E- Learning: A New Method to Teach Anatomy

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Abstract

Today teaching and learning in medical curriculum have moved out beyond textbooks and classrooms into the digital world. According to Ellaway & Masters, "e-learning encompasses a pedagogical approach that typically aspires to be flexible, engaging and learner–centered; one that encourages interaction (staff–staff, staff–student, student–student), and collaboration and communication, often asynchronously (though not exclusively so)." E-learning should blend with, and complement didactic teaching learning methods. A blended learning environment compared with a traditional lecture setting is more fulfilling and gives a constant satisfaction as compared to traditional teaching methods. Medical students coming from varied backgrounds, find the study of Anatomy difficult, as there are a lot of new concepts and terminologies to be understood and memorized. Along with it the vast curriculum and the reduced duration of the course adds to their misery. Available resources like textbooks, workbooks or atlases do not allow accessing all anatomical structures or clinical inputs as well as the latest updates. With advances in technology, electronic learning can solve the insufficiencies experienced by such students and boost anatomy learning. The article traces an E-learning environment through various websites in the study of Anatomy and its advantages over traditional teaching methods.

Keywords: Teaching and Learning, Medical Curriculum, Textbooks, Classrooms, Digital World, E-learning, Traditional Lecture, Websites.

Introduction

The settings in which students of health care absorb information these days are much different than what it was even a decade ago. Back then the internet was not so predominantly utilised in medical education. But today more and more medical schools are employing E-learning platforms. Today teaching and learning have moved out beyond textbooks and classrooms into the digital world. According to Ellaway & Masters, "e-learning encompasses a pedagogical approach that typically aspires to be flexible, engaging and learner–centered; one that encourages interaction (staff–staff, staff–student, student–student), and collaboration and communication, often asynchronously (though not exclusively so)." The common denominator is the use of technology and electronic devices to enhance learning. The foundation for gaining proficiency and absorbing any skill is through communication and repetition.[1] Traditional learning methods in medical education involve learners, educators and also patients; hence repetition becomes difficult to avoid psychological anxiety to the patient. On the other hand E-learning comprises technology and simulation, which can be reiterated any time, to improve learning.

Learning can be didactive, active or interactive. When the learning material is passed on to the student passively, it is 'didactic', when the student

has control over the learning process, it is 'active'. In the Interactive type, the learning content evolves during the study due to teacher student interaction; and instructors act as facilitators and assessors of competency.[2] E-learning lets students evolve beyond the course expectations, and inspires discovery and learning ahead of the curriculum.[3] E learning has also been approved by the UN and WHO as a useful tool in medical education.

E-learning should blend with, and complement didactic teaching learning methods. A blended learning environment compared with a traditional lecture setting is more fulfilling as compared to traditional teaching methods. Medical educators should employ novel and innovative e-learning methods in order to improve student concentration.[4] An E-learning environment facilitates the use of varied technologies which comprise multimedia applications through Web-based learning, Online learning, Distributed learning, Computer-assisted instruction, or Internet based learning. E learning also includes learning via links with other learners through e-mail, video-conferencing, and chat. This enables group discussions which are beneficial to learning.[5]

Discussion

Medical students coming from varied backgrounds, find the study of Anatomy difficult, as there are a lot of new concepts and terminologies to be understood and memorized. Along with it the vast curriculum and the reduced duration of the course adds to their misery. Available resources like textbooks, workbooks or atlases do not allow accessing all anatomical structures or clinical inputs as well as the latest updates. With advances in technology, electronic learning can solve the insufficiencies experienced by such students and boost anatomy learning.[6]

In the present study we examined some websites which impart medical education. 'TeachMe Anatomy' is one of the most comprehensive sites. It works like an encyclopaedia for medical students. It offers the significance of unfamiliar terms in an instant, so that students don't leave the site. Each article gets an aggregated score. It shows how many revisions a post has and how up-to-date it is with the current science. This is something books can't do! It has a classy design. Each page follows a similar formatting style; an introduction to the topic, a description of the structure anatomically with relevant and clear images, and finally a clinical relevance section that draws it back to medicine. The sidebar also features a few quick MCQ-style questions alongside references to related clinical research. The paid-for premium tier gives access to a larger question bank as well as a 3D model.[7]

'Innerbody Research' is a very simple medical education site which is extremely easy to use. In the anatomy section, you can just select a system and start reading. The pages cover just about everything including specific diseases relating to that system. A great feature of the site is a navigation point on each page. You can interactively click around the part of the body relevant to each category e.g. skeletal section and you'll be taken to the detailed information.[8]

'Get Body Smart' has one of the best visuals, highly recommended quizzes and excellent tutorial sites, although unlike other sites it is much less information-dense. The highlight of this site is to show rather than tell, it uses animations to teach rather than detailed text descriptions. A navigation bar takes you to an anatomical system. From there, you touch upon a short tutorial and start solving the questions related to the images. From here you head right to the quizzes to consolidate your learning.[9]

'Anatomy Zone' is a site started by two British doctors that displays 3D videos. An interactive site in which each video comes with a scannable text allowing a user to watch and take notes directly, using the information from the site. The videos are delivered in a lecture-style format by the doctors themselves. 'UMich Anatomy' is the website made by Anatomy Department of University of Michigan Medical School. They have put their whole syllabus online free for public use. It is best for gross anatomy. Each part is structured exactly as the real-life class would progress. It also includes downloadable supplementary materials like lab worksheets and lecture slides too. Each of the available courses is divided into blocks and anatomy is studied according to physiological importance. It binds all together so that a student knows why what they are learning is important. 'www.instantanatomy. net' – Is a website for anatomical education with numerous applications for training in anatomy.[10]

There are innumerable such sites which also include BioDigital - 3-D interactive models, BodyMaps - Allows users to explore the human body in 3-D, Muscle Atlas, The Visible Human Project - Complete 3D representations of male and female human bodies[11], Workshop Anatomy for the Internet - A collection of detailed image of human anatomical structures. Other computer projects available for students include 'Virtual Reality Brain Project' - a project consisting of images of various

cross-sections of the human brain with interactive use. It allows altering the size of these cross-sections, their rotation, and selection of a specific region for observing its structure.[12]

Using various cross-sectional images of organs at different levels helps towards a better understanding and detailed knowledge of a number of anatomical structures with their connections, interconnections and spatial organization which are otherwise difficult to comprehend by students.[13] This is particularly important in the study of neuroanatomy and study of pleura and peritoneum and areas of skull which cannot be easily visualised. These can also be aptly visualised in computer programs using 3D technology.[14] Images of actual cadavers can further assist learning process. If a computer program follows criteria like free access, easy to use, zero downloading and clear explanations it is an excellent choice for medical students especially those who are hard-pressed for time. This type of proficiency will not be provided by textbooks or atlases and sometimes not even by physical assessment of the concerned structure. It also ends up being less costly than buying or preparing an anatomical model for study.[15] In view of the changing and the more clinically oriented curriculum, anatomical websites can now show clinical cases with an explanation of the disease, patient history, physical examination and diagnostic and imaging tests performed[16]. If the patient is deceased the autopsy results can be interpreted on the basis of dissection. This will go a long way in better understanding the clinical topics for a student of anatomy. The usage of cadavers and real specimens aids in longer lasting memory and acquisition of clinical diagnostic skills which is essential for clinical diagnosis of patients in later years.[17]

Books can at times be difficult to access maybe due to its cost, or being heavy to carry around or may just be out of stock; sometimes for conducting research one may have to spend hours in the library looking for references. All these are provided in the virtual space at a lesser cost and time. Bearing in mind the consistent scientific progress even in subjects like anatomy and histology, newer editions of books after updation, are usually done once every few years. Hence the use of trustworthy web sites in this field is essential.[18] A number of websites also offer continuous medical education which is a mandatory requirement for health science graduates including Anatomy. Another very important use of anatomical websites includes interactive videos depicting histology slide preparation, with the latest machinery and the latest techniques. It also includes details of the working of microscopes and slide visualisation, these are at times challenging to absorb from textbooks and are inadequately taught in many places.[19] Thus these technologies can be utilised in a cost effective manner for the continual training and also for keeping abreast of knowledge on anatomical sciences for both learners and educators.

E-learning technology can be used for growth of all 3 learning domains viz., cognitive, psychomotor and affective. In the cognitive domain virtual resources like audio-video clips, podcasts, animations, and web-links for self-directed learning can be provided to students. Psychomotor skills can be enhanced by technology, at least up to the 'knows how' level by Audio-visual demonstration of procedures, diagnostics and interventions. In the affective domain, videos portraying good and bad communication-skills, counselling sessions etc can be used to stimulate learning.[20,21]

Conclusion

There are several distinctive advantages of E-learning over traditional didactic teaching. E-learning has been established to be not only as student friendly as traditional didactic teaching but also incorporates self-directed learning. Learners can learn in a comfortable learning environment, they can learn at their convenience, there is flexibility over contents and over the pace of learning. As a result there is greater ability to concentrate. At the same time the learners are exposed to updated material with latest evidence-based content. Educators can also automate marking, digitally issue tests, track student progress and evaluate competencies accurately and effectively through online assessments.

Competing interests

The authors declare that they have no competing interests.

Authors' Contributions

SPS drafted the manuscript, performed the literature review & SR assisted with writing the paper.

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