Opportunities and Challenges of Online Anatomy Teaching and Learning for Pre-Clinical Students

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Abstract

Teaching anatomy enables the learners to understand and apply the knowledge and concepts in their medical career. Teaching techniques should ensure the knowledge retention and development of specific skills along with different learning styles. Teaching and learning of anatomy commenced in a traditional approach preliminarily and supplemented with computer-assisted methods at present to increase engagement and interaction through learner-centered approaches. The recent crisis, caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), has tremendously affected education globally. It restricted practical-based learning, whereas it has less impact on the theoretical aspect of teaching and learning anatomy. This review discusses the implementation of various teaching and learning strategies in the virtual platform with their prospects and limitations.

Keywords: Anatomy; Teaching-Learning; Online Teaching

Abbreviations: SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2; LMS: Learning Management System; VR: Virtual Reality

Introduction

Basic anatomy knowledge is a vital component of medical sciences for surgery and medical imaging techniques to focus on the relevant anatomical structures [1]. Teaching and learning of anatomy began in 300 B.C. with cadaveric dissection. It continued with didactic teaching, an inspection of prospected specimens, models, living and radiological anatomy, and supplemented with computer-assisted learning in the traditional method of teaching and learning [2]. In addition, to gain knowledge, the medical students should develop specific skills such as experiencing the texture, exploring tissue planes, and relations of the structures by handling tissues and organs of the human body in the practical sessions [3].

The teaching methods of anatomy should express the importance and applicability to the clinical practice because of the significant content of the anatomical terminology with insufficient awareness of the relevancy in the clinical application, which leads to a reduction in the knowledge gain and interest to learn them [4]. The anatomy teaching needs to develop higher-order thinking among the students through knowledge transmission. Therefore, Pedagogical practice of learner-centered approaches like flipped classrooms, problem-based, team-based, and case-based learning, and audience response systems implemented to increase the engagement and interaction in anatomy knowledge generation by the students in the learning process with the true significance of them in their future career [5]. Furthermore, narrative types of active and engaging learning strategies motivate the students to use

their ingenuity, curiosity and intelligence by developing long term memory and confidence in knowledge retention in a specific discipline [6].

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) outbreak has detrimentally affected the above face-to-face teaching and learning of anatomy education worldwide [7]. As a result of maintaining physical distance between the individual in terms of COVID-19 control measures, unable to conduct the teaching and learning with a large group of the physical presence of students in a classroom, lecture hall, and laboratories. It expedites transforming the conventional in-person setting to the virtual form of educational strategies to ensure the continuity of the intended learning outcomes [8]. Therefore, the teaching and learning should be adopted to the new normal and technologies to overcome the interruption in the learning environment caused by the prevailing situation. Various e-learning methods were practiced for tertiary education using digital technologies even before the COVID-19 pandemic [9]. However, it became more popular after the epidemic of corona infection to continue teaching-learning during the lockdown periods.

Online Modes of Teaching-learning During the COVID-19 Crisis

The virtual platform of educations includes scheduled online video lectures, pre-recorded lectures, pre-recorded laboratory dissections videos, and high-quality microscopic images with different magnifications through the learning management system (LMS) were practiced by many educators during the pandemic due to social isolation [10,11]. The formative assessments are carried out using different online assessment tools or Moodle quizzes in LMS to ensure the attainment of the learning objectives after the online sessions. The students are more preferred on the traditional classroom lectures over the online sessions due to the lack of interaction between peers and teachers and reduced concentration in the sessions by the way they feel a reduction in the effectiveness in their learning system [12]. However, scheduled live zoom sessions provide room for collaboration, but the significant restriction for those sessions arose from the unequal strength of internet connectivity ubiquitously. As prospects of online lectures were more beneficial from the students' perspective because they can save more time for self-directed learning, and recorded sessions facilitate better understanding as a consequence of repeated listening to the sessions.

Attempting to the quizzes using text form, flashcards, and digitalized spot-like assessments eases the knowledge retention with a better understanding of the sessions. The quizzes designed with immediate feedback on their

performance, scores and clarifications to the answers were motivated the students to engage in the learning process [13]. In the long run, these formative assessments increased the performance in the final exams [14]. Network interruptions were the significant constraints for online learners [15]. Dissection has been considered a vital part of learning anatomy, and it is practiced for more than a hundred years by many institutions [2]. Regardless of the debate on the standing of cadaveric dissection, it plays a crucial role in learning the gross anatomy with relations and variations in the structures [16]. During the pandemic, the cadaver dissection is significantly reduced, likely due to the lockdown policy and fear of coronavirus reduced the acceptance of the body donations for further processing [11,15,17].

As an alternative for the cadaveric dissection, virtual cadaveric resources like Acland's Video Atlas of Human Anatomy, cadaveric images, videos of prosected specimens and YouTube videos practiced by many institutions. The use of cadaveric images and videos in online teaching leads to ethical concerns. Argosy publisher's Visible Body, Elsevier's complete anatomy, virtual dissection tables like web-based 3D virtual resources are available to learn structures and relations of organs [18]. Moreover, virtual reality (V.R.) based technology [19] and Blackboard collaborative webinars [20] are practiced as effective methods with a 3D natural or artificial computer-based model to teach anatomy as a documentary active learning experience in various levels of engagement. However, the high cost of those techniques could be a limitation for low-income countries.

Some universities postponed practical sessions until the control of the situation as the students expressed their dissatisfaction with the recorded dissection videos, and performance was also reduced in the assessment [17]. Therefore, teachers completed the theory aspect of the sessions online and conducted the dissection with a small group of students in an outsized dissection hall in different time slots by ensuring the safety guidelines to minimize the spread of infection after the reopen to complete the academic year. Also, other groups engage in prosection, plastinated specimens and demonstrations by the assistants. Multiple groups with diverse activities would facilitate maximum utilization of the limited time durations effectively.

Conclusions

Entirely on the online mode of teaching and learning is challenging for medical students in the anatomy discipline. It shows the benefits for theory-based learning but not for practical sessions. Blended learning using conventional offline methods and online platforms would be a valuable tool in the perspectives of teachers and learners in future. Therefore, properly designing the curriculum is crucial for

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teaching and learning anatomy for the virtual platform.

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