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Short Communication

Using Leap Motion Technology in the Development of a Touchless Screen Electronic Dissector Guide in the Anatomy Dissection Laboratory

Mau Fung Ray Lee[1], Kristy Pui Ting Fung[2], Olivia Miu Yung Ngan[3], Mei Kuen Florence Tang[4]*

[1]*Information Technology Services Centre, The Chinese University of Hong Kong (CUHK), China*

[2]*Faculty of Medicine, The Chinese University of Hong Kong (CUHK), China*

[3]*CUHK Centre for Bioethics, The Chinese University of Hong Kong (CUHK), China*

[4]*Teaching and Learning Unit, School of Biomedical Sciences, The Chinese University of Hong Kong (CUHK), China*

***Corresponding author:** Mei Kuen Florence Tang, Dr, Teaching and Learning Unit, School of Biomedical Sciences, Faculty of Medicine, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong SAR, China, Tel: +852 3943 6836: Email: florencetang@cuhk.edu.hk

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Introduction

Anatomy education is a cornerstone of the medical profession education, and knowledge acquisition relied on dissection of human cadavers [1], which is an optimal setting for active learning on anatomical knowledge. Without hands-on experience, there is a gap between the practical knowledge and theoretical knowledge among student learning. Thus, medical students respectfully call these body cadaver donors as "silent teachers" [2].

The availability of cadavers is one key factor in determining how medical students will be able to learn from human dissection. In Hong Kong, like many European countries, a major source of cadavers comes from a voluntary body donationprogram, yet the local institutional-based donation program was not implemented until 2011. With a yearly intake of 250undergraduate students on the MBCHB program, the medical school needs at least 40 human cadavers for teaching purposes. Before the implementation, body donation for medical education and research was scarce, where there wereless than ten body donor registers and less than 20 bodies received for teaching purposes. The low donation rate not only fails to meet the learning need but also impede the teaching quality. After seven years of efforts, there are around 13,000 registered donors in the system, and the institution received 100 human cadavers yearly [2].

In each dissection, students will be divided into groups of 12 to 15 sharing one cadaveron the dissecting table. Before the laboratorydissection, students attend a pre-laboratory talk learning the dissecting procedures to examine those clinical anatomical structures. Each group shared one textbook of Atlas of Anatomy to identify and solve topographical structural problems. After class, books are not made available outside the laboratory. With such a big group and little resources, students often felt frustrated over limited exposure to learning from a valuable cadaver class due to limited resource and time. "I was inadequately prepared for this initial encounter with the human cadaver, and I learned little only," a student groaned after class. Quality anatomy teaching is challenging due to a lack of time in the medical curriculum, qualified teachers, and insufficient cadaver donation [3]. Above all, anatomy is one of the disciplines requiring an innovative pedagogy to stimulate medical students' interest in learning.

Electronic Dissection Guide

Blended learning is one of the contemporary teaching approaches, incorporating e-learning technology. In practice, students can access the teaching material via the online platform for self-study before attending the face-to-face lecture. After that, teachers can engage two-ways discussion with students rather than lecturing basic knowledge.

Our team has developed an electronic dissector guide, including narrative animation and a step-wise dissection video facilitating the learning in anatomy. A list of revision quiz was also included in the guide to encourage learning reflexivity. More importantly, the guide incorporates with leap motion technology [4]. With this feature, it senses hand and finger movement and performs instruction without touching the devices. Its application has been widely adopted in the training simulators [5], digital musical instruments [6] and gamification designs [7] but has not yet been incorporated in anatomy teaching.

To pilot the technology developmental feasibility and implementation, the topic of "lower limbs regions" was picked as a pilot trial. In the guide, five themes were developed including

i) Osteology of lower limb;

ii) Anterior and medial compartment of thigh

iii) Gluteal region and posterior compartment of the thigh;

iv) The popliteal region, the anterior, lateral and posterior compartment of leg and

v) Joints of the lower limb.

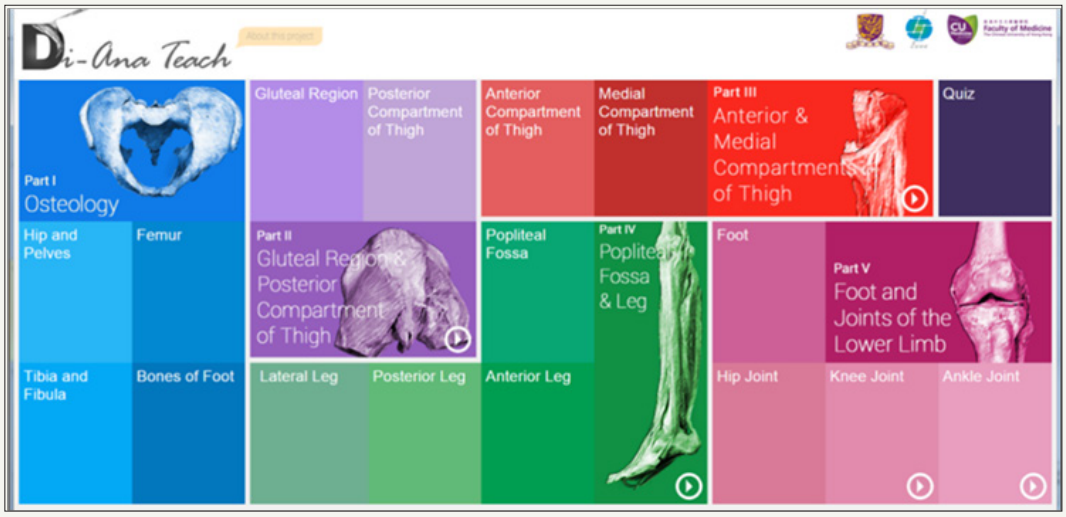

Figure 1: The homepage of the dissector guide. At present, the region of lower limbs was chosen for the pilot study in the project.

At the discussion session on the topics of the lower limbs regions, each dissection table was equipped with a notebook equipped with the 'leap motion' controller device, which enables students to use the guide conveniently even with the wet hand without touch the keyboard to flip the manual of the electronic dissection guide. This keeps the electronic guide clean and net. The narration and video not only guide students but also assist the teacher in the demonstration during the interactive cadaver dissection when teaching time is limited. After class, access to the guide will make accessible to students via the university-wide platform, where they can revise dissection materials outside the classroom, which access to be not granted in the traditional teaching methods. The self-quiz also plays a vital role in the learning process as the scores act as an indicator on how many understanding students retain after learning in the topic.

Conclusion

"Touchless screen" is a novel feature with great potential in anatomy teaching. It creates a handy tool that helps facilitate during practical dissection; yet, the leap motion controller is limitedregarding sensor detection. Next, the team aims to explore the new generation of leap motion controller to improve gesture sensitivity, incorporate zoom-able and rotatable features to look from varying angles in the dissector guide, add more labeling in the dissertation video for more comfortable review, and add more questions in the study self-reflection.

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