Original article

University health sciences students rating for a blended learning course framework

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ABSTRACT

Objectives: Online teaching methods are used to identify the effectiveness of blended learning. The present study aimed to evaluate the attitudes and satisfaction of health sciences students in Saudi Arabia towards blended learning.
Methods: The study used mixed research approach by recruiting students from academic year 2017–2019. Phenomenography technique were used to examine the qualitative data for research.
Results: The instrument was a valid measurement outcome for blended learning courses. Students generally preferred team-based learning rather than face-to-face lectures, which serves as a collaborative learning pedagogy. A high positive attitude and motivation was revealed among the students with respect to the blended model in teaching the research course.
Conclusion: The attitude and satisfaction of students seemed to play a vital role in teaching and learning outcomes. Moreover, it was found that the e-learning tools provided flexible learning environment to the students, regardless of location and time zone.

1. Introduction

The development in teaching and learning methods have focused on team building and group learning (Trna J, Trnová, 2016; Chiu and Cheng, 2017), and tools that could help in learning the teamwork skills. These tools are suggested to be the part of curriculum, methods of instructions in class and assessment (Chiu and Cheng, 2017; Gasparatou, 2017). Thereby, a platform was formed for the group activities to promote interactive and constructive learning by student peers through discussions on course activities, weekly quizzes, research projects and sample exams (Chiu and Cheng, 2017; Gasparatou, 2017).

E-learning deanship was established at King Saud University in 2009, where blackboard as a learning management system (LMS) and virtual classrooms were provided as a platform for teaching and learning. Tools were installed in all colleges including the College of Applied Medical Sciences, where course materials were uploaded on the LMS and made accessible to both instructors and students using their university emails and passwords. The university strategy was to enhance teaching and learning process to maximize students' learning outcomes.

Blended learning evolved as a solution for the conflicts arising between the two methods to gain the benefits of both methods in learning (Muyinda, et.al., 2019; Wong, 2019). Blended learning seems to be used efficiently for delivering learning material. Besides this, it is also helpful for enhancement of communication and administration. Li and Wong showed positive attitude regarding e-lectures in a blended learning course (Li & Wong, 2018). Regionally, few studies indicated a high positive attitude of both the male and female students toward blended learning courses (Taylor M, Vaughan N, Ghani SK, Atas, 2018; Kaur, 2020; Alseweed, 2013). However, the traditional classrooms no longer satisfy the learning requirements and outcomes of students in today's era. An integration of variable learning and teaching elements into a blended environment could be a solution to fit variable learning styles. The accessibility of information through variable sources and the social distancing due to COVID-19 pandemic make e-learning an essential strategy of teaching that should be integrated into course design. Therefore, the present study aimed to assess the attitude and satisfaction of students towards blended learning in health sciences education and research methods.

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2. Methods

The study was conducted in the academic years 2017–2019. A mixed quantitative–qualitative design was conducted to achieve the study objectives. The quantitative part was an online questionnaire; while, the qualitative part was a semi-structured and biweekly online self-reported student feedback. Students' satisfaction and attitude were assessed using a modified questionnaire based on the literature review provided on blended learning environments and models (Wong, 2019). The phenomenography research technique was used to produce qualitative results. All these students have used virtual learning environment for a time span of more than 1 year for campus-based learning. All interviews were recorded on a digital device and data generated through interviewing were inductively examined.

A cohort of 118 female students, enrolled in research methods course during their final semester at Department of Rehabilitation Sciences at King Saud University participated in this study. Informed consent was obtained from each student.. All students completed a full-time enrollment in the course and were bilinguals who could read, write, and speak the English language fluently. They all completed a pre-medical year where computer literacy, statistics, and English language were part of the curriculum. The students grouped into several teams from the beginning of study. The processes carried out within each team were supervised by an expert instructor in management and leadership and were diversified based on the course activities. The goal was to train students on different aspects of team work, including those from management and leadership perspective. All students participated in the course activities with 100% attendance.

To assess the attitude and satisfaction of students towards blended learning in health sciences education and research methods, the course elements were classified into four components, i.e. structure, content, delivery, and assessment.

The structure of the course integrated both traditional and web-based elements. The traditional structure included face-to-face class meetings, lab meetings, and field testing. The students participated in a Team-Based Learning (TBL) open book quizzes and activities during two hours meeting that was conducted weekly. All teams participated in classroom discussions about the quiz and each team discussed the multiple-choice items of it. Each session was timed and smart board tools were used to structure the class activities. Other team-based activities that followed the same structure included case studies and working on the research project, such as developing an outline for the project, statement of the problem, research hypotheses and questions. The students participated in an interactive lecturing, after each team-based activity which lasted for around 60 min. A physical lab was also structured for interactive learning. There were three round tables for a weekly two hours team meetings and discussions with the course instructor. However, for the web-based elements, same structure for face-to-face class meetings was followed when class discussions were delivered via blackboard and virtual classrooms. A relational database was used to code, enter, and analyze the research data. Students were provided with procedures and operation guideline for the database program, which was also installed on each computer for their reference. All teams received orientation on research tools and software, which was followed by interactive instruction and hands-on training throughout the study. Blackboard licensed to King Saud University (Blackboard Collaborate, Inc., Version 11.1.2.5816-g8a9bff8, © 2000–2011) was used for course website. A simple and user-friendly web design was adapted as recommended in the literature to facilitate content delivery to students (Wong, 2019; Petra, Jaidin, Perera, & Linn, 2016).

All course content was uploaded on the course website. The blackboard contained course syllabus, lecture slides, team-based quizzes, assignments, projects instructions, guidelines for course activities, midterms and final exams samples with key answers, students' online feedback, forums, course tools, and grades. The students joined research projects of senior faculty which address professional and community needs, for effective learning outcomes. Each project phase was preceded by relevant theoretical course content, in class or virtual team quizzes and practice, lab meetings, and discussions. Those phases included developing the project proposal outline, review, and discussion of the literature, methods, experimental tool administration, data transcribing, data coding and entry, reliability, data analyses and processing and proposal writing. The students completed two workshops on Excel and SPSS by an experienced research assistant lecturer, for research data tools. The course instructor designed databases for each project using FileMaker Pro 12.0v3 (1084–2012, Inc.), a relational database software. One project only needed an excel spread sheet design, which was uploaded on GoogleDocs© for students to access and enter data. The course instructor trained and supervised the students on how to code, enter, and retrieve data for reliability and analysis. A statistician from Graduate Research Center helped each team on data processing and analysis of their project.

A faculty and two experienced teaching assistants participated in delivering the course. The course content was delivered synchronically via variable channels. The students met once a week for two hours for face-to-face instructions and for team-based learning tasks. Also, students had a weekly team meeting with instructor to discuss the research project. Nearly, half of the lectures' content, team-based learning quizzes, training on research tools, and discussion forums on course content were delivered by Learning Management System (LMS), including the blackboard tools and live virtual classrooms. At the beginning of study, students were oriented on the use of LMS by participating in trial live and recorded sessions. A continuous support service was provided by the deanship of e-learning at the university. One-to-one consultations and inquiries were addressed by course instructors during weekly office hours, university emails, and WhatsApp messaging. All phases of project writing were delivered synchronically via GoogleDocs©.

Assessment was administered on all course activities and assignments, using midterm and final exams with multiple choice and short answer questions, quizzes, forums, written team processes, online feedback writing and research assignments. A sample of final exam and expected outcome were demonstrated to the students. The final research presentation was an open invitation to college and evaluated by instructors and anonymously by students from other teams using a standard research paper presentation scale. The average of two evaluations was used towards research grade.

Thus, a self-developed questionnaire was designed with constructs and elements of relevance to study objectives. These elements were based on previous research on validated measurements of blended learning environments and were modified to fit the study context and population (Chiu & Cheng, 2017; Loomis & Paterson, 2018; Norman, 2003; Daskalakis & Tselios, 2013). The constructs assess learners' attitudes and satisfaction including students' performance and usefulness of blended learning tools (Daskalakis & Tselios, 2013). Students' satisfaction with their achieved knowledge and skills is a construct measured for stakeholders' satisfaction (Hasani, et.al, 2020).

Appendix A has depicted the questionnaire, structured with two constructs that include attitudes and satisfaction of students about blended learning tools used in this course. The questionnaire comprised of 23 items about course blended methods and tools to elicit

students' attitudes and satisfaction with their learning outcomes. The questionnaire was administered electronically via Google-Docs© using one column per page, and designed on the basis of Likert Scale. The students received an announcement via LMS with a brief message about study purpose and a hyperlink to the questionnaire (hosted by GoogleDocs©). Furthermore, a semi-structured student feedback was posted on blackboard with guidelines for content and reporting schedule. The instructor introduced feedback task at the first face-to-face class meeting. The students' feedback was regularly supervised and validated by course teaching assistants. Students' feedbacks which represented their conclusive reflections were analyzed for constructs that correlate with quantitative data. Data was manually reviewed and coded for frequency of constructs and elements.

3. Results

The study results showed that the students responded with high satisfaction regarding blended learning elements. Majority of the students were satisfied with team-based learning (60.8%) for developing teamwork skills. Learning useful information from digital library received a high positive satisfaction (60.7%). Students revealed a high positive attitude towards joining senior faculty research projects (56.9%). Students showed a strong belief about continuous course assessment and feedback (50.9%). Moreover, students strongly recommend TBL to enhance the interaction among team members (47.1%), allowing students to ask questions (45.1%) and as an effective element to learn teamwork skills (45.1%). For technology elements, they perceived that Google-Docs© tools facilitates the teamwork (45.1%) (Table 1).

Students showed most satisfaction with virtual classrooms: virtual classrooms were an "enjoyable experience" (41.2%), an "effective learning" element (35.3%) and a "convenient" learning element (23.5%). Team-based learning also preferred by students: they learned "successful collaboration" (33.3%) and "team work skills" (15.7%). They preferred it as a "learning style" (11.8%), an "enjoyable experience" (11.8%) and "Learning from others' knowledge and experiences" (9.8%). However, students were least satisfied with face-to-face lectures which received the least comments (9.8%) (Fig. 1). The findings showed that the value of sampling adequacy is accepted as it falls between the acceptable range of 0.7–0.8. Furthermore, the findings also showed that the Bartlett's test of sphericity shows significant value less than 0.05, the correlation matrix is not an identity matrix (Table 2). The findings from extraction sums of squared loadings column showed variance of four components. Component 1 showed 57.3% variance, component 2 showed 6.1% variance, component 3 showed 5.3% variance, and component 4 showed 4.8% variance of the overall data (Table 3).

The extraction of components using principal component analysis and rotated component matrix was carried out. The factors with loadings greater than 0.5 were listed and all other values lower than 0.5 were suppressed (Table 4). Likewise, based on the findings, 11 factors in component 4 were used as variables in the further analysis (Table 5). Blended learning and academic writing teaching were observed. The theoretical framework was carried out as an analytical tool for systematic functional linguistics. Continuous feedback writing seemed to have improved students' writing as evaluated by instructors. According to research participants, they primarily consider virtual learning environment as an effective, one-stop repository for the features. The virtual learning

Table 1
The Attitudes and Satisfaction of Students towards the Blended Learning Elements and Tools in Percentages.

| ConstructItem	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1. **Team Based Learning**					
1.1 Team based learning (TBL) increased my learning.			5.9%	39.2%	54.9%
1.2 TBL helped me develop teamwork skills.			3.9%	35.3%	60.8%
1.3 Team interactions allowed me to ask questions without feeling embarrassed at my lack of knowledge. *		3.9%	9.8%	41.2%	45.1%
1.4 The team questions and comments created more member interactions. *			5.9%	47.1%	47.1%
1.5 The team process is an effective learning assignment to learn about teamwork skills.		1.9%		52.9%	45.1%
1.6 Working within a team in class helped me to simulate real life teamwork.			11.8%	49.0%	39.2%
1.7 Teamwork created a safe environment for me to work and learn.			9.8%	50.9%	39.2%
2. **Online Students' Feedback Writing**					
2.1 I find writing a weekly online feedback for my course is a helpful learning tool.		15.7%	15.7%	41.2%	27.5%
3. **Face-to-Face lectures**					
3.1 The lectures facilitated the learning process for me.* (at least 1/3 live via LMS)		1.9%	13.7%	45.1%	39.2%
3.2 I find that the oral explanations in lectures exceeded the amount of depth in comprehension in comparison with the book.*		5.9%	5.9%	49.0%	39.2%
4. **Blackboard**					
4.1 The blackboard tools facilitated my learning.			15.7%	52.9%	31.4%
4.2 Writing a weekly feedback and submitting it through the blackboard helped me to provide continuous feedback.		5.9%	15.7%	49.0%	29.4%
5. **Software and Digital Resources**					
5.1 I learned new skills by applying software (Filemaker, Excel, and SPSS) in research.			5.9%	41.2%	52.9%
5.2 I learned useful information from the Digital library workshop at the Female students' Campus.				39.3%	60.7%
5.3 I recommend students to take the Digital library workshop at the Female students' Campus.			7.1%	35.7%	57.1%
6. **Google Docs**					
6.1 The use of GoogleDocs facilitated my teamwork on our research projects.		3.9%	11.8%	39.2%	45.1%
7. **Joining Senior faculty Research Project**					
7.1 Joining with senior faculty research projects gave me an opportunity to learn research skills		5.9%	9.8%	37.3%	47.1%
7.2 My research topic got me interested to learn about my field.	3.9%	7.8%	5.9%	35.3%	47.1%
7.3 I felt great about my research project.		1.9%		35.3%	62.8%
7.4 Working on research projects with senior faculty is a successful learning model.		1.9%	3.9%	37.3%	56.9%
7.5 What I learned in my research project will help me in my job.		1.9%	15.7%	25.5%	56.9%
8. **Assessment**					
8.1 The continuous oral and written feedback from the course instructor through different channels (small group meetings, over GoogleDocs, over Blackboard) was effective in my learning.		1.9%	7.8%	39.2%	50.9%
8.2 Participating in class evaluation of the projects presentations was effective.		3.9%	17.7%	33.3%	45.1%
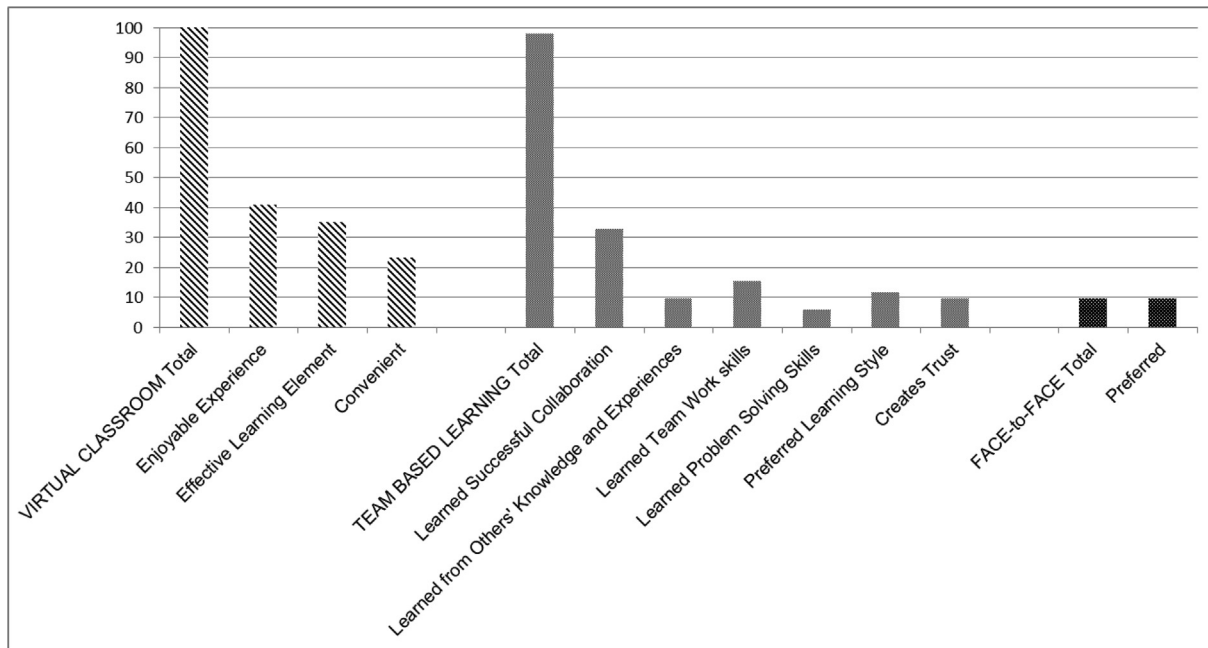
Fig. 1. percentages of students' self-reported satisfaction about virtual classrooms, team based learning, and face-to-face lectures.

Table 2
KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.876
Bartlett's Test of Sphericity	Approx. Chi-Square	1485.138
	df	253
	Sig.	0.000

environment serves as a mechanism, through which students could be involved in examining theoretical models and make use of these models. This category also allowed students to give their feedbacks regarding the performance of these models. The asynchronous communication for exchange of ideas, and investigation

of resource and sharing was observed to be of significant importance.

4. Discussion

The present study showed that virtual classrooms were the most preferred learning element by students as it provides flexibility, convenience, and control over the delivery of content. In previous studies, students and professionals preferred online and blended learning (Kaur, 2020; Alseweed, 2013); e-lectures were also preferred in another study (Li & Wong, 2018) and online over group work was preferred by the participants in the previous study (Wong, 2019). Similarly, Gasaymeh and Jwaifell reported that the

Table 3
Component Extraction Method: Principal Component Analysis.

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.186	57.330	57.330	13.186	57.330	57.330	5.144	22.365	22.365
2	1.418	6.165	63.494	1.418	6.165	63.494	4.638	20.166	42.531
3	1.231	5.354	68.848	1.231	5.354	68.848	3.628	15.776	58.307
4	1.118	4.863	73.711	1.118	4.863	73.711	3.543	15.404	73.711
5	0.969	4.214	77.924						
6	0.796	3.460	81.384						
7	0.626	2.722	84.106						
8	0.532	2.314	86.419						
9	0.460	1.998	88.417						
10	0.399	1.733	90.150						
11	0.308	1.341	91.491						
12	0.294	1.279	92.769						
13	0.272	1.182	93.951						
14	0.238	1.036	94.987						
15	0.223	0.972	95.958						
16	0.188	0.818	96.777						
17	0.177	0.772	97.548						
18	0.141	0.614	98.163						
19	0.126	0.547	98.710						
20	0.105	0.455	99.165						
21	0.095	0.414	99.579						
22	0.054	0.233	99.811						
23	0.043	0.189	100.000						

Table 4

Extraction of 4 components using PCA.

	Component			
	1	2	3	4
Learning useful information from the digital library at the female campus	0.764			
I recommended students to take the digital library workshop at female students' campus	0.711			
Team based learning (TBL) increased my learning	0.764			
TBL helped me develop teamwork skills	0.819			
Team interactions allowed me to ask questions without feeling embarrassed at my lack of knowledge	0.705			
The team questions and comments created more member interactions	0.764			
The team process is an effective learning assignment to learn about teamwork skills	0.837			
Working within a team in class helped me to simulate real life teamwork	0.804			
Teamwork created a safe environment for me to work and learn	0.808			
The lectures facilitated the whole learning process for me	0.801			
I find that the oral explanations in lectures exceeded the amount of depth in comprehension in comparison with the book	0.661			
The blackboard tools facilitated my learning	0.681			0.565
Writing a weekly journal and submitting it through the blackboard helped me to provide continuous feedback	0.680	0.539	0.554	
I find writing a weekly journal for my course is a helpful learning tool	0.649	0.531		
Working on my professor's research projects gave me an opportunity to learn research skills	0.767			
My research topic got me interested to learn about my field	0.786		0.548	
I felt great about my research project	0.805		0.560	
Class evaluation of the projects presentations was effective	0.742			
I learned new skills by applying the software's (Filemaker, Excel, SPSS) in research	0.700			0.589
The use of google docs facilitated my teamwork on our research projects	0.742			
The continuous oral and written feedback from the course instructor through different channels (small group meetings, over google docs, over blackboard) was effective in my learning	0.755			0.458
Working on research projects by professors is a successful learning model	0.818			
What I learned in my research project will help me in my job	0.806			

Table 5

Rotated Component Matrix[a].

	Component			
	1	2	3	4
Learning useful information from the digital library at the female campus	0.708			
I recommended students to take the digital library workshop at female students' campus	0.824			
Team based learning (TBL) increased my learning		0.569	0.457	
TBL helped me develop teamwork skills		0.753		
Team interactions allowed me to ask questions without feeling embarrassed at my lack of knowledge		0.717		
The team questions and comments created more member interactions		0.782		
The team process is an effective learning assignment to learn about teamwork skills		0.686		
Working within a team in class helped me to simulate real life teamwork		0.669	0.438	
Teamwork created a safe environment for me to work and learn		0.533		0.413
The lectures facilitated the whole learning process for me		0.468	0.634	0.365
I find that the oral explanations in lectures exceeded the amount of depth in comprehension in comparison with the book		0.318	0.235	0.389
The blackboard tools facilitated my learning	0.161	0.157	0.601	0.536
Writing a weekly journal and submitting it through the blackboard helped me to provide continuous feedback	0.213	0.240	0.185	0.805
I find writing a weekly journal for my course is a helpful learning tool				0.810
Working on my professor's research projects gave me an opportunity to learn research skills	0.531			0.435
My research topic got me interested to learn about my field	0.512		0.429	0.562
I felt great about my research project	0.724			0.445
Class evaluation of the projects presentations was effective	0.618			0.401
I learned new skills by applying the software's (Filemaker, Excel, SPSS) in research			0.699	
The use of google docs facilitated my teamwork on our research projects	0.562		0.596	
The continuous oral and written feedback from the course instructor through different channels (small group meetings, over google docs, over blackboard) was effective in my learning	0.422		0.742	
Working on research projects by professors is a successful learning model	0.608			
What I learned in my research project will help me in my job	0.793			

graduate students showed a high satisfaction for the use of web-based blog in a blended e-learning course (Gasaymeh & Jwaifell, 2013). The results of the present study indicated students' preference of team-based learning over face-to-face lectures, which support previous studies findings where students learned more in groups (Chiu & Cheng, 2017). This provided evidence for the pedagogical model of collaborative learning.

The present study results showed that collaborative learning was highly preferred by students. Students' interactions with peers help them to process the content of the course by adapting and testing multiple peer perspectives. Peer discussions works as a "scaffolding" mechanism that enhances the learning outcome, given students variable learning aptitudes and curves. Whereas,

the feedback writing was least preferred by the students. Such gap in students' attitudes indicates that students are motivated to learn by participation versus writing alone. According to Schall- Schall-Leckrone and McQuillan, enhanced literacy-focused activities are likely to contribute towards an increased sense of readiness with respect to the attitudes of students (Schall-Leckrone & McQuillan, 2012). The researchers performed data analysis through interviews, observations, and surveys. It has been observed through outcomes that a specialized environment of blended learning has been realized by the study respondents. Furthermore, infusing language-based strategies is an important element of comprehensive approach, which could be adopted by the teachers in blended learning. Writing is also a demanding, com-

plex, multi-skilled task that requires time and is open-ended, especially for students with English as an acquired second language. Students also preferred participation in assessment as reflected in their positive rating of assessment of their projects. Lectures were least preferred (p-value = 0.02) by majority of the students. Probably students are passive listeners in a lecture which does not stimulate active learning. A previous study also reported about the lack of lecture preference (Li & Wong, 2018).

The last two feedbacks focused on students' perception of their experience as a whole within the context of their final projects, which received the most comments (56%). At this stage, their evaluation actually reflected the knowledge and skills they had developed via the integration of all course elements, specifically the technology tools. Their feedback reflected their overall satisfaction with the course outcomes. The feedback "enjoyable experience" (53%) and "learning knowledge and skills for future jobs" (46.4%) was the most reported satisfaction. Few students (less than 10%) mentioned that they have faced few technical issues in accessing their first virtual classroom, which was resolved by the course instructor guidance and the e-Deanship student support. The results deduced by Dhir, Verma, Batta and Mishra considered the need to integrate e-learning into undergraduate education for its positive impact on the delivery and outcomes of blended learning (Dhir, Verma, Batta & Mishra, 2017). An enhanced level of interactivity was initiated by the model, which further enhanced the learning abilities of the students. Implementation of this blended model in teaching research to undergraduate students is indicated. For future studies, the effect of the blended model on the performance of students and construction and learning skills should be examined.

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Ethical Approval

Ethical approval was obtained from the Institutional Review Board of King Saud University (No. 21/0170/IRB). In addition, the course specification and syllabus were approved by the Department of Rehabilitation Sciences Council, the Quality Unit and the College of Applied Medical Sciences Council.

Appendix A

The Items and Constructs of Questionnaire

Constructs and Items	Statements
Team Based Learning	
1.1Satisfaction	Team based learning (TBL) increased my learning.
1.2Satisfaction	TBL helped me develop teamwork skills.
1.3Satisfaction	Team interactions allowed me to ask

(continued)

Constructs and Items	Statements
	questions without feeling embarrassed at my lack of knowledge.*
1.4Attitude	The team questions and comments created more member interactions.*
1.5Attitude	The team process is an effective learning assignment to learn about teamwork skills.
1.6Attitude	Working within a team in class helped me to simulate real life teamwork.
1.7Attitude	Teamwork created a safe environment for me to work and learn.
Online Students' Feedback Writing	
2.1Attitude	I find writing a weekly feedback for my course is a helpful learning tool.
Face-to-Face Lectures	
3.1Attitude	The lectures facilitated the learning process for me.*
3.2Attitude	I find that the oral explanations in lectures exceeded the amount of depth in comprehension in comparison with the book.*
Blackboard	
4.1Satisfaction	The blackboard tools facilitated my learning.
4.2Attitude	Writing a weekly feedback and submitting it through the blackboard helped me to provide continuous feedback.
Software and Digital Resources	
5.1Satisfaction	I learned new skills by applying the software (Filemaker, Excel, and SPSS) in research.
5.2Satisfaction	I learned useful information from the Digital library workshop at the Female students' Campus.
5.3Attitude	I recommend students to take the Digital library workshop at the Female students' Campus.
GoogleDocs	
6.1Attitude	The use of GoogleDocs facilitated my teamwork on our research projects.
Joining Senior Faculty Research Projects	
7.1Attitude	Working with senior faculty on research projects gave me an opportunity to learn research skills.
7.2Attitude	My research topic got me interested to learn about my field.
7.3Satisfaction	I felt great about my research project.
7.4Attitude	Working on research projects with senior faculty is a successful learning model.
7.5Satisfaction	What I learned in my research project will help me in my job
Assessment	
8.1Attitude	The continuous oral and written feedback from the course instructor through different channels (small group meetings, over GoogleDocs, over Blackboard) was effective in my learning.
8.2Attitude	Class evaluation of the projects presentations was effective.

*Dori and Belcher (2005)

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