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Students' perception toward blended anatomy learning modalities in the COVID-19 era

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ABSTRACT

INTRODUCTION: Human anatomy is a cornerstone of medical practice hence teaching modalities should be strengthened. Major challenges were faced in this COVID-19 era when the teaching aspect was considered. The use of eLearning and blended learning is an innovative delivery mode to enhance medical education efficiency in the pandemic era. This study aims at investigating the student perception and satisfaction with the blended learning modality at the University of Rwanda.

METHODS: This was a cross sectional study that was conducted at the University of Rwanda. 115 students undertaking the anatomy module participated and were subjected to the validated online questionnaire using Microsoft form. The data were exported from Google Forms to Microsoft excel 2013 for cleaning and coding and analyzed with SPSS version 25; cleaned data were then exported to SPSS version 25. Descriptive analysis was done using mean, standard deviation, frequency, and percentages. The University approval was obtained.

RESULTS: Out of 134 students, 115 students (85.4%) were enrolled in the study. Learning outcomes were reported to be clear, the anatomy module was well organized, and timely delivered module teaching was reported, and findings were 43.1%, 83,6% and 78.5%, respectively. On practical sessions, students expressed high satisfaction at 87.6%, with cadaver-based learning interest at 91.2%. E-learning relevance was higher than three quarters (76.5%).

CONCLUSION: We noted the effectiveness of online and in-person teaching modalities among medical students undertaking the anatomy module at the University of Rwanda. Improvement of e-learning modality and availing prerequisite equipment at the University of Rwanda is recommended.

Keywords: Anatomy, Teaching, Learning, Pandemics, Medicine

INTRODUCTION

The teaching and learning of anatomy is an essential component of medical education. All stakeholders should monitor the delivery: students, graduates, teachers, medical faculties, institutional assessors, health institutions, and external assessors [1]. It is important that the anatomy teaching and learning strategies be further developed and carried out accordingly to meet the needs of the community in which the medical professionals are going to function [2].

The anatomy curriculum is an active and continuous process that engages students, and involves structures identification, experiences, and information to build knowledge, skills, and attitudes necessary to the required competencies [1].

Therefore, the teaching and learning activities should take place in a medical institution with committed medical faculties, modern infrastructures, and a conducive academic environment that fosters progress in the healthcare system [3]. Learning requires learners' motivation and cognitive engagement as the learning process necessitates consistent mental effort and persistence [4].

In order to engage students in anatomy learning, different experts have suggested a multimodal approach combining classes, dissection, medical images, and computer-based learning. Online learning has become an indispensable tool for learning [2], and the University of Rwanda's School of Medicine and Pharmacy has engaged in e-learning for the last two decades.

The COVID-19 pandemic has affected the educational systems worldwide, leading to the near-total closure of schools, universities, and colleges that have rated the rightness of the use of e-learning [5]. Most governments decided to temporarily close educational institutions in an attempt, to reduce the spread of COVID-19 [5]. In March 2020, Rwanda closed all classes, including nursery, primary, secondary, and tertiary, to curtail the spread of COVID-19. The statistics show that 75713 students were admitted into higher institutions in Rwanda, and all of them stopped their classes due to the Covid-19 pandemic [5]. However, the students were engaged on Moodle e-learning platform with two activities every weekend as an exercise to avoid interruption of the learning process. When the university reopened in November 2020, blended learning had become the reasonable way of teaching and preventing the covid-19 pandemic spread. The blended learning delivery of anatomy modules has been applied for the first time and perhaps come to stay, hence its legitimacy and efficiency. Therefore, the present study seeks to assess students' perception of the blended learning delivery methodology, and benefits and further inform them on ways of improvement.

METHODS

Research population: Two modules of Gross Anatomy were delivered to students from General Medicine, Dental, Surgery, and Pharmacy programs through a blended learning delivery mode during the 2019-2020 academic year. There were other medical students at the Rwanda Military Academy (RMA)-Gako. The general medicine and dental surgery students were taking a similar sequential delivery of anatomy modules, and they constituted our research population. The 135 students have registered for the two modules. The pharmacy for RMA students was excluded from the study population as they have different sequential mode delivery methods.

Study design: A cross-sectional study was employed, a sample size of 135 students determined and drawn from the study population who had registered for the two anatomy modules. The data collection was by use of a structured questionnaire. The research tool had four sections, including sociodemographic characteristics of the study participants, Perceptions of study participants on the Online Learning modules, Perceptions of study participants on practical sessions, and perceptions of study participants on challenges with online self-directed learning.

Data analysis: After extracting the questionnaire from the Google form, the data were exported to Microsoft Excel 2013 for cleaning and coding. For further analysis, cleaned data were then exported to SPSS version 25. Data were analyzed descriptively using mean, standard deviation, frequencies, and percentages. To describe the demographic characteristics of participants and their perceptions on blended learning modalities of the anatomy modules at school, whose responses were categorized using a five-point Likert's scale (Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree). Open-ended questions

were analyzed using thematic analysis, i.e., themes were created and coded on qualitative responses.

Permission to conduct this study was obtained from the University of Rwanda Institute of Research Board (UR-IRB). Individual participants were requested to their participation through an information statement form that clarified the study and its importance. All participants were assured of their rights to withdraw at any study stage without any negative effect. They were also assured of high confidentiality of the information obtained. They were requested not to indicate their names or any identifying marks on the survey forms to ensure anonymity. Consent was an absolute requirement before fulfilling the questionnaire.

RESULTS

Out of 135 students who constitute our population study, 115 (85.8%) responded to the research questionnaire, which shows great interest in this study.

Of the participants aged 19 to 24, 62.6 % were male, and 37.4 % were female. Their mean age was 20.8 years (SD=1.1). The majority (78.4 %) were in the department of general medicine, and others (21.6 %) were in dental surgery. Only 40.5 % of participants had laptops, and the vast majority had smartphones (96.6 %). 78.4 % accessed the anatomy modules using their smartphone, 29.3 % used their laptop, 16.4 % used shared laptops (a

Table 1: Sociodemographic characteristics of the study participants

Characteristics of study participants (N=115)	Frequency	Percent
Gender		
Male	72	62.6
Female	43	37.4
Department		
General medicine	91	78.4
Dental surgery	25	21.6
Ownership of laptop		
No	69	59.5
Yes	47	40.5
Ownership of smartphone		
No	4	3.4
Yes	112	96.6
Accessibility of electricity at home or nearby		
No	10	8.6
Yes	106	91.4
Experience with online learning before covid_19		
No	59	50.9
Yes	57	49.1
Experience with online learning before joining the university		
No	96	82.8
Yes	20	17.2
Residence during covid_19 lockdown		
Rural	53	45.7
Urban	40	34.5
Suburban	23	19.8

Table 2: The student's perception on online learning and teaching

Questions	S A (%)	A (%)	N (%)	D (%)	SD (%)	MEAN(SD)
Online Module Content and Organization						
The learning outcomes were clear	12(10.3)	38(32.8)	49(42.2)	14(12.1)	3(2.6)	3.4(0.9)
The anatomy modules were well organized	55(47.4)	42(36.2)	12(10.2)	6(5.2)	1(0.9)	4.2(0.9)
The anatomy modules were delivered in timely manner	53(45.7)	38(32.8)	18(15.5)	6(5.2)	1(0.9)	4.2(0.9)
The Modules content were adequate	38(32.8)	41(35.3)	25(21.6)	7(6.0)	5(4.3)	3.9(1.1)
Online Student's Contribution						
I participated actively in online of the anatomy modules	31(26.7)	50(43.1)	26(22.4)	7(6.0)	2(1.7)	3.9(0.9)
I was given a chance to participate in these online anatomy modules	50(43.1)	43(37.1)	19(16.4)	2(1.7)	2(1.7)	4.9(0.9)
I did pay much attention to online learning in these modules	30(26.3)	43(37.7)	29(25.4)	8(7.0)	4(3.5)	3.8(1.0)
Using online learning was easy	7(6.4)	14(12.8)	36(33.0)	28(25.7)	24(22.0)	2.6(1.2)
Online Learning Resources						
Learning materials were relevant and useful	36(31.3)	52(45.2)	21(18.3)	5(4.3)	1(0.9)	4.0(0.9)
Recommended reading was relevant and appropriate	34(29.6)	55(47.8)	17(14.8)	7(6.1)	2(1.7)	4.0(0.9)
I did pay much attention to online learning in this module	31(27.4)	48(42.5)	24(21.2)	6(5.3)	4(3.5)	3.9(1.0)
Online assessment and exercises						
Online quizzes were relevant and useful	48(41.4)	42(36.5)	12(10.4)	6(5.2)	7(6.1)	4.0(1.1)
Online assignments were relevant and useful	41(36.0)	48(42.1)	17(14.9)	4(3.5)	4(3.5)	4.0(1.0)
Online discussion forums were useful and relevant	10(8.9)	32(28.6)	33(29.5)	24(21.4)	13(11.6)	3.0(1.2)
Feedback on assessment was timely and helpful	18(15.9)	33(29.2)	33(29.2)	14(12.4)	15(13.3)	3.2(1.3)
Continuous assessment (CAT) was regularly administered	60(53.6)	46(41.1)	4(3.6)	2(1.8)	0(0.0)	4.5(0.7)
Online learning environment						
I was able to download and access all learning resources using Moodle	36(31.0)	41(35.3)	18(15.5)	16(13.8)	5(4.3)	3.8(1.2)
I managed to do all quizzes	28(24.1)	46(39.7)	18(15.5)	16(13.8)	8(6.9)	3.6(1.2)
Online discussion forum was useful and relevant	15(13.2)	32(28.1)	38(33.3)	18(15.8)	11(9.6)	3.2(1.6)
Feedback on assessment was timely and helpful	16(14.0)	34(29.8)	37(32.5)	20(17.5)	7(6.1)	3.3(1.1)
Continuous assessment was regularly administered	43(38.4)	51(45.5)	12(10.7)	2(1.8)	4(3.6)	4.1(0.9)
Class WhatsApp group was relevant and useful	63(55.3)	22(19.3)	20(17.5)	7(6.1)	2(1.8)	4.2(1.1)
The modules were Flexible, Convenient and I was able to complete units at my own pace	13(11.4)	41(36.0)	36(31.6)	17(14.9)	7(6.1)	3.3(1.1)

S A, strongly agree; A, agree; N, neutral; D, disagree; S D, strongly disagree; SD, standard deviation. Scores; S A- 5, A- 4, N- 3, D- 2, and S D- 1

laptop from a relative, classmate or neighbor, etc.), 8.6 % used public facility (Internet cafe, school computers, public library, etc.), and 6 % could access the anatomy modules using shared smartphone (a smartphone from relative, classmate or neighbor, etc.).

Most of the participants used 3G mobile data bundles during the lockdown and after the reopening of the university. However, after the reopening of the University of Rwanda, the number of students who used 3G mobile data bundles decreased from 87.1 % during lockdown to 80 % after the reopening, and the number of those who used shared hot spots, Wi-Fi modems, and cable network increased. Over 90 % of the participants had access to electricity at home or nearby (91.4 %). Almost half of the participants indicated that they had experienced online learning before covid-19 (49.1 %) and only 17.2 % had experienced online learning before joining the university. Regarding the residence of participants during the covid-19 lockdown, 45.7 % were living in rural areas, 34.5 % in urban areas, and the remaining 19.8 % were living in suburban.

Regarding the online module content and organization, most of the students agreed with the following statements: The learning outcomes were clear (43.1 %), the anatomy modules were well organized (83.6 %), the anatomy modules were delivered promptly (78.5 %) and the module content was adequate (68.1 %).

For online student participation, 69.8 % of participants agreed that they participated actively in the online learning of the anatomy modules, and the majority (80.2 %) agreed that they were given a chance to participate in the online anatomy modules. 64 % responded that they did pay much attention to online learning in the modules. When asked whether using online learning was easy, almost half of the students disagreed (47.7 %), and only 19.2 % agreed.

Regarding the online learning resources, based on participants' responses, the majority of students indicated that Learning materials were relevant and useful (76.5 %), 77.4 % agreed that recommended reading was relevant and appropriate, and 69.9 % responded that they did pay much attention to the online learning in this module.

Students were also asked questions related to online assessment and exercises, the majority of participants agreed that Online assignments were relevant and useful (78.1 %), quizzes were relevant and useful (77.9 %), Continuous assessment (CAT) was regularly administered (94.6 %), feedback on assessment was timely and helpful (45.1 %), and Online discussion forums were useful and relevant (37.5 %).

About the Online learning environment, the majority (83.9 %) of the students agreed that the continuous assessment was regularly administered, 74.6 % agreed that the class WhatsApp group was relevant and useful, 66.3 % agreed that they were able to download and access all learning resources using Moodle, 63.8 % agreed that they managed to do all quizzes, 47.4 % agreed that the modules were flexible, convenient, and they were able to complete units at their own paces, 43.8 % of students agreed that the feedback on assessment was timely and helpful, and 41.3 % agreed that the online discussion forum was useful and relevant.

Learning Resources & Tools: The vast majority of students agreed with the following statements: practical learning fits with the modules content (87.6 %), cadavers as teaching materials were sufficient (91.2 %), cadaver structures were clear, instructive, and helpful (82.3 %), anatomical models as teaching materials were sufficient (83.2 %), medical images fit the sessions content (83.9 %), lecturers and lab technician were available, accessible, and supportive (84 %), anatomical models as teaching materials were clear, instructive and helpful (92 %), and anatomical flash cards were clear , instructive and helpful (77 %).

Organization and Planning: 81.6 % of the students agreed that the group composition was fair (balanced, same aptitude, comparable), 85.5 % agreed that group size facilitated interaction and peer learning, and 84.8% agreed that they personally had the opportunity to perform practical learning activities (hand on). 92.9 % of students agreed that the practical timetable was respected, 90.3 % agreed that the lecturers were punctual (start learning activities on time), and 93.8 % agreed that they were punctual (start learning activities on time), some other 46.5 % of participants agreed that the time allocated to each session was sufficient considering activities to be done.

Learning process: The vast majority of students indicated that they appreciated the interaction with

Table 3: Perceptions of students on Practical sessions

Questions	S A (%)	A (%)	N (%)	D (%)	SD (%)	MEAN (SD)
Learning Resources & Tools						
Practical learning fits with the modules content	63(56.3)	35(31.3)	10(8.9)	4(3.6)	0(0.0)	4.4(0.8)
Cadavers as teaching materials were sufficient	68(60.2)	35(31.0)	7(6.2)	3(2.7)	0(0.0)	4.5(0.7)
Cadavers' structures were clear, instructive and helpful	39(34.5)	54(47.8)	13(11.5)	7(6.2)	0(0.0)	4.1(0.8)
Anatomical Models as teaching materials were sufficient	41(36.6)	52(46.6)	13(11.6)	5(4.5)	1(0.9)	4.1(0.9)
Medical images fit the sessions content	50(44.6)	44(39.3)	16(14.3)	2(1.9)	0(0.0)	4.3(0.8)
Lecturers and Lab Technician were available, accessible and supportive	57(50.4)	38(33.6)	13(11.5)	5(4.4)	0(0.0)	4.3(0.8)
Anatomical Models as teaching materials were clear, instructive and helpful	44(38.9)	60(53.1)	8(7.1)	1(0.0	0(0.0)	4.3(0.6)
Anatomical flash cards were clear, instructive and helpful	39(34.5)	48(42.5)	20(17.7)	6(5.3)	0(0.0)	4.1(0.6)
Organization and Planning						
Group composition was fair (Balanced, same aptitude, comparable,..)	43(38.1)	49(43.4)	16(14.2)	4(3.5)	1(0.9)	4.1(0.9)
Group size facilitated interaction and peer learning	54(48.6)	41(36.9)	13(11.7)	1(0.9)	2(1.8)	4.30(0.8)
I, personally had the opportunity to perform practical learning activities (hand on)	56(48.3)	42(36.2)	11(9.5)	2(1.7)	2(1.7)	4.3(0.9)
Practical time table were respected	72(63.7)	33(29.2)	5(4.4)	3(2.7)	0(0.0)	4.5(0.7)
Lecturers were punctual (start learning activities on time)	67(59.3)	35(31.0)	8(7.1)	3(2.7)	0(0.0)	4.5(0.7)
Student were punctual (start learning activities on time)	54(47.8)	52(46.0)	7(6.2)	0(0.0)	0(0.0)	4.4(0.6)
Time allocated to each session were sufficient considering activities to be done	18(16.1)	34(30.4)	27(24.1)	23(20.5)	10(8.9)	3.2(1.2)
Learning process						
I appreciated the interaction with Lecturers/facilitators during the practical session	43(38.1)	51(45.1)	16(14.2)	3(2.7)	0(0.0)	4.2(0.8)
I appreciated the interaction with my group members during the practical session	65(57.5)	44(38.9)	3(2.7)	1(0.9)	0(0.0)	4.5(0.6)
I appreciated the guidelines, instruction and were helpful	62(55.4)	42(37.5)	8(7.1)	0(0.0)	0(0.0)	4.5(0.6)
I was comfortable working on cadavers	57(50.4)	49(43.4)	5(4.4)	2(1.8)	0(0.0)	4.4(0.7)
The practical session improves my knowledge and understanding of the topics	83(73.5)	27(23.9)	2(1.8)	1(0.9)	0(0.0)	4.7(0.6)
Learning environment						
Light in laboratory was enough to visualize the structures	66(57.9)	42(36.8)	5(4.4)	1(0.9)	0(0.0)	4.5(0.6)
The practical Laboratory was clean	79(68.1)	28(24.1)	6(5.2)	1(0.9)	0(0.0)	4.6(0.6)
I was able to cope with the smell from cadavers & chemicals in the laboratory	38(33.3)	55(48.2)	15(13.2)	6(5.3)	0(0.0)	4.1(0.8)
Space Laboratory is sufficient to the group size (wide enough)	61(53.5)	38(33.3)	12(10.5)	3(2.6)	0(0.0)	4.4(0.7)
PPE (Personal Protection Equipment: surgical masks, gloves, lab coat) was sufficient	88(78.6)	21(18.8)	2(1.8)	1(0.9)	0(0.0)	4.8(0.5)
COVID-19 preventive measures (social distance, surgical masks, hand sanitizer and hand washing) were respected	65(57.0)	39(34.2)	10(8.8)	0(0.0)	0(0.0)	4.5(0.7)

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OSPE (Objective structure practical exam) and practical session evaluation						
OSPE evaluation were relevant to the topic covered in practical session	63(54.8)	41(35.7)	8(7.0)	3(2.6)	0(0.0)	4.4(0.7)
Time allocated to OSPE were sufficient	37(32.2)	43(37.4)	18(15.7)	10(8.7)	7(6.1)	3.8(1.6)
OSPE marks were fair and objective	18(15.8)	47(41.2)	38(33.3)	8(7.0)	3(2.6)	3.6(0.2)
Preparation for OSPE provided a learning opportunity	41(35.7)	53(46.1)	16(13.9)	4(3.5)	1(0.9)	3.7(0.9)
practical sessions assessments were fair, objective and instructive	41(35.7)	53(46.1)	14(12.2)	6(5.2)	1(0.9)	4.1(0.8)
I will recommend practical learning to continue in the same way in the future	56(48.3)	39(33.6)	14(12.1)	5(4.3)	1(0.9)	4.1(0.9)

S A, strongly agree; A, agree; N, neutral; D, disagree; S D, strongly disagree; SD, standard deviation. Scores; S A- 5, A- 4, N- 3, D- 2, and S D- 1

lecturers/facilitators during the practical session (83.2 %), that they appreciated the interaction with group members during the practical session (96.4 %), that they appreciated the guidelines, and that instructions were helpful (92.9 %), that they were comfortable working on cadavers and the practical session improved knowledge (93.8 %), and understanding of the topics (97.4 %).

Learning environment: The majority of the students indicated that the light in the laboratory was enough to visualize the structures (94.7 %). 92.2 % indicated that the laboratory was clean. 81.5 % indicated that they were able to cope with the smell from cadavers and; chemicals in the laboratory. 86.8 % agreed that the space in the laboratory was sufficient to the group size (wide enough), nearly all agreed that PPE (Personal Protection Equipment: surgical masks, gloves, lab coat) was sufficient (97.4 %), and the majority indicated that the COVID-19 preventive measures (social distance, surgical masks, hand sanitizer and hand washing) were respected (91.2 %).

OSPE (Objective structure practical exam) and practical session evaluation: Regarding the objective structure practical exam (OSPE) and practical session evaluation, 90.5 % of participants indicated that they were relevant to the topic covered in a practical session. 69.6 % indicated that the time allocated to OSPE was sufficient, and the majority (57 %) indicated that the OSPE marks were fair and objective. 81.8 % of the students agreed that preparations for the OSPE provided a learning opportunity; also, 82.1 % agreed that practical session's assessments were fair, objective, and instructive. Furthermore, most of the students

indicated that they will recommend practical learning to continue in the same way in the future (81.9 %).

Challenges with online Self-directed Learning: Table 4 summarizes the responses to questions on the perceptions of participants on challenges with online self-directed learning.

The majority of participants agreed that learning at home was destabilizing and lacked focus (69.3 %). 57.1 % indicated that their internet connectivity was not fast and stable. Almost half of the participants (48.6 %) believed that the cost of the internet was not affordable to them and their families/tutors/sponsors, whereas 41.1 % agreed that the UR-Huye campus had not enough accessible computer laboratories. 38.7 % of participants cited the reliability of UR-E-Learning challenges and the reliability of internet challenges (38.7 %). 26.8 % agreed that they were not able to submit all assignments and quizzes.

Some other challenges were indicated by the participant, including lack of access to support while they had a problem (help desk) (23.4 %); lack of electricity at home (18.6 %); lack of required computer skills, and online learning study skills (15.8 %), and so on.

Students' suggestions: Students were asked to provide suggestions to improve in a practical session. The most common suggestions provided by the students were to extend the time for the practical session (44 %), students suggested more explanations (22.4%), Interaction between facilitators and students (9.5 %), the number of facilitators should be increased (5.2 %).

When asked to provide suggestions to improve online, the most common suggestions were:

Table 4: Perceptions of study participants on challenges with online self-directed learning

Questions	S A (%)	A (%)	N (%)	D (%)	SD (%)	MEAN (SD)
Issues faced during the online learning						
I do have required computer skills and online learning study skills	26(22.8)	38(33.3)	32(28.1)	14(12.3)	4(3.5)	3.6(1.1)
The cost of internet is affordable to me and my family/tutor/sponsor	5(4.4)	17(14.9)	32(28.1)	40(35.1)	20(17.5)	2.5(1.1)
I have access to laptop and smart phone	29(25.2)	27(23.5)	32(27.8)	22(19.1)	5(4.3)	3.9(1.3)
Electricity at home is available and reliable	47(41.6)	35(31.0)	10(8.8)	14(12.4)	7(6.2)	3.5(1.2)
My internet connectivity is fast and stable	3(2.6)	14(12.3)	32(28.1)	41(36.0)	24(21.1)	2.4(1.0)
UR-Elearning is reliable	4(3.6)	28(25.2)	36(32.4)	27(24.3)	16(14.4)	2.8(1.1)
Help desk (assess to support while you have a problem for example change password is available and rapid)	22(19.1)	36(31.3)	30(26.1)	15(13.0)	12(10.4)	3.4(1.2)
Learning at home was destabilizing and lack of focus	44(38.6)	35(30.7)	22(19.3)	8(7.0)	5(4.4)	3.9(1.1)
I was able to submit all assignments and quizzes	19(16.5)	38(33.0)	27(23.5)	22(19.1)	9(7.8)	3.3(1.2)
UR-Huye campus has reliable internet	5(4.3)	26(22.6)	42(36.5)	25(21.7)	17(14.8)	2.8(1.1)
UR-Huye campus has enough accessible computer laboratories	4(3.6)	22(19.6)	40(35.7)	27(24.1)	19(17.0)	2.7(1.1)

Abbreviations: S A, strongly agree; A, agree; N, neutral; D, disagree; S D, strongly disagree; SD, standard deviation. Perceptions were scored as; S A-5, A-4, N-3, D-2, and S D-1.

providing materials to students (including videos, images, notes, books and so on) (36.5 %), providing enough time to complete the task (18.3 %), providing enough internet (13.9 %) and giving laptops to students (11.3 %).

DISCUSSION

The teaching and learning of anatomy have been a challenging task for a long time, and it has been made harder with COVID-19 interrupted social interactions such as face–to–face teaching [5]. However, challenges come with new ideas, and we have adopted them to reinforce blended learning as a delivery modality.

Generally, students learn by listening to the teacher and reading the instructions materials, but more by performing various tasks that may require the trial and error mode of learning [6].

Our data shows that students were engaged in the learning activities and felt that the online learning materials were adequate and engaging. Learning requires attention, and 64% of the respondents stated they paid much attention to online learning. It is believed that powerful learning rules in the nervous system are possible if selective attention determines nervous plasticity [2]. Nervous plasticity is the biological basis of the acquisition of new knowledge and competencies. Attention is reinforced by the reward system, which is also linked with learning [3]. In this study, we can affirm that the feeling of relevancy and usefulness of the learning material is an emotional reward; the students are happy with the new information gained. 76.4 % of the respondents stated that the learning materials were relevant and useful, while 77.4% found them to be appropriate. The feeling that the online reading was not in vain is a strong motivation to repeat that learning activity.

The assessment is an important trigger of the learning process. Students generally learn what is expected to be assessed. The assessment boosts self-esteem, inspires, and motivates the learners. The assessment also promotes deeper learning and understanding [4]. By integrating the assessment into the learning strategy, team-

based learning (TBL) has been demonstrated to be a very effective teaching method [5]. In our study, the assessment was considered to be an important part of the learning process and 94.6% of students stated that the continuous assessments were regularly administered, while 77.9% recognized the usefulness of online quizzes, and 78.1% the usefulness of online assignments, 81.8% of our students agree that preparation the objective structured practical exam was a learning opportunity. This is in concordance with the finding of authors [7], who find that the inclusion of assessment of learning (AfL) motivates the learners. The engagement of students by formative assessment has proved to increase the interactions of students with the content and with peers. To be effective, the assessment needs to be fair. Fairness is to make judgments that are free of bias or discrimination. It is the moral responsibility of the educator to make sure that their assessments are fair to all their students. Fairness of assessment creates a confident environment for the learners. 10% of our students question the fairness of our OSPE Objective Structured Practical Exam (OSPE). Although it is the minority of our students, it may indicate that the process should be improved. The OSPE being a kind of oral exam can pose a potential risk of a negative perception of the examiner toward the students and can be a source of bias. There is a need of a serious assessment of our OSPE process.

One important anatomy learning tool is practical teaching. At UR School of Medicine, we combine various practical teaching methods that include cadavers' dissection or prosections, medical images, computer-based technologies, anatomical models, surface and clinical anatomy. This multimodal delivery of anatomy is in concordance with various authors who have noticed that no single method, even the centuries-long cadavers' full dissection, can allow for delivering the anatomy curriculum of a modern school of medicine [7–10]. To assess the perceptions of our students toward our practical teaching, we evaluated five domains: learning resources, organization and planning, learning process, learning environment, and assessment. In all aspects, the students were satisfied by around 90%, which is a strong satisfaction rate and an encouraging message from our students to maintain the multimodal approaches to teaching anatomy.

One of the learning challenges identified in this study is the reduced feedback students received in online teaching. Feedback is a vital component in the learning process, and the TBL teaching modality is interesting as it provides immediate feedback to the learners. However, when external feedback is lacking or insufficient, learning outcomes can still be attained, as our study has proved. In a situation like online learning where the feedback is received with delay, the previous study has demonstrated that the confidence of students in their judgments is a compensatory mechanism to attain the learning outcomes [11]. How to build the confidence of learners? That should be an important task of the blended learning instructors.

CONCLUSION

The covid-19 pandemic presented an enormous challenge to the education system of countries globally. However, it was an opportunity to innovate how to deliver knowledge, skills, and attitudes without compromising the quality. The blended learning method started years ago and presents an interesting alternative to the traditional method. Our study assessed the students' perception on this mode of delivery of the anatomy modules, and our findings have shown a high acceptance of this learning strategy. If the identified challenges are solved, the blended learning delivery may be generalized even when the pandemic is under control.

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