Transforming Medical Education during the COVID-19 Pandemic: A Commentary Article

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Commentary Article

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ABSTRACT

Medical education around the world has experienced major disruptive changes as a result of the COVID-19 pandemic, and various technologies have been rapidly deployed to sustain teaching and learning. Emerging technologies for education, such as artificial intelligence, are likely to be fundamental components of the transformation and future of medical education. Human society has entered the era of artificial intelligence, medicine and medical education have undergone profound changes. Artificial Intelligence (AI) is already being used in many industries, especially in healthcare and medical education. This commentary is based on the opportunities and challenges of medical education with artificial intelligence during the COVID-19 pandemic. We tried to discuss the key points related to artificial intelligence in medical education by reviewing the studies and based on educational experiences during the COVID-19 pandemic. We hope that by presenting this report, we can play a role in understanding this evolution.

Keywords: Medical education; Artificial intelligence; COVID-19

DESCRIPTION

In December 2019, a pneumonia outbreak of unknown origin was reported in Wuhan, Hubei Province, China. The global spread of SARS-CoV-2 and thousands of deaths from Coronavirus disease (COVID-19) prompted the World Health Organization to declare a pandemic on March 12, 2020 [1,2]. The global pandemic of COVID-19 has affected all areas of human life, including medical education [3]. The pandemic has successfully caused the global shutdown of several activities, including educational activities, and this has led universities to turn to online learning as an educational platform in response to the crisis [2]. The use of distance learning led to the suspension of face-to-face teaching in medical schools worldwide [4]. Therefore, universities had to quickly adapt to a different style of learning, mainly in the form of collective webinars and passive learning [5].

Among the many areas impacted, medical education faced a daunting task: How to continue training the next generation of healthcare professionals while ensuring their safety. This is where Artificial Intelligence (AI) stepped in to revolutionize medical education, offering innovative solutions to overcome the limitations imposed by the pandemic [1,2].

Artificial intelligence, an important branch of computer science, was introduced in 1956. The term AI, created by John McCarthy in 1955, is defined as a machine with intelligent behavior such as perception, reasoning, learning, or communication and the ability to perform human tasks. AI is composed of three main paradigms: Symbolic (logic based and knowledge based), statistical (probabilistic methods and machine learning), and sub symbolic (embodied intelligence and search) [6]. The field of using artificial intelligence technology has now expanded to education, security, economy, transportation, health care, education, gaming and entertainment and other fields, and the application scenarios are getting richer [7].

The emergence of artificial intelligence has stimulated a paradigm shift (6). Artificial intelligence is a growing phenomenon and will soon facilitate massive changes in many professions, including medical education. Currently, artificial intelligence technology is mainly used in undergraduate/postgraduate medical education, training of clinical specialists, and continuing medical education [7]. Artificial intelligence has solved various problems in education, including: Language processing, reasoning, planning, cognitive modeling, virtual inquiry system, telemedicine management and recording educational videos in medical schools and... [8].

AI played a pivotal role in enhancing the online learning experience. Virtual simulations and AI-powered educational platforms provided medical students with realistic patient scenarios and interactive learning modules. These tools not only helped bridge the gap created by the lack of clinical rotations but also improved students' clinical reasoning and decision-making skills [8].

On the other hand, regarding the evaluation of students, traditional methods of assessing medical students, such as in-person exams and practical assessments, became challenging during the pandemic. AI-enabled remote assessment tools were introduced to ensure fair and accurate evaluations. These tools could monitor students during online exams, detect cheating, and even assess clinical skills through virtual simulations, ensuring the integrity of the assessment process.

Another notable aspect of integrating artificial intelligence into medical education is its capacity to provide immediate feedback and assessment. This allows students to track their progress, identify weaknesses, and receive immediate guidance for improvement [9]. Learning assessment with the help of artificial intelligence can contribute to a more objective, faster, more cost-effective assessment process and provide individualized feedback [10]. Therefore, one of the important applications of artificial intelligence is in the automatic review of assignments and predicting the correctness of students' answers based on their observational behaviors [6].

This experience makes students' learning deeper and more pleasant and increases students' concentration. This is because AI can teach students individually and highlight areas that need further study, and if students don't understand something, AI can point it out [11]. AI can also help educators create individualized learning plans, track learner progress, and provide real-time feedback [5]. Artificial intelligence algorithms were used to analyze students' learning patterns, their strengths and weaknesses, allowing instructors to tailor educational content to individual needs. This personalized approach not only improved learning outcomes, but also reduced student burnout and frustration [7,11].

AI-powered data analysis helped medical schools identify areas where students struggled the most and adjust curricula accordingly. Artificial intelligence can be used to examine the effectiveness of the curriculum and the overall satisfaction of medical students with the program, as this is important in the training of future doctors [10].

Artificial intelligence methods such as machine learning/deep learning, robotics training and virtual reality have been used to enhance the learning experience and improve outcomes. In the field of behavioral health, virtual reality has been used as a tool to create immersive and interactive environments that allow students to practice their skills in simulated scenarios that mimic real-world situations. This approach helps learners to better understand the psychological and emotional needs

of patients and fosters empathy and effective communication skills. In ophthalmology, machine learning/deep learning has been used to help students recognize and diagnose various eye diseases and conditions using medical images. In orthopedics, both machine learning/deep learning and robotic training have been applied. Machine learning/deep learning helps predict outcomes, optimize treatment plans, and identify potential complications [9].

Also, the pandemic has accelerated the adoption of telemedicine and health services, creating an increased demand for healthcare professionals well-versed in these technologies. AI-based telehealth platforms offer opportunities to perform virtual diagnosis and treatment planning. This hands-on experience is invaluable in preparing future physicians for the evolving health care landscape [9,12].

There is no denying that this pandemic has affected the mental health of students and healthcare professionals. AI-powered mental health apps and chatbots offer a lifeline and confidential resources for coping with stress and burnout. These tools enabled students to effectively continue their studies [12,13].

CONCLUSION

The COVID-19 pandemic has pushed the boundaries of innovation in medical education, and artificial intelligence has emerged as a transformative force. By providing virtual learning environments, personalization, telemedicine, remote assessment, data analytics, and mental health support, AI has not only helped medical education adapt to the challenges of the pandemic, but It also improved the overall quality of education in health care. As we move forward, the lessons learned from this experience will continue to shape the future of medical education, making it more flexible, inclusive, and technologically advanced. While this shift has brought many benefits, it has also created challenges related to hands on training, digital fatigue, inequity in access to technology, and ethical concerns that need to be carefully considered. Also, distance learning can be isolating and potentially affect the sense of community and collaboration among medical students. Balancing these advantages and disadvantages is critical for a comprehensive and effective medical education experience for students in the post-pandemic era. What is clear is that the adoption and transformation of technology is inevitable and part of our current reality.

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CONSENT FOR PUBLICATION

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AVAILABILITY OF DATA AND MATERIALS

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