Blended peer-assisted learning using a video conference system for anatomy education: student learners' and student facilitators' perspectives

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Abstract: Anatomy education that traditionally relies on face-to-face delivery is disrupted by the outbreak of COVID-19. Due to suspension of face-to-face instruction in schools, our institution adopted a video conferencing system with peer-assisted learning (VCS-PAL). The study objectives are to: 1) report our institutional experience in adopting blended VCS-PAL in anatomy teaching; 2) describe perceptions towards this pedagogy during the pandemic among student facilitators and learners. In the mixed-method educational research, 139 year-2 biomedical engineering and pharmacy students were surveyed regarding their VCS-PAL learning experience. A total of 85 returned the survey, with a response rate of 60.7% (85/139). Most students found the live demonstration of plastinated specimens helpful in learning anatomy (82%). The general feedback from both student learners and student facilitators are positive. The blended VCS-PAL approach in anatomy education provides an excellent adjustment opportunity amidst the outbreak of the COVID-19 pandemic.

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Keywords: COVID-19; video conferencing system; peer-assisted learning; blended VCS-PAL approach; anatomy education; remote learning; health professional training.

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1 Introduction

The outbreak of COVID-19 leads to a disruption in health professional education that is mainly grounded on face-to-face teaching sessions. With the implementation of social distancing regulations, ordinary face-to-face education has been substituted with synchronous online education with a video conferencing system (VCS) (Watkins, 2020). Simply put, VCS is the utilisation of the Internet for virtual communication between individuals in different geographical locations. This real-time remote transmission of video and sound offered a solution to the social distancing restrictions, enabling teachers to deliver lectures and communicate with students (Byrnes et al., 2021).

The VCS is a multicasting media stream networking all the end-user synchronously without a georgical barrier. Even though the first generation of VCS served a visual teleconferencing service in the 1970s (Noll, 1976), this technology was not commonly intervened in the community due to limited accessibility. In the era of information explosion, the significant advancement of smartphone and mobile app development leads to a paradigm shift in the technology adoption from using the desktop to mobile (Guenaga et al., 2012). Camera-equipped hand-held mobile devices are readily accessible that enable mobile learning in remote educational settings. Nowadays, mobile devices are not only for personal communication but are regarded as learning tools through information technology in knowledge acquisition (Dunleavy et al., 2019). Mobile learning becomes an alternative way for the young generation to learn actively and understand knowledge with hand-held devices outside the classroom without physical contact (Hockly, 2013). The integration of VCS with mobile devices, such mobile applications also widely used by the healthcare sector, includes monitoring patients with multiple chronic conditions (Mallow et al., 2016) and following the prognosis for the out-patient (Pencle et al., 2018) by physicians and secondary healthcare (Moehr et al., 2005).

Peer-assisted learning (PAL) refers to the student-centric pedagogy, where the senior students teach and guide junior students' learning process (Furmedge et al., 2014). PAL as a part of the gross anatomy teaching has long been integrated into both undergraduate and postgraduate programmes in Western countries (Field et al., 2007; Nnodim, 1997; Duran et al., 2012; Bugaj et al., 2019), with recognisable benefits for both senior and junior learners, including learning efficacy, competency, autonomy, and self-confidence

(Bugaj et al., 2019; Santee and Garavalia, 2006; Secomb, 2008). Though PAL gains its recognition in the west, its application is not commonly reported in Eastern countries and institutions (Field et al., 2007). Teachers in our institutions pondered whether there are other strategies to gain students' attention during lessons. A peer-assisted way was therefore suggested and implemented. We decided to incorporate this new element, with the utilisation of flexible set up of VCS either in mobile devices or desktops, into our teaching pedagogy.

Anatomy is a branch of fundamental knowledge in the field of biomedical sciences, as well as the quintessence in pre-clinical knowledge of health profession training (Estai and Bunt, 2016). In the crossroad of modern pedagogy, innovative learning media and technologies, ranging from online videos, visual 3D anatomy applications, virtual dissection tables (Periya and Moro, 2019), have been widely mobilised to facilitate teaching-learning activities by both east and west today (Chen et al., 2020; Houser and Kondrashov, 2018).

At our institution, the anatomy education utilised the VCS for synchronous remote lectures and adapted it to practical sessions, including online live specimen demonstration and peer-facilitated discussions, i.e., VCS-PAL. In this project, our team would like to investigate if blending VCS and PAL in anatomy education can provide an active learning environment for the new pedagogy. We are particularly interested in the changing of setting two-way intercommunication even in remote anatomy education. The study objectives are to

1 report our institutional experience in adopting blended VCS-PAL in anatomy teaching

2 describe perceptions towards this pedagogy during the pandemic among student facilitators and learners.

2 Methodology

2.1 Setting new anatomy teaching approaches

2.1.1 Conventional and VCS-mediated anatomy teaching and learning

Various elements are incorporated in traditional anatomy teaching to provide systematic and advanced training for prospective healthcare professionals in the Faculty of Medicine of our institution, the Chinese University of Hong Kong (CUHK). Examples include didactic lectures, plastinated specimen demonstrations, and e-Learning resources (Figure 1). Didactic lectures serve to lay a solid foundation of anatomical knowledge, enabling students to understand human structures. The didactic lectures are organised in a system-based approach, covering both microscopic and gross anatomy for each human system module. Under normal circumstances, face-to-face lectures spanning one or two hours are delivered by lecturers in front of 20 to 30 students and are often accompanied by an interactive question-and-answer session in the end.

Following lectures are the practical for the plastinated specimen demonstration. After the corresponding structures in lessons have been delivered, a themed practical session for demonstration of plastinated structures is then arranged in each human system module. A checklist is first launched and uploaded to the Blackboard system to the

students in advance. The teachers explained further the spatial and temporal organisation of the specimens with labels. Before the practical session, students are encouraged to review the relevant anatomical concepts from lectures and supplementary e-Learning resources. The theme of the module is discussed and presented in the form of case studies or scenario-based questions. Applying concepts covered in the didactic lectures to solve questions during the practical allows students to consolidate anatomy knowledge through question-answer exercises. Figure 2 shows the plastinated specimen present in the practical session.

Figure 1 Conventional framework in anatomy education before the COVID-19 pandemic (see online version for colours)

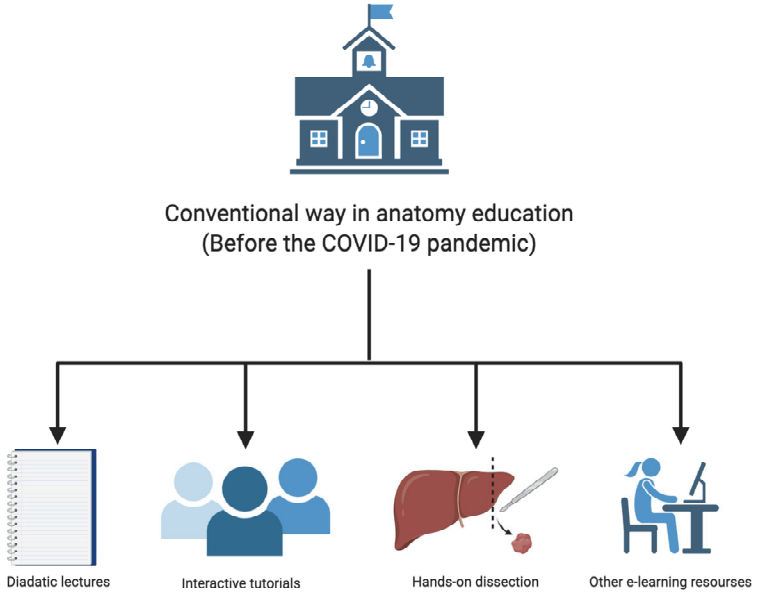
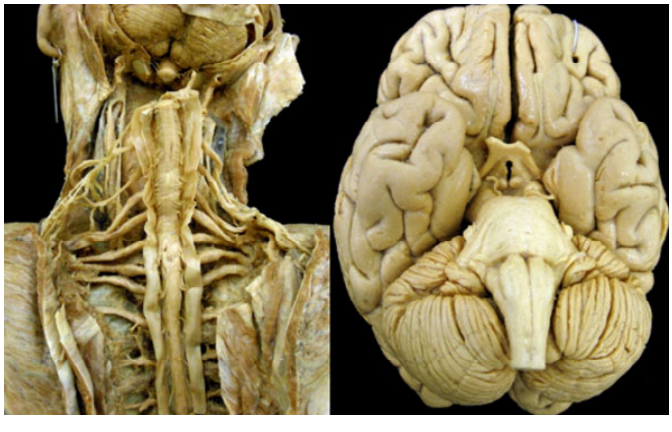
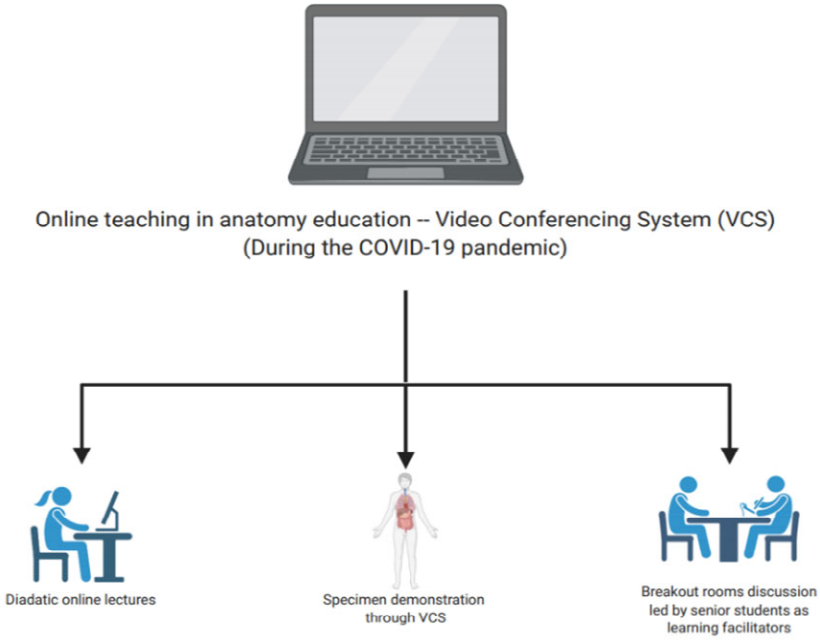


Figure 2 Dorsal view of the neck with the dissected spinal cord (left) and inferior view of the brain (right) for practical



Under the pandemic, the gigantic switch from teaching and learning medium has made didactic lectures slightly distinctive from each other. Didactic online lectures are conducted with the same course curriculum and contact hours as the face-to-face mode. In synchronous remote classes, lecturers must share their teaching material and audio. The 'screen sharing' function mainly highlights concepts with cursors or writes and draws additional notes to explain the lecture PowerPoint slides or using the 'video-sharing' function to show the video. On the other hand, students can turn on their microphone or use the 'raise hand', 'poll', and 'chat box' functions to respond to questions. In response to the concerns brought by VCS-mediated education, the major methodology, under the pandemic in our institution in teaching anatomy, encompasses irreplaceable didactic online lectures, specimen demonstration through VCS by lecturers, and a new breakout room discussion element titled VCS-PAL led by the senior students (Figure 3).

Figure 3 Teaching framework for VCS teaching in anatomy education during the COVID-19 pandemic (see online version for colours)



Note: The major methodology includes didactic online lectures, specimen demonstration through VCS, and breakout rooms with discussions (VCS-PAL) led by senior students from Medicine and Biomedical Sciences.

Apart from didactic lectures prior to pandemic, students consolidate their knowledge from e-Learning resources, e.g., 2D/3D animated videos or augmented reality (AR) courseware. The resources are made available on an online learning platform, where students are allowed to conduct self-reflection activities. Nonetheless, the transition from face-to-face learning to distance learning does not act as a panacea in order to respond to the COVID-19 outbreak. The passive nature of online didactic lectures led to the deterioration of concentration and interest to initiate question-asking and discussion between peers and teachers. In contrast, the face-to-face pedagogy can entertain and

engage the active learning for years, which has already been discussed in education literature (Richardson, 2008). Especially in this technological-advanced era and the utilisation of an online platform for lecture delivery, active learning exercises are requested to be incorporated into lectures to establish firmer engagement between learners and teachers. Besides, content delivery in online specimen demonstrations is one-way, and that defeats the very purpose of specimen demonstrations at the first place – the promotion of active learning.

Under the pandemic, the demonstration of the plastinated specimen for the practical sessions is conducted similarly to the face-to-face teaching but reformed in a digital VCS web/app. As shown in Figure 4, specimens are introduced according to the checklist provided prior to the class. The complex setup for the live plastinated specimens is indicated in Figure 4(a). Our team used the rear cam of the mobile device to capture the demonstration process via VCS to the students; whereas, the other notebook device was for monitoring 'chat' from the students who could ask questions remotely. The plastinated specimen is held up, rotated, and zoomed close towards the rear cam of mobile devices, as shown in Figure 4(b), with the teaching staff explaining each structure. Our team also automatically set 'record to the cloud' for the whole demonstration process, which was uploaded after the session for self-revision. The VCS brings problems notwithstanding the traditional aspects that have phenomenal potential to provide engagement and communication for pre-clinical healthcare professional training.

Figure 4 The demonstration of the plastinated specimen for the practical sessions (see online version for colours)

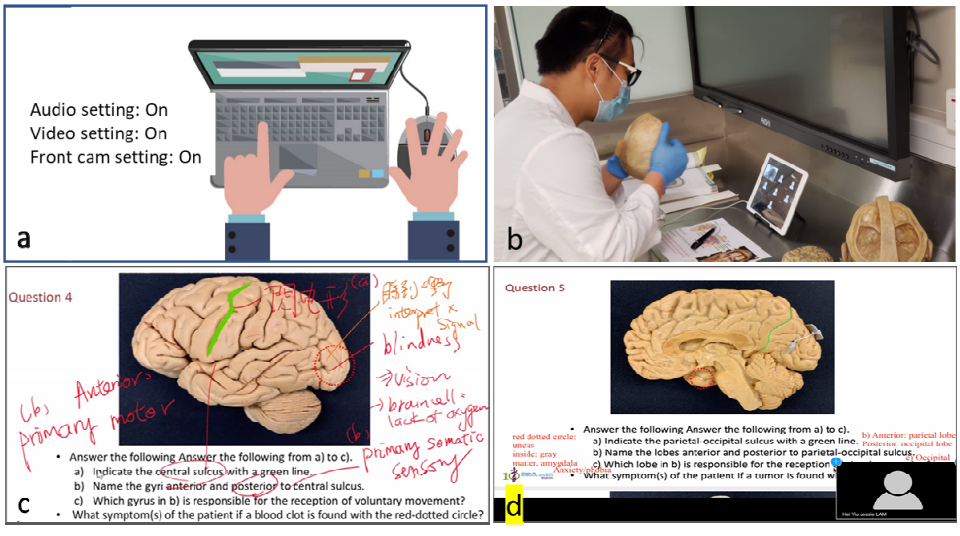
Notes: In (a), the diagrammatic illustration shows the setup of live plastinated specimen demonstration using the VCS via mobile and notebook devices. In (b), the screenshot of online specimen demonstration during practical session in anatomy courses. The live plastinated specimen videos are recorded by the 'recording' function in the VCS and then uploaded in the Blackboard system for self-paced study purposes.

2.1.2 Blended online teaching with PAL under the pandemic

Student facilitators in the PAL session were recruited from Medicine and Biomedical Sciences, who study in their senior year with enthusiasm in teaching Anatomy. In each discussion session, six student facilitators were recruited in total. In terms of PAL implementation, each student facilitator must prepare a brief content introduction, discussion questions and answers (whereas lecturers provide questions and answers)

before each session. After the demonstration was conducted via VCS, the teacher arranged the 'breakout room' with a small group discussion [Figure 5(a)]. Respective student facilitator led the breakout room discussion with 5–6 student learners in a virtual room for 20–25 minutes, guiding junior students to answer the questions as shown in Figure 5(b) and Figure 5(c). Moreover, the student facilitator facilitated the student learners to attempt the designated questions and exchange ideas with their peers. The session concludes with a group mini-presentation regarding the discussed content for the whole class, closing with feedback from lecturers and Q&A sessions [Figure 5(d)].

Figure 5 Blended online teaching with PAL under the pandemic (see online version for colours)



Notes: In (a), the diagrammatic illustration shows the 'breakout room' arrangement using the VCS via notebook device. In (b) and (c), according to the question provided, the student facilitator further interacted, discussed, and delivered the group's critical concept of the anatomical structure. In (d), the representative of the group presented their answers to the class synchronously.

2.2 E-Survey on student learners and focus group interview for the involvement of student facilitators for the VCS-PAL

An anonymous electronic Survey (e-Survey) was conducted to 139 Year 2 Biomedical Engineering and Pharmacy students at the end of the human physiology and anatomy course in 2020, which was approved by the Survey and Behavioural Research Ethics Committee of the Chinese University of Hong Kong. The e-Survey comprised three sections. Firstly, the student learners were asked their perceptions of which e-Learning methods or tools are helpful for anatomy learning. Secondly, the four questionnaire categories involved 14 closed-end questions in the 5-likert scale format to compare learning experiences in the new blended VCS-PAL approach. Lastly, they are requested to comment on the enablers and barriers of this new challenging learning. The survey also included one open-ended question enabling students to give comments on the overall learning experience. The question is, "please describe the pros and cons of each pedagogy elements". Descriptive analysis was reported.

In addition, our team also bought the focus group interview for the six student facilitators to gain perspective insight into the new remote teaching approach of VCS-PAL at the end of the academic term end. Thematic analysis will be used to identify key themes, providing a description and understanding of phenomena and then discover patterns and developing themes. This analysis composed of two fundamental analysis approaches (Creswell and Clark, 2007).

3 Results

3.1 Student learners' perception towards VCS-PAL

A total of 85 returned the survey, with a response rate of 60.7%. The one open-ended question allows students to give comments on the overall learning experience. Table 1 shows the preferred learning medium among students. Overall, the student learners are Generation Z. About 82% of them agreed that the live demonstration of plastinated specimens is helpful in the learning of Anatomy; whereas the percentage of attending Zoom lecture is 69%, reading of textbook is 58.8%, participating in group discussion is 31.8%, and others (for example, e-Learning resources) is 8%. From the data analysis, student learners adapt quickly to interactive remote learning with the live demonstration for plastinated specimens under the new normal pedagogy.

Table 1 Preferred learning medium in anatomy among biomedical engineering and pharmacy students

Which of the following do you find helpful in learning anatomy? (Click more than one)	*Percentage %*
Textbook	54
Zoom lecture	69
Live demonstration for plastinated specimen	82
Group discussion	31
Others	8

With social distancing measurement, the student learners are satisfied with the blended VCS-PAL approach to uphold their quality of Anatomy learning. From the data analysis in Table 2, the Cronbach alpha coefficient for all variables is above 0.8, indicating that the variable of four questionnaire sets is reliable and the scales' internal consistency is acceptable.

As observed in the t-test analysis of Table 3, the p value < 0.01 of all the variables expect 3c, which show the significant difference in the study. The e-Survey of four questionnaires in the form of 5-likert scales was further analysed. The average mean value is positive (>3) for all four categories. The highest means of Category 1b at 4.06 and 2a at 4.09 indicate that students agreed that the VCS-PAL approach could facilitate their learning in unexpected situations. On the contrary, the reflection of the lowest means in Category 3c at 3.2 that the opinions of student learners regarded as a bit in neutral using group presentation as a teaching modality in anatomy education.

Table 2 Cronbach's alpha coefficient of scales for the variables of four questionnaire sets

Variables		*Number of items*	*Cronbach's alpha*
1	Live demonstrations in plastinated specimens:	4	0.95
	a The live demonstration for today's practical makes the activity more enjoyable		
	b Compared with the textbook, the live demonstration is more helpful to assist me in understanding the structures		
	c Live demonstration facilitates understanding		
	d Overall, I like using live demonstrations in zoom		
2	PAL in the breakout room discussion	4	0.88
	a Student facilitators' participation in the group discussion facilitates the learning of anatomical knowledge		
	b It is good to have discussions and fun with peers		
	c Group discussions facilitate critical thinking and analytical skills		
	d Overall, I like participating in the group discussion session in zoom		
3	Group presentation session:	3	0.83
	a Group presentations facilitate memorisation		
	b Group presentation trains my presentation skills		
	c Overall, I like participating in the Group discussion session in zoom		
4	Overall perception of cognitive anatomy learning:	3	1.00
	a Practical zoom facilitates interactive learning in online teaching today		
	b The learning initiatives enhance the effectiveness of learning outcomes		
	c The information given on the topics applies to my professional development		
Total		14	0.97

Table 3 Perceptions towards blended online teaching with PAL

Variables		*Mean*	*t-value*	*Sig. (two-tailed)*
Live demonstrations with plastinated specimens	The live demonstration for today's practical makes the activity more enjoyable	3.89	9.052	0.000*
	Compared with the textbook, the live demonstration is more helpful to assist me in understanding the structures	4.06	10.673	0.000*
	Live demonstration facilitates understanding	3.89	9.159	0.000*
	Overall, I like using live demonstrations in zoom	3.66	6.424	0.000*

Notes: 5-point Likert scale (ranging from 1 – strongly disagree to 5-strongly agree), $p < 0.05$**, $p < 0.01$*, Test value = 3 (arithmetic mean value), df = degree of freedom, Mean =Likert score mean, Sig. = significance.

Table 3 Perceptions towards blended online teaching with PAL (continued)

Variables		*Mean*	*t-value*	*Sig. (two-tailed)*
PAL in the breakout room discussion	Student facilitators' participation in the group discussion facilitates the learning of anatomical knowledge	4.09	12.219	0.000*
	It is good to have discussions and fun with peers	3.54	5.501	0.000*
	Group discussions facilitate critical thinking and analytical skills	3.65	7.373	0.000*
	Overall, I like participating in the group discussion session in zoom	3.42	4.476	0.000*
Group presentation session	Group presentations facilitate memorisation	3.63	6.967	0.000*
	Group presentation trains my presentation skills	3.36	4.015	0.000*
	Overall, I like participating in the group discussion session in zoom	3.27	2.867	0.005*
Overall perception of cognitive anatomy learning	Practical zoom facilitates interactive learning in online teaching today	3.71	6.967	0.000*
	The learning initiatives enhance the effectiveness of learning outcomes	3.78	4.015	0.000*
	The information given on the topics applies to my professional development	3.85	2.867	0.000*

Notes: 5-point Likert scale (ranging from 1 – strongly disagree to 5-strongly agree), $p < 0.05$**, $p < 0.01$*, Test value = 3 (arithmetic mean value), df = degree of freedom, Mean = Likert score mean, Sig. = significance.

Table 4 Written comments from the student learners for VCS-PAL pedagogy for anatomy learning

Learning sustainability
Live demonstration
• It would be perfect if the zoom demonstration breaks into a smaller group. The breakout room discussion helps us to understand more
• I love the live demonstration a lot
• Without the live demonstration, I can't understand and memorise most of the structure
• I hope the live demonstration will be recorded and continuously to be adopted after the pandemic
• It is good that we can see the 3D specimen as it is easier to picture the structure
PAL group discussion
• The student facilitators were beneficial to help to understand the practical session
• Student facilitators are friendly and explain concepts in detail
• Also, thanks for finding many such student facilitators to help us in the group discussion!
• I wish this could be done with the other anatomy practicals

Table 4 Written comments from the student learners for VCS-PAL pedagogy for anatomy learning (continued)

Learning barriers
• The time is rush, can be extended for the group discussion time
• Should allow more time to revise functional anatomy
• The pace was breakneck; it is almost impossible to understand and learn everything unless I am already familiar with the topics thoroughly
• Plus, the breakout room experience was terrible, not everyone spoke and ended up only 2/3 of us completing the exercise; again, the pace was fast, and time is super limited
• The live demonstration camera is not so clear that sometimes I cannot recognise the areas are pointed by teachers

Student learners had opportunities to express opinions about the newly adopted VCS-PAL approach. The comments are further analysed into two categories, i.e. the Teaching Sustainability and Teaching Barriers. Overall, the blended VCS-PAL approach received positive feedback on the pedagogy as indicated in Table 3, specifically the Live Demonstration and the PAL Group Discussion. One of the comments stated that "I hope the live demonstration will be recorded and continuously to be adopted after the pandemic". Will also reflect the student learners who can accept such alternative pedagogy for teaching anatomy. Students enjoyed the interaction and intellectual exchange in the PAL group discussion, for example, visualising specimens and in-depth discussion. Of course, there is a strive for a balance in the blended VCS-PAL approach; teaching barriers were also presented, including occasional inactive discussion, poor participation rate, and insufficient time for the presentation.

3.2 Reflections from student facilitators

At the end of the course, student facilitators were invited to have the focus group interview for their insight into teaching and learning experience with the VCS-PAL approach. The reflections were scrutinised and summarised below by three themes.

3.2.1 PAL improves communication and teaching

All facilitators agreed that incorporating PAL is beneficial to online teaching whenever and wherever in-person interaction is limited. In conventional teaching, the teacher to student ratio is 1:340 in the lecture and 1:30 in the tutorial, whereas the teaching ratio for PAL is further reduced to 1:5 per group in the breakout session.

During zoom breakout room sessions, student learners were assigned questions on designated subjects. The small groups empowered student facilitators to focus on junior students' feedback and pay heed to their needs and responses. The student facilitators could explain topics in substantial depth that student learners found hard to grasp. This facilitates further consolidation of concepts learnt in the previous lectures and structures of the specimens presented in the demonstration sessions for junior students. Aside from this, as non-authoritarian figures who lead the breakout session, student facilitators could shape a relaxing environment, building a foundation of interactive atmosphere and granting students a more comfortable environment to raise their questions.

3.2.2 Student learners are proactive participation in VCS-PAL

Student facilitators generally acknowledged the convenience of the VCS-PAL system in the context of intercommunication. Student learners, in that atmosphere, were motivated to initiate self-learning, evoke critical thinking, and increase concentration, and thus boost their academic performance. Moreover, in a computer-supported and collaborative learning environment, more effective interaction and participation were enabled compared to a traditional classroom setting. Task-oriented and reflective activity, complex reasoning and argumentation, critical thinking skills, and authentic proof activity could therefore be reinforced.

However, occasionally lacking interaction between students during discussion sessions in VCS constitutes the major reason that this new system did not entirely convince them. Apart from potential privacy infringement, some student learners, initially inactive, feel a certain level of uncomfortableness and reluctance to turn on the camera. Since student learners may not turn on their microphones and cameras, strenuosity exists for facilitators to perceive the reactions and attentiveness of students, unlike in conventional face-to-face sessions.

3.2.3 Consolidate the professional knowledge of career development

Below quoted one of the student facilitator's experiences in the newly adopted VCS-PAL approach for anatomy education:

> "The new pedagogy is of mutual benefits for student learners and student facilitators. As a facilitator, the preparation work completed before the session enables me to consolidate further and better understand the topics. Revising previous lectures and reviewing reference literature refreshes my memories of what I have learnt in my early years. With the presentation and guidance performed during breakout sessions, I learnt to organise and explain the topics in a more precise manner, facilitating not only students' but also my anatomy learning."

The above quote addresses a significant value in PAL that content learnt in the previous years was hardened for student facilitators. Consolidating pre-clinical expertise is crucial for healthcare professionals to understand anatomy thoroughly and prepare for later training in future career paths.

3.2.4 Low-resolution of VCS-mediated learning for live specimen demonstration

Admittedly, student facilitators come across technical problems while holding the discussion session at intervals. Complaints such as blurred images, low resolution making specific tiny and delicate structures could not be seen, and poor Wi-Fi connection often make the further enactment of VCS-mediated education in a dilemma. The blurred images of the specimen serve minimal effectiveness in improving the recognition, understanding and memorisation of the structural features and their respective functions. Other technical problems mainly from the online learning software, such as connection problems, audio problems, background noise problems, and transition errors, might also pose difficulties in providing a smooth learning experience.

4 Discussion: blended VCS-PAL e-Learning for anatomy education

With the transition from face-to-face to online teaching amidst the pandemic, the efficiency and effectiveness of the new teaching and learning format become the focus of discussion in the education of prospective healthcare professionals (Pei and Wu, 2019; Hamilton et al., 2016; Quesada-Pallares et al., 2019). It is evident that the VCS-PAL approach enables learning with autonomy, self-confidence, and peer evaluation, as Bugaj et al. (2019) have mentioned in narrating the crucial elements in PAL for healthcare education. Most importantly, the VCS also work to eliminate space-time constraints, notwithstanding its few limitations in PAL that could be naturally overcome in conventional face-to-face teaching.

In short, the VCS-PAL encompasses three major elements with our collective data. Firstly, the approach relies on senior students to transfer retrospective knowledge and experience to student learners. Secondly, a well-recognised bilateral learning process can be established effectively (Bugaj et al., 2019; Guraya and Abdalla, 2020). On the one hand, senior students could use the opportunity to gain teaching experience. On the other hand, student learners could clarify and solidify concepts learnt with advice from the student facilitators. Thirdly, lecturers will provide presentation feedback to guide both student tutors and tutees in the process. As previously described, PAL is a learning model where students from similar educational backgrounds but not necessarily the same level help each other learn (Guraya and Abdalla, 2020). In traditional anatomy learning, faculty members who design the course content predominantly determine student learners' breadth and depth of knowledge. Online learning, nevertheless, as the core problem we would like to solve, made communications difficult, and the lack of real-life specimen visualisation or hands-on practicum made anatomy learning obscure. Therefore, the VCS-PAL approach aims to provide a collaborative platform to enhance the interactive anatomical learning experience and provide a new source of knowledge input and inspiration from peer support under the pandemic.

According to our survey results and facilitators' recall, one deficiency of VCS-PAL is decreased student activity and interactions. Since some student learners tend to turn off their webcams, it was challenging to note their verbal and facial cues during the discussion session. Attitude upset the long-established triadic initiation-response-feedback (IRF) that predominates in face-to-face classrooms. It relies on linguistic interactions between teachers and students, and the immediate response between both to further answer and explain certain concepts articulates the discussion (Hall and Fine, 1977). This pattern dominates most of the time in traditional classroom teaching (Molinari et al., 2013) but is now rendered unavailable with webcams off.

Students' 'click-and-respond' action is prohibited unconsciously without facial expressions and body language. Most of them would rather stay quiet throughout the entirety of lectures and tutorials. The inactivity of students incapacitates teachers from modifying their teaching methods, adjusting the pace and speed of teaching, and clarifying common problems encountered by students. Mainly speaking, the learning atmosphere in Asia is considered more passive than in Western countries. The education in Asia is more exam-centric than the liberal arts education system in Western culture that stresses cherishing individual talents, attributed to such phenomenon (Lim, 2010). Student learners might find answering questions or making mistakes embarrassing, thus are less likely to respond to lecturers and facilitators. Teachers and students'

contributions are essential in promoting a more encouraging classroom environment for maximal in-class interactions.

Another interesting phenomenon observed in VCS-PAL is the increased participation of previously inactive students in a breakout room with PAL approach. This is due primarily to the smaller group size in zoom breakout rooms, which leaves more freedom and flexibility for efficient double-way communication among student learners and facilitators. Student learners are more willing to discuss and raise queries compared to big class didactic lectures. This phenomenon is believed to be more eminent among Asian students. In general, student learners are found to be more proactive in class when given various means of their choice to be involved in class, such as using voice audio, typing in the chat-box, or annotating on the diagram in small groups breakout discussion sessions. The variety of available channels appeals and caters to students with different preferences and learning modes, thus effectively encouraging in-class participation. More importantly, the relaxing VCS-PAL environment allows sufficient flexibility for students in the same small breakout groups to use their mother tongue, the language they are most comfortable with (Cantonese in our institution for the majority of students). Those previously reluctant to respond, burdened by their incompetency in English, could then express themselves freely at ease. As discussions with peers are pivotal in understanding key concepts and clarifying misunderstandings, learning performance in anatomy increases with increased student participation. All in all, traditional anatomy classes are taught in a more top-down and one-way approach, while those launched via Zoom promotes dual-way learning for maximising in-class interactions. The increased student participation in breakout sessions largely relies on the unique zoom classroom functions, which are not technically available in conventional face-to-face big classes.

The VCS-PAL should seek to escalate students' confidence and initiative in the learning process, such as enhancing communication skills for prospective healthcare professionals to facilitate interdisciplinary collaboration at work. A method mentioned above to achieve such a goal is to combine synchronous online learning activities with traditional face-to-face lectures for future learning and teaching. This paper discussed our approach in blending VCS and student facilitators for PAL; there was another proposal on 'blended' education by Liu et al. (2016) a few years ago, with a slight deviation on the definition of 'blended' between the papers. The latter suggested that online didactic lectures should be accompanied by face-to-face interactive classes such as IRF tutorials and anatomy dissections, as their advantages are not reproducible by online remote classes. With lectures held via VCS, space-time constraints can be minimised. With PAL held face-to-face, advantages of conventional face-to-face classes can be retained. As PAL can be arranged either in-person or via VCS, future education research can be conducted to compare their efficiency as a brand-new research direction.

Considering the benefits, the future of PAL in anatomy education for healthcare professionals after the COVID-19 restriction subsides is worthy of discussion. PAL serves as a great platform to provide a peer-led advisory service to junior student learners. We propose that PAL can still be adopted after the resumption of face-to-face teaching. To student learners, content learnt in lectures can be too complicated to comprehend, even with intensive tutorials and dissection sessions. The failure to grasp and formulate revision strategies is at the core of the issue. PAL offers a better peer learning platform for student facilitators to connect with student facilitators who have completed the course. Elucidation of the course requirements and learning objectives increase motivation in learning anatomy, which is often rated as an uninteresting subject

(Bergman et al., 2013). Moreover, the knowledge gap causes teachers to overestimate students' ability and thus set a higher level of difficulty in the course design. In contrast, PAL creates a more suitable learning environment for student learners who are afraid to raise their questions. The student facilitators, being closer in age and academic level with learners, are capable of conveying knowledge and advice at an understandable level. Therefore, our team has agreed that PAL can be an extra element for healthcare professionals in anatomy teaching after the resumption of face-to-face instruction.

5 Conclusions: navigating the new normal for anatomy education

Under the new normal brought by the pandemic, the VCS-PAL approach is adopted to prevent outbreaks on the campus. There is room for improvement in the conduction of VCS-PAL. All parties involved are in the process of familiarising themselves with the technical nuances and operations of the online learning platform. Teachers should refrain from] presenting learning materials in a one-way, top-down direction to prevent reinforcing the Asian-type passive learning culture. Teachers and facilitators should deliver the content precisely and concisely so that students can enjoy the newly adopted e-Learning experience. The unexpected technical circumstances encountered in e-Learning can be overcome with the assistance of experienced technical staff. Software should be upgraded in order to maximise screen resolution for the presentation of specimen images while teaching. Boosting students' learning experience can affect their perception and performance in and out of class, thereby changing their ratings and feedback in surveys and studies.

The overall feedback from both student learners and student facilitators are positive. Aside from some occasional technical issues in VCS, the blended VCS-PAL approach provides an excellent adjustment opportunity in anatomy education in view of the COVID-19 pandemic and social distancing regulations. Such an opportunity is extraordinary as the traditional learning mode of anatomy predominantly relies on face-to-face and experiential learning. The VCS-PAL approach prompts active participation and intellectual exchange between students and teaching staff, encouraging students to respond and ask questions. VCS-PAL received satisfactory student perception feedback. Future research directions can focus on comparing efficiency between face-to-face and VCS teaching, the disparity in academic performance following didactic lectures and PAL etc. To conclude, remote pedagogy by VCS-PAL has surprising benefits on teaching and could be incorporated as the gold standard of anatomy education in the future. Innovative approaches in education should ultimately serve to construct a solid knowledge foundation and strengthen practical skills to improve the professional competency of prospective health professionals.

Disclaimer

We certify that we do not involve any organisation with financial or non-financial interests in the commercial products used and discussed in this manuscript.

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