hindrance in the optimum utilization in the process of learning in the field of medical education as it cannot be optimally utilized by medical students of weaker economic background and students with special aids.[14,15]

Plan for Implementation

The findings obtained from the SWOC methodology; it is evident that there is a need for skilled faculties for the proper utilization of the technology. The students need to have a basic foundation of technical aids so that they can optimally utilize modern resources in the best way possible. This can be implemented by keeping these sessions under the foundation course modules for students under the CBME curriculum and by regularly assessing the progress of the students through frequent discussion, quizzes, tests, clinical case discussion on the LMS platform apart from the traditional classes, and case discussions in clinical postings. Both traditional and modern methods need to go hand-in-hand to get the best outcome.

Conclusion

In conclusion, gradual and systematic digitalization of learning of medical students should be synchronized with the traditional didactic lectures to have maximum compliance with the current model of

medical education. However, this could be only possible when both the learner and the faculty are competent enough to utilize modern teaching and learning aids of technology to get the best outcomes from the process of teaching, learning, and assessment.

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