

Factors Influencing Students' Satisfaction with Online Learning via Blackboard in a Physics Course at King Saud University During the COVID-19 Pandemic

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Abstract: The spread of the COVID-19 pandemic across the world has disrupted the education process. Most educational institutions have closed and shifted from traditional classroom instruction to online learning platforms to protect students from viral exposures. Students' satisfaction with online courses is considered a significant factor in predicting the effectiveness and success of online learning. The resulting wide use of online learning calls for an exploration of the factors influencing student's satisfaction with this mode of learning. The study aimed to explore factors influencing students' satisfaction with online learning via Blackboard in a physics course at King Saud University. The Course Experience Questionnaire CEQ (Ginns & Ellis, 2007) was applied to explore the satisfaction of 334 undergraduate first year Health Colleges students. The results revealed that there was a positive strong correlation coefficient between students' satisfaction with online learning of the physics course and all the proposed factors, namely online teaching quality, online resources quality, online appropriate workload, and online students' interaction, and all of these coefficients were also statistically significant at the 0.01 level. These results show that all the proposed factors significantly, positively, and strongly influenced the students' satisfaction with online learning of the physics course.

Keywords: higher education, science teaching, Web-based learning, virtual learning, blackboard, Information & Communication Technology (ICT), online learning, students' satisfaction, COVID-19.

العوامل المؤثرة في رضا الطلبة عن التعلم عن بُعد بواسطة بلاكبودر في مقرر للفيزياء بجامعة الملك سعود خلال جائحة كورونا (كوفيد-19)

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الملخص: إن انتشار جائحة كورونا في جميع أنحاء العالم أثر على العملية التربوية، إذ أن معظم المؤسسات التعليمية أغلقت أبوابها وتحولت من التدريس الصفحي المعتاد إلى منصات التعلم عن بُعد لحماية طلبتها من خطورة هذه الجائحة. يُعتبر رضا الطلبة عن المقررات في التعلم عن بُعد عامل حاسم في تحديد مدى فاعلية التعلم عن بُعد ونجاحه. إن الاستعمال الواسع للتعلم عن بُعد يحتاج إلى استقصاء العوامل المؤثرة في رضا الطلبة عن هذا النوع من التعلم، وذلك من أجل زيادة فعاليته وتحسين بيئته. هدفت الدراسة الحالية إلى استقصاء العوامل المؤثرة في رضا الطلبة عن التعلم عن بُعد بواسطة بلاكبودر في مقرر للفيزياء بجامعة الملك سعود خلال جائحة كورونا (كوفيد-19). استخدمت الدراسة استبانة جينس وإيليس (Ginns & Ellis, 2007) لاستكشاف رضا 334 طالبًا وطالبة من طلبة الكليات الصحية الذين يدرسون مقرر للفيزياء في السنة الأولى من دراستهم الجامعية. أشارت نتائج الدراسة إلى وجود ارتباطات قوية وموجبة بين رضا الطلبة عن التعلم عن بُعد وجميع العوامل المقترحة، وهي، جودة التدريس، وجودة مصادر التعلم، ومناسبة حجم العمل، وتفاعل الطلبة، وأن جميع هذه الارتباطات ذات دلالة إحصائية عند مستوى دلالة (0.01). هذه النتائج تُظهر أن جميع العوامل المقترحة تؤثر بشكل دال وموجب وقوي في رضا الطلبة عن التعلم عن بُعد في مقرر الفيزياء.

الكلمات المفتاحية: التعليم العالي، تدريس العلوم، التعلم القائم على شبكة الإنترنت، التعلم الافتراضي، بلاكبودر، تكنولوجيا المعلومات والاتصالات، التعلم عن بُعد، رضا الطلبة، كوفيد-19.

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Introduction

The emergence of the COVID-19 pandemic in December 2019 and its subsequent spread across the globe has disrupted teaching and learning in the world. Due to the wide spread of this pandemic, most countries have applied the closure of educational institutions to protect individuals from viral exposures. Although social distancing is considered one of the most important protection methods to decelerate the breakout of COVID-19, a large number of learners have been negatively affected. Due to this closure, as well as to support the continuation of the education process, educational institutions have shifted from face-to-face classroom instruction to synchronous and asynchronous online learning platforms such as Learning Management Systems (LMSs), Microsoft Teams, Zoom, among others.

In Saudi Arabia, all educational institutions were closed in the middle of the second semester of the 2019/2020 academic year (March 8th, 2020), and online learning had become the main method of instruction during the pandemic. To continue the educational process, King Saud University (KSU) began using online learning through LMS, Blackboard (Bb). The physics course (Phys 109) was one of the courses that was taught online. Since exploring the factors influencing learners' satisfaction with the online learning is required to enhance its environment, it was vital to investigate learners' satisfaction with online learning in the physics course, and determine the factors that influence this satisfaction, which is the aim of this research.

The remarkable accessibility to the Internet and various virtual resources play a significant role in expanding online learning, which impacts tremendously the quality of teaching and learning, and changes the preference of learners from traditional instruction to online learning (Ali & Ahmad, 2011). Additionally, online learning has experienced growth and widespread use due to its significant advantages, as well as the development of ICT tools that support its environments.

The literature documents several advantages of online learning that offer more benefits to learners and the learning-teaching process. These benefits involve effective learning of science and meaningful acquisition of knowledge. In online learning, students are provided with supportive materials and resources that help them comprehend and expand information, which is a big motivation to learn more and enhance the learning process (Lei, 2010), and introduce new

patterns and practices in learning (Huon et al., 2007). Online learning is instrumental in providing more educational opportunities and utilizing a wide range of information technology resources, which streamlines pedagogy and learning (Duhaney & Duhaney, 2006). Hence, the implementation of online learning enhances pedagogy, upgrades the student social interaction, increases the access to knowledge, and facilitates revision (Osguthorpe & Graham, 2003).

Online learning also offers flexibility in time and place of learning, which makes it easy for learners to select the place and time of their learning (Baber, 2020), which are considered important characteristics for studying adults (Rovai & Jordan, 2004). This provides an alternative for students who cannot enroll in traditional classrooms for various reason. Further, ICT tools that are used in online learning increase and strengthen communication channels, which enhance the level of experience and knowledge exchange among students themselves and with their instructor. This results in improved students' performance.

The findings of research literature confirmed these advantages since it was reported that students were satisfied and engaged with online learning (e.g., Jusuf et al., 2021), and the online learning experience was perceived as positive by learners (e.g., Sawaftah, 2022; Suharsih & Wijayanti, 2021; Maphosa, 2021).

As most educational institutions, including universities, offer online courses, it is crucial for instructors and administrators to take the aspects of online teaching-learning environment into account to enhance the learning process. The areas to be taken into account include instructor support, instructor presence, course structure, course design, student interaction, facilitating conditions, learning content, student's computer skills, and instructor's computer skills.

Research literature reported that online learning provides a high quality of interaction to students, with each other and with their instructor (Sawaftah, 2022), which has been recognized as an important construct in the learning process, especially in online courses (Picciano, 2002). The findings of Wu et al. (2010) suggested that students' interaction creates a supportive environment of learning, enhances their performance expectations, and raises their level of satisfaction with learning.

Online learning provides interaction to students through both synchronous learning tools such as video meetings, audio meetings and chat breakout rooms, and asynchronous learning tools such as discussion boards and emails (Alamri & Tyler-Wood,

2017). Having multiple types of interaction in online learning, whether this occurs synchronously in the virtual classrooms or asynchronously across a social network, has proven to be a factor that raises the exchange and communication level of students' experiences among each other and with their instructors (Voci & Young, 2001), increases learners' motivation (Ku et al., 2013), and creates positive attitudes towards learning (Donnelly, 2010), which, consequently, enables learners to be more engaged in the learning process (Wang et al., 2009). Therefore, the great advantages of online learning include interaction between students themselves and with their instructor, which take place due to flexibility of learning through the synchronous and asynchronous learning network models (Katz, 2002).

These opportunities for students' interaction in online courses result in enhancing their satisfaction and improving learning outcomes (Grandzol & Grandzol, 2010). This is supported by the findings of Ali and Mirza (2020) that indicated a significant positive relationship between students' interaction and their satisfaction with online learning. In addition, the findings of Croxton (2014) suggested that students' interaction was a vital factor of their satisfaction with online learning.

The satisfaction of students can be defined in terms of attitudes arising from an evaluation of the provided services, educational experiences, and other facilities (Weerasinghe et al., 2017). Allen et al. (2002) claimed that learners' satisfaction can be identified from their pleasure level as well as the effectiveness of the education they receive.

In the online context, students' satisfaction can be defined in terms of their perceptions of online learning environment and learning outcomes, or their feelings and attitudes toward the learning process and experiences that they had in online courses. Gray and DiLoreto (2016) reported that students' perceived learning and their satisfaction with online learning environment together can represent a better understanding of the success of online learning. According to Kerzic et al. (2021), students' satisfaction has come to be a reliable tool for measuring the success of implementing ICT-based initiatives in virtual learning environments. The research literature suggests that online learning provides a high level of students' satisfaction with their learning experiences (e.g., Jusuf et al., 2021; Suharsih & Wijayanti, 2021).

Accordingly, students' satisfaction can be considered one of the most important elements in their perceived

learning as well as in the education process. This fact is confirmed by the findings of the research literature. For example, the findings of Ikhsan et al. (2019) indicated that students' perceived learning outcomes contributed to their satisfaction with online learning. The results of Levy (2003) also indicated a significant relationship between the effectiveness of online courses and the learners' satisfaction with these courses.

Due to its authentic advantages and characteristics, online learning has changed the processes of acquiring learning experiences. This has lead researchers to explore the factors that affect learners' satisfaction with online experiences in higher education, which resulted in several factors being identified. The findings of Alenezi (2022) revealed that all the proposed social factors, namely social interaction, social identity, social support, social space, social presence, and social influence had a significant positive effect on the learners' online learning satisfaction. Another study relating to students' perspectives of their satisfaction with online learning was provided by Kaur et al. (2022), who concluded that clear goals and standards, generic skills, and appropriate assessment had a significant impact on the overall student satisfaction, whereas appropriate workload and good teaching skills had no significant effect on the overall satisfaction. Among various factors, the findings of Yin et al. (2022) showed that various factors of students' online course experiences, namely generic skills, good teaching, and appropriate workload were significantly associated with their efficacy and satisfaction with online learning. Moreover, the results of She et al. (2021) indicated that both students' interaction and students' engagement significantly and positively affected the students' online learning satisfaction. In exploring the factors that affect learners' and faculty's satisfaction, the findings of Elshami et al. (2021) indicated that technical issues (SWEET), enhancing engagement, and study-load and workload were the themes emerging from the thematic analysis to affect online learning satisfaction of students and faculty. Furthermore, the study of Baber (2020) indicated that student interaction, course structure, instructor facilitation, student motivation, and instructor knowledge had a positive effect on students' perceived learning outcomes and their satisfaction with online learning. In terms of feature contribution, the factors mostly affecting students' online learning satisfaction with higher weight are indicated in the findings of Zhang et al. (2020). The results suggested that the attractiveness of teaching methods is the most af-

fect factor. The factors which impact students' perceptions of their learning outcomes and satisfaction with asynchronous online courses were examined by Gray and DiLoreto (2016). The findings indicated that course structure and instructor presence positively influenced students' satisfaction, while students' interaction, with each other and with their instructor, didn't influence students' satisfaction. Among different institutional variables, the findings of Barbera et al. (2013) indicated that four variables significantly influenced learners' perceived learning and their satisfaction with online learning. Further, the learning content and the course design were more influential than the direct instruction and the social presence. In exploring the factors that affect students' online courses satisfaction, the findings of Ali and Ahmad (2011) suggested that student-instructor interaction, instructor performance, and course evaluation were significantly and positively affected students' satisfaction with online learning. In examining the factors that impact on learners' satisfaction with online learning, Sun et al. (2008) indicated that the critical factors influencing students' satisfaction with online learning are instructor attitude toward e-learning, perceived usefulness, e-learning course flexibility, perceived ease of use, student computer anxiety, diversity in assessments, and e-learning course quality. On the other hand, technology quality, Internet quality, and student interaction with others didn't influence learners' perceived satisfaction. In exploring the factors affecting students' satisfaction and their perceived learning in online courses, the findings of Eom et al. (2006) indicated that instructor feedback, student learning style, course structure, instructor facilitation, student self-motivation, and student interaction have a significant impact on learner satisfaction.

Research Problem

Due to the outbreak of the COVID-19 pandemic across the globe, KSU began using online learning through LMS, Blackboard. The author contacted first year undergraduate Health Colleges students who were enrolled in the physics course that was using the Blackboard as their platform for online learning. Some students complained about the quality of online learning through the Bb platform, and others expressed dissatisfaction with online learning of this course, which contradicts the research literature.

The findings of research literature reported that online learning provides a high level of satisfaction

to students (e.g., Jusuf et al., 2021; Suharsih & Wijayanti, 2021), which is considered a significant predictor of learning outcomes (Eom et al., 2006), and important factor of the effectiveness and success of online learning (Baber, 2020; Ikhsan et al., 2019; Gray & DiLoreto, 2016). In addition, the findings of research literature reported that online learning provides a high quality of interaction to students, between students themselves and with their instructor (e.g., Sawaftah, 2022). This interaction has a strong positive relationship with the quality of online learning (Grandzol & Gradzol, 2010), and students' satisfaction with online courses (Alenezi, 2022; She et al., 2021; Elshami et al., 2021; Baber, 2020; Zhang et al., 2020).

This led the researcher to examine the relationship between learners' satisfaction with online learning of the physics course via the Bb platform and their perceptions of proposed factors, namely the online teaching quality, the online resources quality, the online appropriate workload, and the online students' interaction.

Purpose of the Study

The present study aimed to explore the relationship between learners' satisfaction with online learning of the physics course via the Bb platform and their perceptions of proposed factors, namely the online teaching quality, the online resources quality, the online appropriate workload, and the online students' interaction.

Research Questions

This study addresses the following research questions:

1. Is there a statistically significant relationship between students' satisfaction and their perceptions of the teaching quality in the online physics course via the Bb platform?
2. Is there a statistically significant relationship between students' satisfaction and their perceptions of the resources quality in the online physics course via the Bb platform?
3. Is there a statistically significant relationship between students' satisfaction and their perceptions of the appropriate workload in the online physics course via the Bb platform?
4. Is there a statistically significant relationship between students' satisfaction and their perceptions of

their interaction in the online physics course via the Bb platform?

Significance of the Study

The emergence of the COVID-19 pandemic in December 2019, and its subsequent spread across the world led to the closure of all educational institutions in an attempt to limit the number of hospitalizations and deaths caused by the pandemic as much as possible. As a result, there was an urgent need to use online learning platforms instead of classroom instruction. To continue the educational process, KSU began using online learning through LMS, Blackboard, which had already been in use for blended learning.

The literature confirmed the need for exploring the factors influencing students' satisfaction with online courses (Ali & Dodeen, 2021; Barbera, et al., 2013), which is considered a significant factor in predicting learning outcomes (Eom, et al., 2006), and an important factor including the effectiveness and online learning success (Baber, 2020; Ikhsan et al., 2019; Gray & DiLoreto, 2016), to strengthen its effectiveness and enhance its environment.

This shows the urgent need to explore the factors influencing students' satisfaction with online learning at KSU to enhance the quality of this mode of learning, especially because this educational setup may continue until the end of the COVID-19 pandemic, or after the end of this pandemic in a different percentage of implementation.

Accordingly, the results may provide the research literature with factors influencing students' satisfaction with online courses, which is considered as a predictive factor in evaluating the online learning. This may help the instructors, administrators and policy makers at the Physics Department at KSU to enhance the strengths and to tackle the weaknesses of the online learning environment of the physics course, and to address any shortcomings of online learning implementation in this course.

Procedural Definitions

Blackboard (Bb): It is a web-based software that enables the teacher to use various electronic tools to manage course material, communicate quickly with students, track students' completion of homework and other tasks, and send feedback to students. Moreover, students can have a secure access to digital courses, select courses they choose to study, complete their assignments, get feedback from their instructor, and maintain online communication with

each other and with their teacher (through chat rooms, email, and the Bb platform).

Online learning: Online learning is an electronic instruction provided via a web browser that KSU's teachers, including the teachers for the physics course, used to teach their learners using synchronous and asynchronous network models.

Students' satisfaction with online learning: It is the students' perceptions of online learning of the physics course via the Blackboard platform. The student's satisfaction was determined by his or her total score on the CEQ scale, which consisted of four subscales, including Good E-teaching (online teaching quality), Good E-resources (online resources quality), Appropriate Workload in Online Learning, and Students' Interaction in Online Learning.

Methodology

Participants

The study population encompassed 1453 (871 males and 582 females) first year undergraduate Health Colleges students at KSU, and registered in the physics course in the second term of the 2020/2021 academic year. The physics course was delivered online using Bb platform. Only 334 students (183 males and 151 females; 22.99% of the whole population) responded to the CEQ, who formed the study sample. The study sample is suitable to represent its population. The CEQ link was emailed to the whole study population at the end of the second term of the 2020/2021 academic year.

Implementation of online learning in the Physics Course

The physics course is a four-credit-hours required course at KSU with three hours for the theoretical part and one hour for the experimental part. Only the theoretical part was delivered online. It was taught during the second term of the 2020/2021 academic year within 14 weeks using the Bb platform as follows:

- The Preparatory Year Deanship provided a video tutorial for all students on how to use the Bb platform to study their courses online (the physics course being one of these courses).

For three hours a week, the instructors taught the physics course to students online via the Bb platform. Moreover, teachers provided the course material using interactive multimedia technologies in the form

of a SCORM file (Shareable Content Object Reference Model) loaded via the Bb. SCROM file contains a collection of industry standards for e-learning courses and the Bb system, and is similar to a zip file that contains multiple files inside. The multimedia file consisted of information, training, assessments, fixed and moving photos and drawings, and links to videos and interactive online materials.

- Students logged into their Bb accounts using their usernames and passwords in order to access the course and use the interactive online multimedia tailored to their capacities and preferred speeds.

- Students completed their assignments and tasks and saw their teachers' feedback on their own accounts.

- Through the available social communication tools (chat rooms, emails, and the Bb platform), students could communicate with each other and their teachers in synchronous and asynchronous interactions. This also enabled them to inquire about information, engage in discussions, and exchange thoughts.

- Bb enabled teachers to communicate with their learners synchronously and asynchronously, track their assignments completion, and send feedback to them.

Choosing the Instrument (CEQ)

According to Yin et al. (2022), the Course Experience Questionnaire (CEQ) is based on a theory of university learning and teaching in which the curriculum, instruction, and assessment are key determinants of approaches to learning and the quality of learning outcomes (Lizzio et al., 2002). The 18-item version of the CEQ (Ginns & Ellis, 2007) was applied for the purpose of this study. Actually, the original instrument had a three-point Likert scale, however, it was altered to a five-point scale (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree). The CEQ has four subscales labelled Good E-teaching (online teaching quality), Good E-resources (online resources quality), Online Appropriate Workload, and Online Students' Interaction. The CEQ subscales and their definitions are presented in Table 1.

The CEQ instrument consisted of two parts. While the first part contained general information such as

the study purpose and instructions on how to respond to the items, the second part contained the items of the instrument.

Approval of the study Implementation

Taking into account the ethics of scientific research, an application was submitted to the Common First Year Deanship at KSU to obtain approval to apply the study on the first year Health Colleges students. Before distributing the questionnaire (CEQ) to students, approval was obtained from the Research Studies Implementation Committee (RSIC) in the Common First Year Deanship, which is headed by the Vice Dean for Educational and Academic Affairs.

Scoring for the CEQ

Scoring for the CEQ positive items was as follows: 1 point for the response "Strongly Disagree," 2 points for the response "Disagree," 3 points for the response "Neutral," 4 points for the response "Agree," and 5 points for the response "Strongly Agree." For the negative items, scoring used the reverse of this allocation.

Validity of the CEQ

A group of referees was consulted to ensure the content validity of the instrument CEQ; three referees in curricula and methods of teaching science, and two referees in curricula and methods of teaching English who have backgrounds in translation. All of these referees were from KSU. They were requested to validate the content of this instrument as well as the clarity and translation of its items. The referees' notes and suggestions were focused on the translation aspect only, and these were taken into account.

The CEQ was distributed to a pilot sample of 65 students from within the study population (but outside the sample) to test its internal consistency, and Pearson's correlation coefficients were calculated. The internal consistency was tested by calculating the correlation coefficients of the items with their subscales and with the scale as a whole. The correlation coefficients are presented in Table 2.

Table 1: The CEQ subscales and their definitions

Subscale no.	Subscale title	No. of items	Subscale definition
1	Good E-teaching (online teaching quality)	7	It measures the instructor's effectiveness in conducting online classes.
2	Good E-resources (online resources quality)	5	It measures the effectiveness of online materials and activities in assisted learning.
3	Online Appropriate Workload	3	It measures the reasonable work volume required to handle the online course.
4	Online Students' Interaction	3	It measures the students' motivation and perception levels of the topics when participating in discussion boards.

Table 2: Pearson's correlation coefficients of the items with their subscales and with the whole scale (n=65)

Subscale	Item no.	Item	Correlation of item with its subscale	Correlation of item with the scale
Good E-teaching (quality of teaching)	2	The instructor helped learners to focus on the discussions between themselves in the online physics course.	0.558**	0.467**
	5	The responses of my instructor encouraged me to learn more effectively in the online physics course	0.472**	0.376**
	9	I didn't receive enough feedback from my instructor in the online physics course	0.626**	0.480**
	11	The instructor helped to control the discussions between learners in the online physics course	0.642**	0.480**
	13	The instructor's interaction helped me to attain a better learning experience in the online physics course	0.659**	0.677**
	15	The instructor used the Blackboard interface to keep learners informed about results in the online physics course	0.787**	0.860**
	18	The instructor used the Blackboard interface to keep learners updated about information related to the online physics course	0.783**	0.794**
Good E-resources (quality of online resources)	1	The learning materials in the online physics course are extremely suitable at explaining the content	0.858**	0.804**
	4	The learning materials helped me to learn the required content in the online physics course	0.753**	0.477**
	8	The learning activities in the online physics course are designed to help learners perform better	0.452**	0.530**
	12	The learning activities in the online physics course helped me to understand the required content	0.530**	0.320**
	14	The learning materials in the online physics course are designed to make the content more interesting to me	0.839**	0.849**
Appropriate Workload	6	The workload in the online physics course means that it cannot all be completely comprehended	0.695**	0.643**
	10	I had enough time to understand the required content in the online physics course	0.788**	0.540**
	17	The work volume in the online physics course is too heavy	0.793**	0.560**
Student Interaction	3	I interacted with learners' postings in the online physics course even if they weren't evaluated	0.735**	0.564**
	7	Learners' submissions in the online physics course motivated me to explore more knowledge resources	0.905**	0.814**
	16	Learners' submissions in the online physics course helped me to understand my ideas from a different perspective	0.901**	0.826**

Note. **Correlation is significant at the 0.01 level (2-tailed)

Table 2 shows that the Pearson's correlation coefficients between items and their subscales ranged from 0.45 to 0.91, and all of these coefficients were statistically significant at the 0.01 level. Besides, the Pearson's correlation coefficients between items and the scale as a whole ranged from 0.32 to 0.86, and all of these coefficients were also statistically significant at the 0.01 level.

Reliability of the CEQ

The data of pilot sample was used to calculate the CEQ reliability. The 65 students' responses were analyzed to calculate the Cronbach's alpha coefficient (α) for the reliability of the CEQ as a whole and each of subscales. The reliability coefficient of the whole CEQ was 0.91, and the reliability coefficients of the subscales were 0.77, 0.73, 0.63, and 0.81 respectively, which showed that the CEQ was reliable and satisfactory.

Collection of Data: Students' satisfaction with online learning in the physics course

A link to the CEQ was emailed to the entire whole study population at the end of the second term of the 2020/2021 academic year after the learners had completed the physics course over a 14-week period. CEQ respondents were only 334 participants.

Data Analysis

To determine which of the proposed factors (independent factors) may influence students' satisfaction with online learning in the physics course (dependent factor), the Pearson's correlation coefficients of the

four subscales of the CEQ (proposed factors) with the whole scale (students' satisfaction) were calculated.

Additionally, to check if the multiple linear regression can be used to confirm the influencing factors, and to estimate their influence degree on students' satisfaction, two tests were conducted through SPSS by using the data of the study sample (334 students). The first one was the Person's correlation coefficients test among the proposed factors, and the second one was the multicollinearity diagnostics test by calculating the variance inflation factor (VIF) of the proposed factors. The results of the two tests suggested that the correlation coefficients among the proposed factors was less than 0.8 (ranged from 0.348 to 0.653), and the variance inflation factor (VIF) for the proposed factors was less than 3 (ranged from 1.751 to 2.192). These results indicated that there were no strong correlations nor multicollinearity diagnostics between the proposed factors, which supported using the multiple linear regression.

Furthermore, to determine the strength of the correlation coefficient between each of the proposed factors and the students' satisfaction, the present study considered the correlation to be strong if the Pearson's correlation coefficient was greater than or equal to 0.6, i.e. when $r \geq 0.6$ (Barbera et al., 2013).

Results and Discussion

To address the research questions, Pearson's correlation coefficients between each of the four subscales of the CEQ (proposed factors) and the whole scale (students' satisfaction) were calculated. The Pearson's correlation coefficients are presented in Table 3.

Table 3: Pearson's correlation coefficients of the proposed factors with students' satisfaction (n=334)

Factor no.	Factor (subscale)	Mean (out of 5)	SD	Correlation with the whole scale (with satisfaction)
1	Good E-teaching (online teaching quality)	3.81	0.38	0.88**
2	Good E-resources (online resources quality)	3.86	0.28	0.85**
3	Online Appropriate Workload	4.04	0.34	0.73**
4	Online Students' Interaction	3.99	0.27	0.78**

Note. **Correlation is significant at the 0.01 level (2-tailed)

Table 3 shows that the Pearson's correlation coefficients between the proposed factors and students' satisfaction ranged from 0.73 to 0.88, and all of these coefficients were positive, strong ($r > 0.6$), and statistically significant at the 0.01 level. To estimate the

degree of influence of those factors on students' satisfaction, a multiple linear regression was conducted; the results of which are presented in Table 4 and Table 5.

Table 4: ANOVA results for students' scores on the CEQ (students' satisfaction, n=334)^a

Model	Sum of squares	df	Mean square	F	Significance (p-value)
Regression	40.970	4	10.242		
Residual	0.000	329	0.000	2.29E+16	0.000 ^b
Total	40.970	333			

a: Dependent Variable: Students' Satisfaction.

b: Predictors: (Constant), Good E-teaching, Good E-resources, Appropriate Workload, Students' Interaction.

As shown in Table 4, the regression is statistically significant at the 0.01 level (F=2.29E+16, p=0.000), which indicates that there are statistically significant correlations between the students' satisfaction and the

proposed factors. Table 5 also shows a summary of regression analysis for the factors explaining students' satisfaction.

Table 5: Summary of regression analysis for the factors explaining students' satisfaction

Independent Variables (Factors)	Dependent Variable: Students' Satisfaction					
	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity VIF
	B	Std. Error	Beta			
(constant)	8.18E-10	0.000		0.060	0.952	
Good E-teaching	0.389	0.000	0.411	92275832.44	0.000	1.822
Good E-resources	0.278	0.000	0.292	59628371.39	0.000	2.192
Appropriate Workload	0.167	0.000	0.251	56660717.14	0.000	1.796
Students' Interaction	0.167	0.000	0.298	68145214.20	0.000	1.751

As shown in Table 5, the Beta coefficients of the proposed factors with students' satisfaction ranged from 0.251 to 0.411, and all of these coefficients were statistically significant at the 0.01 level. Additionally, Table 5 shows that the variance inflation factor (VIF) of the proposed factors ranged from 1.751 to 2.192 (VIF<3).

Results and Discussion of the First Question

Table 3 shows that the Pearson's correlation coefficients between students' satisfaction and their perceptions of the teaching quality in the physics course was 0.88, and this coefficient was statistically significant at the 0.01 level. In addition, as shown in Table 5, the Beta coefficient of the teaching quality in the physics course was 0.411, and this coefficient was statistically significant at the 0.01 level.

This indicates that there is a positive and strong correlation between students' satisfaction and their perceptions of the teaching quality in the physics course. This result shows that the students' perceptions of the teaching quality in online learning of the physics course via the Bb platform positively and strongly influenced their satisfaction, with an influence degree of 41.1%.

This result may be attributed to the use of ICT which includes learning approaches and technical tools centered on learners, meeting their interests, and suiting

their abilities, which enhanced effective and meaningful learning in the physics course (Sawaftah & Aljeraiwi, 2018). Furthermore, online learning ensured convenience and flexibility for students to choose the time and place of learning (Baber, 2020), which is an important factor for studying adults (Rovai & Jordan, 2004). Therefore, online learning offered an opportunity for an interesting utilization of various technological tools to facilitate teaching and learning outside the traditional classroom (Duhaney & Duhaney, 2006), increased students' access to knowledge, facilitated revision (Osguthorpe & Graham, 2003), and motivated and enabled more students to benefit from various educational opportunities (Duhaney & Duhaney, 2006).

This environment of learning helped the instructors to focus and guide online discussions between learners and interact online with their students, which encouraged them to get the most out of their learning. Moreover, the instructors' online responses encouraged students to look for more in-depth learning, and they received helpful online feedback.

These factors helped students to learn and understand the content of the physics course, which raised the level of their satisfaction with what they learned and with the teaching quality in the physics course. As a result, the teaching quality in the physics course via

the Bb platform positively and strongly influenced their satisfaction with this course.

This result is consistent with the findings of Yin et al. (2022) and Zhang et al. (2020) which indicated a significant positive relationship between the good teaching factor and students' satisfaction with online learning. Whereas, this result is inconsistent with that reported by Kaur et al. (2022), whose results suggested that the good teaching factor had no significant effect on students' satisfaction with online learning.

Results and Discussion of the Second Question

As shown in Table 3, the Pearson's correlation coefficient between students' satisfaction and their perceptions of the online resources quality in the physics course was 0.85, and this coefficient was statistically significant at the 0.01 level. Additionally, as shown in Table 5, the Beta coefficient of the online resources quality in the physics course with students' satisfaction was 0.229, and this coefficient was statistically significant at the 0.01 level.

This indicates that there is a positive and strong correlation between students' satisfaction and their perceptions of the online resources quality in the physics course. This result shows that the students' perceptions of the online resources quality in the physics course positively and strongly influenced their satisfaction, with an influence degree of 22.9%.

This result may be attributed to the online resources which provided students with greater opportunities to comprehend and extend the knowledge presented, motivated them to learn, supported and improved the learning process (Lei, 2010), and introduced new patterns and practices in learning (Huon et al., 2007).

This result may also be attributed to the online learning materials that were designed to make the content of the physics course interesting to students, which helped them to understand and learn the required content. Furthermore, the activities in the online physics course may be designed to enhance students' performance, resulting in them understanding the required activities for this course.

These factors contributed to raising the students' satisfaction level with what they learned and with the quality of online resources in the physics course. As a result, the quality of online resources in the physics course via the Bb platform positively and strongly influenced their satisfaction with this course.

Results and Discussion of the Third Question

Table 3 shows that the Pearson's correlation coefficients between students' satisfaction and their perceptions of the online appropriate workload in the physics course via the Bb platform was 0.73, and this coefficient was statistically significant at the 0.01 level. Further, as shown in Table 5, the Beta coefficient of the online appropriate workload in the physics course with students' satisfaction was 0.251, and this coefficient was statistically significant at a level of 0.01.

This indicates that there is a positive and strong correlation between students' satisfaction and their perceptions of the online appropriate workload in the physics course. This result shows that the students' perceptions of the online appropriate workload in the physics course positively and strongly influenced their satisfaction, with an influence degree of 25.1%.

This result may be attributed to advantages of the online learning including the high quality of interaction (Sawaftah, 2022), the level of experience and knowledge exchange (Voci & Young, 2001), and the greater flexibility for students to choose the time and place of learning (Baber, 2020), which is an important factor for studying adults (Rovai & Jordan, 2004). This enabled more students to fulfill the tasks and activities of the physics course, and contributed to raising their workload satisfaction level.

Furthermore, online learning offered an opportunity for an interesting utilization of various technological tools to facilitate teaching and learning outside the traditional classroom (Duhaney & Duhaney, 2006), increased students' access to knowledge, enhanced ease of revision (Osguthorpe & Graham, 2003), and enabled and motivated students to make use of more educational opportunities (Duhaney & Duhaney, 2006), which helped students to fulfill the tasks and activities of the physics course, and contributed to raising their workload satisfaction level.

Creating this learning environment meant that the online physics course could be comprehended thoroughly as students had enough time to understand what they had to learn, and the workload for this course was appropriate. This helped students learn and understand the content of the physics course, and enabled them to share in the tasks and activities, which contributed to raising the level of students' satisfaction with the workload in the physics course. As a result, the online appropriate workload in the physics course via the Bb platform positively and strongly influenced their satisfaction with this course.

This result conforms with the findings of Yin et al. (2022) and Elshami et al. (2021) which indicated a significant positive relationship between the appropriate workload and students' satisfaction with online learning. On the other hand, this result contradicts that reported by Kaur et al. (2022), whose results suggested that the appropriate workload factor had no significant effect on students' satisfaction with online learning.

Results and Discussion of the Fourth Question

Table 3 shows that the Pearson's correlation coefficients between students' satisfaction and their perceptions of the online interaction in the physics course via the Bb platform was 0.78, and this coefficient was statistically significant at the 0.01 level. Additionally, as shown in Table 5, the Beta coefficient of the students' online interaction in the physics course with their satisfaction was 0.298, and this coefficient was statistically significant at a level of 0.01.

This indicates that there is a positive and strong correlation between students' satisfaction and their perceptions of interaction in the physics course. This result shows that the students' perceptions of their interaction in online learning of the physics course via the Bb platform positively and strongly influenced their satisfaction, with an influence degree of 29.8%.

This result may be attributed to the high quality of student interaction that is provided by the use of online learning in the physics course (Sawaftah, 2022), which has enhanced the much-needed social interaction between students on the one hand and with their instructors on the other hand in both cases of synchronous interaction in the virtual classrooms and asynchronous interaction across a social network. This possibility of having multiple types of interaction helped in raising the communication and exchange level of students' experiences among each other and with their instructors (Voci & Young, 2001), increased students' perceived learning and motivation (Ku et al., 2013), and created positive attitudes toward learning (Donnelly, 2010; Woltering et al., 2009), which helped them to be more engaged in the learning process (Wang et al., 2009). Further, the research literature has documented many studies that have reported a significant positive relationship between students' interaction and their satisfaction with online courses (e.g., Alenezi, 2022; She et al., 2021; Ali & Mirza, 2020; Baber, 2020; Croxton, 2014; Barbera et al., 2013; Ali & Ahmad, 2011; Eom et al., 2006).

In this regard, students interacted more with each other's online postings. Other students' online submissions triggered more investigation of various knowledge sources and helped in understanding ideas from a new perspective. This helped students to understand the content of the physics course, which raised the level of their satisfaction with what they learned and with their interaction in the physics course. As a result, the students' online interaction, with each other and with their instructors, in online learning of the physics course via the Bb platform positively and strongly influenced their satisfaction with this course.

This result corresponds with the results of the following studies which indicated a significant positive relationship between students' interaction and their satisfaction with online courses: Alenezi, 2022; She et al., 2021; Ali & Mirza, 2020; Baber, 2020; Croxton, 2014; Barbera et al., 2013; Ali & Ahmad, 2011; Eom et al., 2006. In contrast, this result contradicts the results that have been reported in the study of Gray and DiLoreto, (2016) and the study of Sun et al., (2008), which indicated that student interaction did not influence students' satisfaction with online courses.

Conclusions

The present study explored the relationship between students' satisfaction with online learning of the physics course via the Bb platform at KSU and their perceptions of proposed factors, namely the teaching quality, the online resources quality, the appropriate workload, and the students' interaction. The results revealed that there is a strong positive correlation coefficient between students' satisfaction with online learning of the physics course and all of the proposed factors, and all of these coefficients were also statistically significant at the 0.01 level. These results show that the teaching quality, the online resources quality, the appropriate workload, and the students' interaction significantly, positively, and strongly influenced the students' satisfaction with online learning of the physics course.

Limitations of the Study

The study has the following limitations:

- The study sample consisted of a group of first year undergraduate Health Colleges students at KSU, which limits the results generalization outside this population.
- The study sample consisted of students registered for a general physics course in the second term of the

2020/2021 academic year, which limits the results generalization beyond this term and this course.

- The study instrument CEQ, was translated and adjusted, and its psychometric characteristics were confirmed. Therefore, the validity and reliability of this instrument played an important role in the interpretation of results.

Recommendations

Based on the findings and their discussion, the study indicates the following recommendations:

- Just as the present study examined the relationship between students' satisfaction with online learning of the physics course via the Bb platform at KSU and their perceptions of proposed factors, including the teaching quality, the online resources quality, the appropriate workload, and the students' interaction; it is important to examine these relations in other science courses as well.

- It is important to investigate other factors which may influence students' satisfaction with online learning in physics classes, such as students' performance, students' computer skills, technical support, teacher support, facilities conditions, teacher's feedback, course design, and learning content.

- The findings of this study may also provide the instructors, administrators and policy makers within the Physics Department at KSU with factors that affect students' satisfaction with online learning of the physics course. Such findings are considered an important factor in evaluating this mode of learning, to enhance the online learning environment and address any shortcomings of online learning implementation in this course.

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