

Article

# Online Learning, Mobile Learning, and Social Media Technologies: An Empirical Study on Constructivism Theory during the COVID-19 Pandemic

Omar A. Alismaiel <sup>1,\*</sup>, Javier Cifuentes-Faura <sup>2</sup>  and Waleed Mugahed Al-Rahmi <sup>3</sup>

<sup>1</sup> College of Education, King Faisal University, Al-Ahsa 13982, Saudi Arabia

<sup>2</sup> Faculty of Economics and Business, University of Murcia, 30001 Murcia, Spain

<sup>3</sup> Faculty of Social Sciences and Humanities, School of Education, Universiti Teknologi Malaysia, Skudai 80990, Malaysia

\* Correspondence: oalismael@kfu.edu.sa

**Abstract:** The study's main purpose was to discover the important factors that impact university students' online learning and academic performance during the COVID-19 epidemic, as well as their usage of social media throughout the pandemic. Constructivism theory was used and developed with constructs mostly linked to leveraging social media for collaborative learning and student interaction during the COVID-19 pandemic, given the context-dependent nature of online learning during the epidemic. During the COVID-19 epidemic, additional components such as collaborative learning, student participation, and online learning were implemented. The enlarged model, which assesses students' happiness and academic performance during the COVID-19 epidemic in connection to social media use, was validated using empirical data collected via an online survey questionnaire from 480 Saudi Arabian higher education students. AMOS-SEM was used to analyze the model's various assumptions (Analysis of Moment Structures-Structural Equation Modeling). The findings revealed that (1) using social media for collaborative learning and students' engagement has a direct positive impact on students' interactivity with peers and teachers; (2) students' interactivity with peers and teachers has a direct positive impact on online learning during the COVID-19 pandemic; (3) online learning during the COVID-19 pandemic mediates the relationship between students' interactivity and satisfaction; (4) online learning during the COVID-19 pandemic mediates the relationship between students' interactivity and satisfaction. Students, higher education institutions, and educational technology application suppliers would benefit greatly from the conclusions of this study, both theoretically and practically.

**Keywords:** social media technologies; online learning; COVID-19 pandemic; constructivism theory; academic performance



**Citation:** Alismaiel, O.A.; Cifuentes-Faura, J.; Al-Rahmi, W.M. Online Learning, Mobile Learning, and Social Media Technologies: An Empirical Study on Constructivism Theory during the COVID-19 Pandemic. *Sustainability* **2022**, *14*, 11134. <https://doi.org/10.3390/su141811134>

Academic Editors: Alfonso Chaves-Montero, Javier Augusto Nicoletti, Francisco José García-Moro and Walter Federico Gadea-Aiello

Received: 30 July 2022

Accepted: 31 August 2022

Published: 6 September 2022

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

In the worldwide COVID-19 epidemic, traditional or face-to-face schooling has encountered unprecedented obstacles. Countries have made attempts to limit huge crowd meetings and maintain physical social distance in order to regulate the virus epidemic. Therefore, most countries implemented quarantine periods, thus ending traditional education [1,2]. Similarly, governments have switched from face-to-face to online education for all subjects. During the COVID-19 epidemic, many undeveloped nations, such as Saudi Arabia, lacked digital channels, social media, or online learning to engage students and instructors. Moreover, during the COVID-19 epidemic, they were unable to provide complete online learning [3]. COVID-19 has forced teachers and students in many developing countries to connect online for the first time for academic reasons. Because many schools lack an online learning management system (LMS) for the COVID-19 pandemic, leveraging social media to engage students and promote online learning throughout the pandemic

might be advantageous [4,5]. During the COVID-19 epidemic, the study focuses on the participation of students and teachers on many social media platforms to drive online social interaction and generate successful online learning [6]. The interactive elements were interaction with group members or peers, interactivity with supervisors or lecturers, active collaborative learning, and engagement. Perception criteria included perceived ease of use, perceived utility, social media use, and research student delight. Therefore, both interpersonal and perceptual factors impact research students' academic achievement in higher education. Social media may boost collaborative learning and engagement by allowing individuals to work together to achieve a common goal [7]. Furthermore, study students' usage of social media suggests a positive relationship between academic success and satisfaction [8,9]; also discovered a relationship between academic success and student Facebook usage. It is uncommon for pupils to utilize social media for educational purposes [10]. Furthermore, students use social media to socialize rather than actively collaborate, participate, or achieve academic goals [8]. According to [11], a research model of social media antecedents and consequences was used; however, the results showed a higher perceived risk of using social media to waste time and a decreased willingness to learn. In addition, several research have found that the quantity of time spent on social media has a substantial influence [12]. It is likely that the majority of higher education students use social media and spend substantial time on it, and that the monitoring students' social media usage has a negative component. Excessive social media use is becoming more of a problem since it can lead to a lack of drive. According to experts, motivation might help a student's inner drive to succeed academically [10]. Students' strong desire to participate in active collaborative learning and study using technology may lead them to assume that social media may help them achieve this goal [13]. Thus, there is a negative impact on student interactions [14]. Social media has an influence on and can complicate a student's academic transfer from a college to a university level of education, jeopardizing research students' academic success [15]. The effects of social media in active collaborative learning environments were investigated, and it was revealed that using social media in these scenarios might help students learn more effectively. Thus, researchers should look at the interaction pattern that occurs during active collaborative learning [16]. Instructors do not use social media to educate or engage their students, despite their expertise with previous technology [17]. Professors are also lacking in social media abilities [18]. Students are not convinced by the existing platforms of teacher interaction, according to [19], so there is an excuse for effective active collaborative learning and understanding student-teacher communication regarding their training. However, students are receptive to new social media that will facilitate learning with teachers. According to educators, students seldom use social media networks for educational objectives [20]. Educators who utilize social media, however, have highlighted worries regarding the challenges it presents, as well as the insufficient evaluation and assessment [21]. According to an empirical study, students on campus demand more assistance in accessing additional social media active collaborative learning options than they do in face-to-face sessions. Lecturers can help students with quick inquiries, solutions, and coordination when it comes to using social media for active collaborative learning and involvement [22]. Teachers and students were given the opportunity to submit input during evaluative periods [23]. Experts claim that Facebook has a negative influence on school achievement in general, with male pupils being the most affected [24]. Therefore, the primary goal of this research is to identify and correct the flaws in a model that shows interactivity, social media use, active collaborative learning, engagement, and satisfaction of research students in higher education using the constructivism theor to evaluate academic performance during the COVID-19 pandemic [25]. As a consequence, this research is significant because it will disclose the characteristics and variables, the relationship between social media usage for active collaborative learning and engagement, and how these factors affect research students' academic advancement in higher education. "What are the interaction aspects that increase active collaborative learning and engagement, and hence academic success during the COVID-19

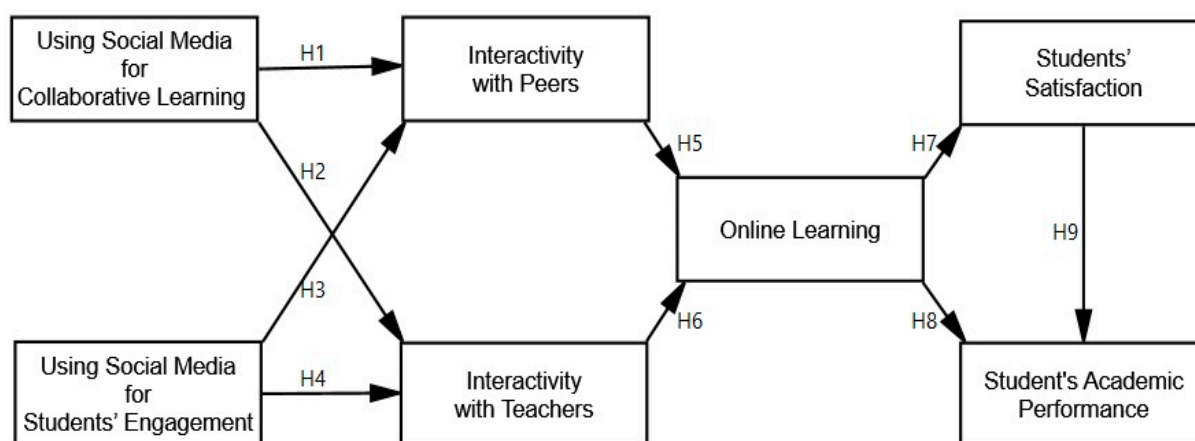
pandemic?” asks the researcher. This research will create a model of social media use for active collaborative learning and engagement by interactive factors, which will have an impact on academic performance in higher education institutions during the COVID-19 pandemic. It will also investigate the validity of constructivism for interactivity and social media use for active collaborative learning and engagement, which will have an impact on the academic performance of research students during the COVID-19 pandemic.

### *Social Media Use in Higher Education*

Students in high school may utilize social media to evaluate and appreciate creative work, offer and receive educational assistance, and validate and enjoy creative work from classmates. Faculty usage [17,26], student engagement [27,28], and influence on, as well as related to, academic accomplishment are all researched in the context of higher education [29,30]. According to the researchers, university students who engaged in interactive blogs had a more favorable attitude toward peer interaction and academic achievement [31]. Students can use social media to communicate, cooperate, and interact in a social setting [32]. The use of social media curricula in higher education for teaching and learning has attracted the scholarly community’s interest. Cognitive abilities and motivation for active collaborative learning in higher education, reflection, and metacognition are essential components of social media [33]. Several research have shown that using social media for student assignments results in higher levels of learning [34].

## **2. Interactive Variables Used with Theories**

Students who were unable to achieve cognitive equilibrium and tried to become accustomed to achieving equilibrium cognition and supported learners in building knowledge can be found in social media networks to be interactive and with the perspective of the allotment of knowledge and information or discussion with others, according to the social constructivist theory [25]. As a consequence, constructivism [25] will be utilized to support the research’s main thesis: learning is an active, creative process. The goal of this study was to fill in the gaps in the literature by examining how the use of social media for active collaborative learning and engagement affects the academic performance of research students during the COVID-19 pandemic. The constructivism theory was used to create the research model. As a consequence, constructivism was chosen in this research since it claims that engaging with classmates and lecturers leads to active collaborative learning [35]. Prior work has paved the way for the creation and refinement of a research model to investigate the influence of social media use in collaborative learning on academic achievement among research students. As a consequence of the investigation, seven operational themes of crucial factors on social media use for active collaborative learning and engagement that affect academic achievement were discovered and classified, see Figure 1.



**Figure 1.** Research model.

### *2.1. Using Social Media for Collaborative Learning*

In education, a social network is referred to as social media for allowing communication among research students, supervisors, professors, and experts, as well as enabling learners to grasp processes and participate in groups through the group process [36]. To support the learning processes required for the construction of a knowing society, new learning platforms that allow collaborative and constructive learning are required [37]. Students can utilize collaborative learning assignments on a wiki to discuss their work with others, receive feedback, and make changes before submitting the final version [38]. Students can utilize wikis to compile a collection of papers that represent the learning group's common knowledge. According to [39], active collaborative learning is more successful in diverse knowledge scenarios, and learners have strong cognitive abilities in this area. Several research looked at the possibilities of social media as a collaborative and cooperative learning tool [40]. To investigate students' perspectives of social media as an interactive learning tool, [41] created social media profiles for four university courses. Students who support using social media for academic purposes cited several benefits of using a social media course page as a useful learning resource, including increased interaction and engagement in discussions regarding course topics or research, as well as exposure to relevant media and learning materials. Several participants, however, were concerned regarding the necessity to stay on top of the social media course activities [42].

### *2.2. Using Social Media for Student Engagement*

The engagement is centered on interactions between the person and the environment in order to ensure social and intellectual connections between study group members and the class in order to change student awareness and engagement [43]. Therefore, of the widespread usage of social media, individuals have incorporated online contact into their daily lives, demonstrating the various ways in which people interact with one another through information sharing [44]. Furthermore, a number of research that looked at the experience of utilizing social media networks revealed that it led to excellent learning outcomes and engagement [45]. One of the good aspects of social media platforms [46] is their influence on emotional components of the learning environment, as well as its impact on motivation and student engagement for active collaborative learning.

### *2.3. Interactivity with Peers*

Learner involvement in the course has increased as well, as seen by social media activity logs, particularly with an evaluation task. According to recent research [46], virtual interactions are one of the most effective strategies to improve communication, inspire students to study, encourage them to take their learning assignments more seriously, and boost social network. While research on the use of social media for teaching and learning [17] is still in its early phases, these studies imply that it has the potential to be a transformative method for learning and teaching in higher education as a social networking tool. Before structuring their courses, selecting the pedagogical strategies they intend to employ and the sorts of evaluations they feel would increase their students' participation in the learning process, educators must first analyze their students' intellectual and social backgrounds. The usage of social media in higher education can help increase professor–student connection [47]. According to [48], social media use for learning is just as essential as learning objectives; thus, they must have a social presence, include interactive learning, and encourage active collaborative learning.

### *2.4. Interactivity with Teachers*

Fluid interactions among research group members may be suffocated by traditional learning approaches [49]. Student participation has an impact on academic success [50]. Despite the relevance of the concept of integration, the integration of commuting students differs significantly from that of on-campus students, with socio-academic moments [51]. The traditional concept of engagement with peers and professors had more attraction

and importance for those students than the regularity with which these encounters took place or the depth of relationship between researchers and supervisors. By providing new opportunities to promote engagement, advanced technology has revolutionized the way students connect with one another, both inside and beyond the classroom. Facilitating relationships is crucial since it leads to more effective and better learning. Therefore, it is possible that it will become a need for academic achievement [52].

### *2.5. Online Learning during the COVID-19 Pandemic*

This study backs up statements from [53], that using social media for online learning during the COVID-19 pandemic and academic communication, such as social media, can promote social learning and social presence. It also claims that by creating an interactive learning environment, encouraging social presence, and fostering social presence, using social media for formal academic communication might improve learning results. Various research have been produced that indicate the benefits of interpersonal connection because online engagement has been thoroughly examined in recent decades. Human involvement in online environments has been linked to student pleasure [54,55], faculty satisfaction [56], and student academic achievement [54,55,57].

### *2.6. Students' Satisfaction*

Students from one cultural context may have various viewpoints on educational interventions based on their actions in another cultural environment [58]. This highlights the need of doing comparative research on online learner engagement as well as the impact of cultural variations on online student cooperation [59]. Furthermore, active collaborative learning environments, as well as students' happiness with them, is a hot topic that has spawned several research papers in the literature [60]. When it comes to user adoption and enjoyment with technology, perceived usefulness and ease of use are crucial elements to consider. They have been demonstrated to predict consumer happiness with websites and computers [61]. According to [62], while some studies have indicated that user entertainment has a significant impact on technology success, others have discovered that user perceptions of technology-provided entertainment are linked to IS systems and product adoption and satisfaction [63]. All forms of communication, according to [64], are important and should be incorporated in online courses since they promote students' learning and enjoyment. Furthermore, few studies have been performed on how students interact, communicate, negotiate, and cooperate in online classrooms [65]. This shows that students like connecting with peers who share similar interests, which boosts overall satisfaction with active collaborative learning in homogeneous groups [66].

### *2.7. Students' Academic Performance during COVID-19 Pandemic*

Despite the fact that they mostly use it for social rather than academic purposes, the majority of respondents agreed that social media had a positive impact on their academic performance during the COVID-19 pandemic, according to a study on the impact of social media on students' academic performance during the COVID-19 pandemic in education [67]. It has been shown that there is a correlation between collaborative learning, engagement, and academic accomplishment [27]. The usage of social media in higher education has been recommended based on research [18]. Social media is viewed by learners and their communities as a means of disseminating fresh information. Facebook may be used to assist students or a specific group of people to communicate more successfully in a variety of ways [68]. The amount of time and effort students spend on educational activities is measured by student interaction and engagement [69]. The phrase "social media" encompasses a wide range of networked tools or technologies that highlight the Internet's social aspects as a conduit for communication, active collaborative learning to increase academic achievement, and creative expression in higher education [70]. They lead to the use of social media to increase educational access and engagement [71]. Social media platforms are widely used by students for both amusement and education. College



students utilize a variety of social media programs since it has become an important part of their daily lives for both personal and educational aims [8].

### 3. Research Methodology

We sent out 500 questionnaires for the study and 491 were returned by respondents; after human processing, 6 of the 491 questionnaires were incomplete (“students did not complete the survey”) and had to be deleted, leaving 485. Outliers, defined as “data that differs abnormally from other values in a random sample,” were found in 5 of the remaining 485 questionnaire copies put into SPSS, bringing the total number of acceptable surveys to 480 students. Hair et al. [72] argued for such exclusions, claiming that outliers might lead to erroneous statistical conclusions and should be removed. For the purpose of the study, we built a conceptual model based on constructivism theory to measure student satisfaction and academic achievement.

#### 3.1. Instrument Development

Because Likert scales are widely used in information system (IS) research and have been thoroughly assessed in both marketing and social science, they were employed to examine the responses in this study [73]. This study’s variables were all graded on a five-point Likert scale from 1 to 5: (1) Strongly disagree, (2) Disagree, (3) Undecided, (4) Agree, and (5) Strongly Agree were the five options. When choosing and creating a measuring scale, several aspects that affect the scale’s reliability, validity, and utility must be taken into account. The study by Cooper and Schindlers [74] provided the foundation for these factors. The questionnaire looked at how students and researchers in higher education felt about using social media for active collaborative learning and engagement, as well as how it influenced their academic performance during the COVID-19 pandemic, was fine-tuned with the support of a pilot study with students, and tested beforehand. A questionnaire with 27 items was prepared after minor layout changes, and the online survey was administered toward the end of the semester in September 2021. Four items derived from [75] were used to examine the use of social media for collaborative learning in the questionnaire adapted from earlier studies. Students’ engagement with social media was examined using three questions derived from [43]. A subset of six questions from [76] was used to assess interactivity with peers and teachers. Four questions derived from the questionnaire were used to assess online learning [77]. Students’ academic performance during the COVID-19 pandemic was tested using four items from [78], and finally, student satisfaction was examined using four questions from [63].

#### 3.2. Sample Size and Data Collection

Sampling is a statistical approach that includes picking a subset of individual observations from a population with the purpose of influencing student and researcher academic performance during the COVID-19 pandemic and satisfaction in higher education by employing social media for participation and active collaborative learning. The two types of sampling processes are random and non-random sampling. This study employed a random sampling technique because it assures that the research target group has an equal probability of being picked.

### 4. Data Analysis and Results

The current study’s empirical analysis aims to explore how the interrelationships of many independent and dependent factors connected to using social media for active collaborative learning impact the academic performance during the COVID-19 pandemic of students and researchers. Structural Equation Modeling was the primary statistical tool employed in the data analysis for a variety of reasons (SEM). SEM is the most rigorous and powerful statistical research approach for dealing with complicated models, according to several specialists [72]. SEM is a set of statistical models aimed at explaining correlations between a large number of variables. After the measurement model has been confirmed, the researcher moves on to the second stage, which comprises estimating the structural model between the latent variables.

The one-step technique, on the other hand, estimates the measurement model and structural models at the same time [72]. The data are shown in Table 1.

**Table 1.** Adjusted goodness-of-fit index (AGFI).

Model	NPAR	CMIN	DF	<i>p</i>	CMIN/DF
Default model	80	839.735	298	0.000	2.818
Saturated model	378	0.000	0	0.000	0
Independence model	27	21,734.431	351	0.000	61.921
Adjusted Goodness-of-Fit Index (AGFI)					
Tucker–Lewis index			TLI	0.000	0.970
Incremental Fit Index			IFI	0.000	0.975
Comparative Fit Index			CFI	0.000	0.975
Root-Mean-Square Residual			RMR	0.000	0.027

#### 4.1. Validity and Reliability

In this study, AMOS 23 was used to calculate individual item dependability. The item is deemed dependable if the squared multiple correlations in ( $R^2$ ) of each item in the measurement model exceed 0.5. Individual item dependability is demonstrated if the standardized loading is equal to or greater than 0.70 [72]. The entire amount of true score volatility as a proportion of overall scale score variance is represented by composite reliability (CR) [72]. The consistency of a collection of variables in a measurement is determined using CR. The resulting coefficient is interpreted in the same way as Cronbach's alpha, with the difference that it accounts for true factor loadings rather than assuming that each item in the composite load assessment is equally weighted [72]. The average variance extracted (AVE) displays the total amount of variance in the indicators that the hidden construct accounts for [72]. Confirmatory factor analysis (CFA) can be used to explore this form of validity (see Tables 2 and 3).

**Table 2.** Relationship between factors (validity and reliability).

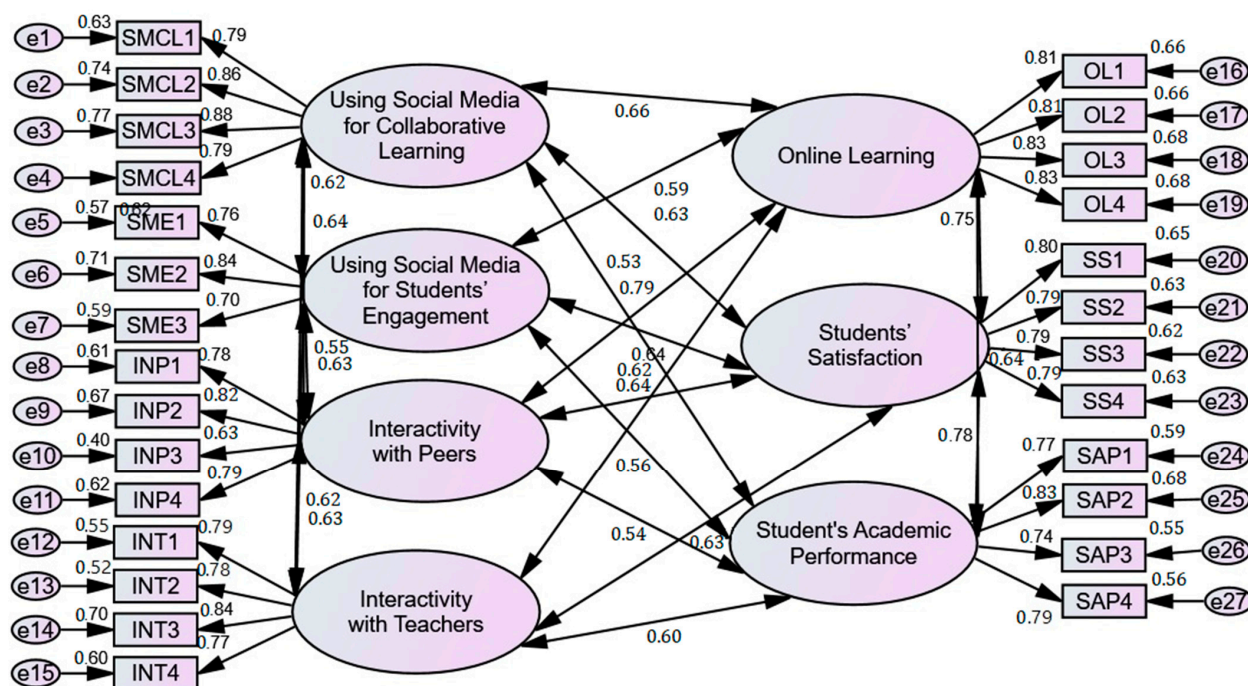
Relationship between Factors and Items			Estimate	Composite Reliability (CR)	Cronbach's Alpha	Average Variance Extracted (AVE)	Squared Multiple Correlations in ( $R^2$ )
SMCL4	<---	Using Social	0.789	0.891	0.900	0.599	
SMCL3	<---	Media for	0.880				
SMCL2	<---	Collaborative	0.862				
SMCL1	<---	Learning	0.795				
SME3	<---	Using Social	0.704	0.873	0.889	0.610	
SME2	<---	Media for	0.840				
SME1	<---	Engagement	0.757				
INP4	<---	Interactivity with Peers	0.782	0.903	0.911	0.620	
INP3	<---		0.829				
INP2	<---		0.822				
INP1	<---		0.782				
INT4	<---	Interactivity with Teachers	0.773	0.887	0.895	0.587	
INT3	<---		0.843				
INT2	<---		0.778				
INT1	<---		0.792				
OL4	<---	Online Learning	0.826	0.907	0.881	0.633	
OL3	<---		0.825				
OL2	<---		0.814				
OL1	<---		0.813				
SS4	<---	Students' Satisfaction	0.795	0.890	0.864	0.641	
SS3	<---		0.785				
SS2	<---		0.793				
SS1	<---		0.804				
SAP4	<---	Students' Academic Performance	0.793	0.879	0.880	0.589	
SAP3	<---		0.744				
SAP2	<---		0.827				
SAP1	<---		0.766				

**Table 3.** Sample covariances reliability.

Factors	Code	SMCL	SME	INP	INT	OL	SS	SAP
Using Social Media for Collaborative Learning	SMCL	0.855						
Using Social Media for Engagement	SME	0.373	0.841					
Interactivity with Peers	INP	0.267	0.313	0.840				
Interactivity with Teachers	INT	0.369	0.425	0.287	0.837			
Online Learning	OL	0.292	0.348	0.287	0.288	0.853		
Students' Satisfaction	SS	0.308	0.363	0.376	0.340	0.293	0.903	
Students' Academic Performance	SAP	0.282	0.345	0.328	0.328	0.259	0.358	0.883

#### 4.2. Measurement Model Fit

The total model measure, according to [72], may be that the fit is evaluated using a variety of goodness-of-fit metrics divided into three categories: absolute fit measurements, incremental fit measures, and parsimonious fit measures. As a consequence of this advice, the following indices were used in this investigation: RMR, IFI, TLI, CFI, RMSEA, and 2/df. The Root-Mean-Square Error of Approximation (RMSEA) was chosen for this study because it is one of the most often used metrics for correcting the GOF test statistic's propensity to reject models with a high sample size or a large number of observable variables [72]. As illustrated in Figure 2, many fit indices should be employed to evaluate a model's goodness-of-fit, with a value of 0.90 or above [72].

**Figure 2.** Measurement model.

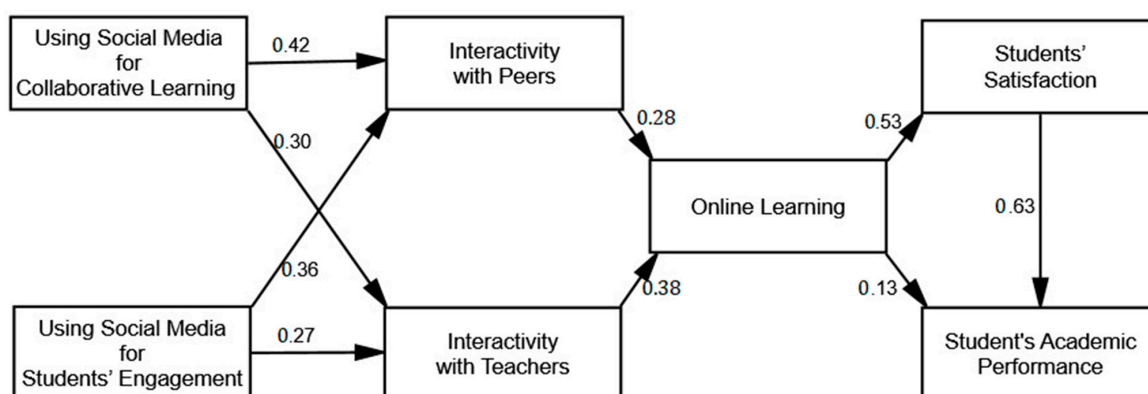
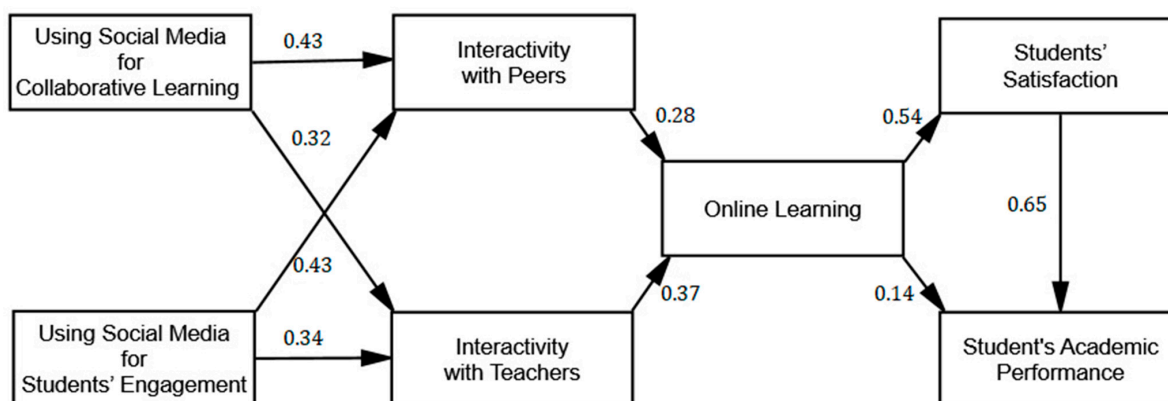
#### 4.3. Hypothesis Testing

Hypothesis testing is the penultimate step in the data processing process. The goal of this investigation was to look at the nine options listed in Table 4. The statistical significance of the parameter estimated by SEM was determined using the Critical Ratio (C.R.), which is defined as the parameter estimate divided by the standard error (S.E.) [72]. Smaller  $p$ -values ( $p < 0.01$ ) are frequently regarded as very significant since they suggest that the observed difference would only occur once in a hundred times if no genuine difference existed. To summarize, when sample sizes or the number of observable variables get larger [72], the statistical test or the resultant  $p$ -value becomes less relevant [72], as seen in Figures 3 and 4.



**Table 4.** Hypotheses relationships test.

No	Hypotheses Relationships			Estimate	S.E.	C.R.	<i>p</i>	Results
H1	INP	<---	SMCL	0.422	0.026	16.147	0.000	Accepted
H2	INT	<---	SMCL	0.297	0.028	10.638	0.000	Accepted
H3	INP	<---	SME	0.361	0.023	15.953	0.000	Accepted
H4	INT	<---	SME	0.273	0.024	11.295	0.000	Accepted
H5	OL	<---	INP	0.278	0.024	11.606	0.000	Accepted
H6	OL	<---	INT	0.385	0.026	14.782	0.000	Accepted
H7	SS	<---	OL	0.530	0.022	24.179	0.000	Accepted
H8	SAP	<---	OL	0.131	0.021	6.235	0.000	Accepted
H9	SAP	<---	SS	0.634	0.022	28.691	0.000	Accepted

**Figure 3.** Structural model.**Figure 4.** *p*-value results.

The hypotheses indicate the interrelationships between the components that may impact how higher education research students utilize social media for active collaborative learning and involvement, as well as their academic achievement. A two-step structural equation modeling technique was used to evaluate the assumptions. This technique was chosen for this study because it is more practical than other ways, such as the one-step method [72], as shown in Table 4.

## 5. Discussion and Implications

This research adds to the current literature by adding constructivism theory to better understand how students use social media for learning. Social media, along with the Internet, have revolutionized the way students interact, engage, and cooperate throughout the world. Collaboration and engagement on social media encourage a constructivist approach

to learning, in which students and teachers collaborate for mutual benefit [79,80]. They can discuss and share useful knowledge in a group environment through social media sites. In addition, effective social media use boosts participant engagement, collaborative learning, and learner performance. Social media-based learning systems, rather than traditional learning approaches, put online learning during the COVID-19 pandemic in the hands of students [81]. Students may foster healthy classroom conversations, student engagement, peer integration, and teacher integration by using social media. These findings corroborate those of [82], which discovered that social networks are simple to use and explore, as well as being beneficial for interactive learning. Previous research on social networking networks and their practical utility yielded similar results [9,83–85] and claims that using social media in the classroom encourages greater contributions and participation in active student collaboration and engagement. Therefore, these virtual community interactions foster the desired learning outcomes and student success. Employing online social media for collaborative learning and interaction with instructors and peers boosts student engagement, which improves academic achievement. Students' intellectual capacities should be developed on a platform provided by the higher education administration. Based on the outcomes of the empirical study, it can be stated that social media communication devices assist students in regaining knowledge and engaging with others in real-time while transferring educational materials' contents. Furthermore, modern communication devices would aid students who are shy in front of their peers; instructors might open up on the web for collaborative learning and teaching in a global setting; physically challenged students would benefit from such technology. It also stands to reason that the widespread use of advanced tools in practical training in higher education makes it simpler for professors and students to engage digitally through web-based learning, discussion groups, and other techniques. This research discovered that using social media for collaborative learning and engagement, as well as interactions with peers and teachers, has a positive impact on students' online learning during the COVID-19 pandemic and academic performance during the COVID-19 pandemic, implying that implementing such sophisticated technological tools in higher education would result in innovative, drastic changes in international collaborative learning and engagement. Here is a summary of the key research findings. Peer and teacher contact, as well as students' use of social media for educational reasons, enhance with collaborative learning and engagement. Students' use of social media enhances online learning during the COVID-19 pandemic, interaction and engagement, as well as student–instructor communication. The contact and participation of students have a favorable influence on online learning during the COVID-19 pandemic. Furthermore, online learning during the COVID-19 pandemic has a strong favorable effect on student satisfaction and academic achievement. Therefore, this research provides a framework for examining the influence of students' educational use of social media on collaborative learning and engagement. This model was created based on observations from the literature and then tested using structural equation modeling. Students' usage of social media for educational purposes was examined using constructivism theory basics. After that, the effects of students' usage of social media for online learning during the COVID-19 pandemic on student engagement, faculty member involvement with students, and student course participation were examined. Finally, the overall effects of student interaction, instructor–student relationships, and student course participation in collaborative learning were discovered to have an impact on students' happiness and academic achievement in online learning during the COVID-19 pandemic. According to this study, the indicators are well-representative of the constructs. When all goodness-of-fit criteria were approved, the measurement model was likewise judged to be adequate. The concept reliabilities and average variance extracted values were determined in the current study, which looked at both convergent and discriminant validity. The research model was found to be sufficient as a consequence of the data, and the study's nine hypotheses were confirmed and approved. The model was updated with additional correlations, and the model's validity was validated using the indices and goodness-of-fit indices. All of these findings imply that social media offers a number of benefits, including

the ability to improve collaborative learning and engagement with peers and instructors; all of which have an impact on online learning during the COVID-19 pandemic, student satisfaction, and academic achievement. This project provided a paradigm for harnessing social media for collaborative learning and involvement in order to improve students' academic performance during the COVID-19 pandemic. Students were most satisfied with the assistance offered by teaching staff and their universities' public relations during the global lockdown and shift to online learning, all of which are results of our research [86–88]. Here are the scientific contributions:

- By integrating social media into instructional practices, students' attitudes regarding technology and their enthusiasm for using it for digital learning can be improved. In order to improve their ability to study, succeed, and conduct research, instructors and mentors should encourage students to use social media to solve problems, share information, and trade expertise.
- It is recommended that colleges and universities support students who have used social media in the classroom in lieu of pressuring those who have not. With this method, students use elements and resources from social media in their educational process.
- Technology and resources have an impact on students' attitudes toward and intentions for using social media for digital learning. Digital learning choices based on social media should be used by students.

## 6. Conclusions and Future Work

The study's main goal was to look at the effects of a variety of factors on online learning during the COVID-19 pandemic and student happiness in order to help students improve their academic performance during the COVID-19 pandemic. Using social media for collaborative learning, using social media for student engagement, interactivity with peers, interactivity with teachers, online learning during the COVID-19 pandemic, student satisfaction, and student academic performance during the COVID-19 pandemic were all included in the proposed model for this study, which was based on constructivism theory. These factors were assessed using a structural equation modeling (SEM) technique and an online questionnaire comprising 27 questions. Both collaborative learning and engagement had a favorable impact on peer and instructor interaction, according to the findings; both factors affected online learning during the COVID-19 pandemic, which improved students' happiness and academic success. The use of social media as a platform for educational learning, cooperation, and student participation, as well as the use of social media as a platform for interaction and online learning during the COVID-19 pandemic, were all highlighted. These recommendations, when combined with a set of standards for using social media in higher education, would benefit both students and institutions. According to the findings of this study, future research could incorporate more characteristics to analyze the impact of various aspects on online learning during the COVID-19 pandemic and students' academic performance during the COVID-19 pandemic through the use of social media for collaborative learning and student engagement. Future research should look at additional studies and variables that influence the usage of social media for online learning during the COVID-19 pandemic, collaborative learning, and engagement to improve students' academic achievement (e.g., environmental and cultural). Regardless of the insights it offers, this study has its own limitations. The findings should be interpreted cautiously because this study only examined one university, and behavior at other universities (both private and public) may vary. This study's emphasis on quantitative data is another drawback; as a result, researchers should use qualitative data instead (such as observations or interviews) to avoid discovering inconsistencies between research themes. Future studies should repeat this investigation in several nations, regions, and cultures to correct its flaws and broaden the range of its conclusions. Due to the small sample size, it was not able to conduct moderator research, hence the effects of age and gender were not examined.

**Author Contributions:** Conceptualization, O.A.A.; methodology, O.A.A., W.M.A.-R. and J.C.-F.; software, O.A.A. and W.M.A.-R.; validation, W.M.A.-R. and O.A.A.; formal analysis, J.C.-F., O.A.A. and W.M.A.-R.; investigation, O.A.A., W.M.A.-R. and J.C.-F.; resources, O.A.A.; data curation, O.A.A., W.M.A.-R. and J.C.-F.; writing—original draft preparation, O.A.A.; writing—review and editing, O.A.A., W.M.A.-R. and J.C.-F.; visualization, O.A.A., W.M.A.-R. and J.C.-F.; supervision, O.A.A.; project administration, O.A.A.; funding acquisition, O.A.A. All authors have read and agreed to the published version of the manuscript.

**Funding:** This work was supported by the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia (Project No. GRANT139).

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

1. Bao, W. COVID-19 and online teaching in higher education: A case study of Peking University. *Hum. Behav. Emerg. Technol.* **2020**, *2*, 113–115. [[CrossRef](#)] [[PubMed](#)]
2. Gonzalez, T.; De la Rubia, M.A.; Hincz, K.P.; Comas-Lopez, M.; Subirats, L.; Fort, S.; Sacha, G.M. Influence of COVID-19 confinement on students' performance in higher education. *PLoS ONE* **2020**, *15*, e0239490. [[CrossRef](#)]
3. Hsieh, M.Y. The most sustainable niche principles of social media education in a higher education contracting era. *Sustainability* **2020**, *12*, 399. [[CrossRef](#)]
4. Manca, S. Snapping, pinning, liking or texting: Investigating social media in higher education beyond Facebook. *Internet High. Educ.* **2020**, *44*, 100707. [[CrossRef](#)]
5. Sobaih, A.E.E.; Moustafa, M.A.; Ghandforoush, P.; Khan, M. To use or not to use? Social media in higher education in developing countries. *Comput. Hum. Behav.* **2016**, *58*, 296–305. [[CrossRef](#)]
6. Awidi, I.T.; Paynter, M.; Vujosevic, T. Facebook group in the learning design of a higher education course: An analysis of factors influencing positive learning experience for students. *Comput. Educ.* **2019**, *129*, 106–121. [[CrossRef](#)]
7. Baanqud, N.S.; Al-Samarraie, H.; Alzahrani, A.I.; Alfarraj, O. Engagement in cloud-supported collaborative learning and student knowledge construction: A modeling study. *Int. J. Educ. Technol. High. Educ.* **2020**, *17*, 1–23. [[CrossRef](#)]
8. Friday, J.A.; Olayemi, O.; Solomon, S.O.; Emmanuel, A.K.; Sunday, A.O.; Richard, O.A.; Dandison, C.U.; Abdullahi, A.Y.; Saheed, A.G.; Awoniyi, L.; et al. Social Media Usage for Computing Education: The Effect of Tie Strength and Group Communication on Perceived Learning Outcome Friday Joseph Agbo, Olayemi Olawumi, Solomon Sunday Oyelere University of Eastern Finland, Finland Emmanuel Awuni Kolog Univer. *ERIC* **2020**, *16*, 5–26.
9. Al-Maatouk, Q.; Othman, M.S.; Aldraiweesh, A.; Alturki, U.; Al-Rahmi, W.M.; Aljeraiwi, A.A. Task-technology fit and technology acceptance model application to structure and evaluate the adoption of social media in academia. *IEEE Access* **2020**, *8*, 78427–78440. [[CrossRef](#)]
10. Iqbal, J.; Qureshi, N.; Ashraf, M.A.; Rasool, S.F.; Asghar, M.Z. The effect of emotional intelligence and academic social networking sites on academic performance during the COVID-19 pandemic. *Psychol. Res. Behav. Manag.* **2021**, *14*, 905–920. [[CrossRef](#)]
11. Hosen, M.; Ogbeibu, S.; Giridharan, B.; Cham, T.H.; Lim, W.M.; Paul, J. Individual motivation and social media influence on student knowledge sharing and learning performance: Evidence from an emerging economy. *Comput. Educ.* **2021**, *172*, 104262. [[CrossRef](#)]
12. Sudargini, Y.; Purwanto, A. The effect of teachers pedagogic competency on the learning outcomes of students. *J. Ind. Eng. Manag. Res.* **2020**, *1*, 2722–8878. [[CrossRef](#)]
13. Mustapha, L.K.; Omar, B. Do social media matter? Examining social media use and youths' political participation during the 2019 Nigerian general elections. *Round Table* **2020**, *109*, 441–457. [[CrossRef](#)]
14. Alalwan, N.; Al-Rahmi, W.M.; Alfarraj, O.; Alzahrani, A.; Yahaya, N.; Al-Rahmi, A.M. Integrated three theories to develop a model of factors affecting students' academic performance in higher education. *IEEE Access* **2019**, *7*, 98725–98742. [[CrossRef](#)]
15. Sutherland, K.; Davis, C.; Terton, U.; Visser, I. University student social media use and its influence on offline engagement in higher educational communities. *Stud. Success* **2018**, *9*, 13–24. [[CrossRef](#)]
16. Oluwajana, D.; Adeshola, I.; Clement, S. Does the use of a web-based collaborative platform reduce cognitive load and influence project-based student engagement? *Curr. Psychol.* **2021**, 1–14. [[CrossRef](#)]
17. Supardi, S.; Juhji, J.; Azkiyah, I.; Muqdamien, B.; Ansori, A.; Kurniawan, I.; Sari, A.F. The ICT basic skills: Contribution to student social media utilization activities. *Int. J. Eval. Res. Educ.* **2021**, *10*, 222–229. [[CrossRef](#)]
18. Ma, A.T.H.; Ng, S.L.; Cheung, L.T.O.; Lam, T.W.L. How do uses of and gratifications from social media platforms drive responsible birdwatching behavior? *Glob. Ecol. Conserv.* **2021**, *27*, e01614. [[CrossRef](#)]



19. Cankaya, S.; Yunkul, E. Learner Views about Cooperative Learning in Social Learning Networks. *Int. Educ. Stud.* **2017**, *11*, 52. [\[CrossRef\]](#)
20. Qureshi, M.A.; Khaskheli, A.; Qureshi, J.A.; Raza, S.A.; Yousufi, S.Q. Factors affecting students' learning performance through collaborative learning and engagement. *Interact. Learn. Environ.* **2021**, 1–21. [\[CrossRef\]](#)
21. McNeill, E.; Toth, A.J.; Harrison, A.J.; Campbell, M.J. Cognitive to physical performance: A conceptual model for the role of motor simulation in performance. *Int. Rev. Sport Exerc. Psychol.* **2020**, *13*, 205–230. [\[CrossRef\]](#)
22. Hamadi, M.; El-Den, J.; Azam, S.; Sriratanaviriyakul, N. Integrating social media as cooperative learning tool in higher education classrooms: An empirical study. *J. King Saud Univ. Comput. Inf. Sci.* **2022**, *34*, 3722–3731. [\[CrossRef\]](#)
23. Torphy, K.; Hu, S.; Liu, Y.; Chen, Z. Teachers turning to teachers: Teacherpreneurial behaviors in social media. *Am. J. Educ.* **2020**, *127*, 49–76. [\[CrossRef\]](#)
24. Shahibi, M.S.; Rusli, K.N.K.K. The Influence of Internet Usage on Student's Academic Performance. *Int. J. Acad. Res. Bus. Soc. Sci.* **2017**, *7*, 873. [\[CrossRef\]](#)
25. Vygotsky, L.S. *Mind in Society: The Development of Higher Psychological Processes*; Harvard University Press: Cambridge, MA, USA, 1978.
26. Al-Rahmi, W.M.; Alias, N.; Othman, M.S.; Marin, V.I.; Tur, G. A model of factors affecting learning performance through the use of social media in Malaysian higher education. *Comput. Educ.* **2018**, *121*, 59–72. [\[CrossRef\]](#)
27. Ochs, C.; Sonderegger, A. What Students Do While You Are Teaching—Computer and Smartphone Use in Class and Its Implication on Learning. In *Lecture Notes in Computer Science (including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), Proceedings of the IFIP Conference on Human-Computer Interaction, Bari, Italy, 30 August–3 September 2021*; Springer Science and Business Media Deutschland GmbH: Berlin, Germany, 2021; Volume 12933 LNCS, pp. 501–520.
28. Cifuentes-Faura, J.; Obor, D.O.; To, L.; Al-Naabi, I. Cross-cultural impacts of COVID-19 on higher education learning and teaching practices in Spain, Oman, Nigeria and Cambodia: A cross-cultural study. *J. Univ. Teach. Learn. Pract.* **2021**, *18*, 135–151. [\[CrossRef\]](#)
29. Al-Rahmi, W.M.; Othman, M.S.; Yusuf, L.M. Effect of engagement and collaborative learning on satisfaction through the use of social media on Malaysian higher education. *Res. J. Appl. Sci. Eng. Technol.* **2015**, *9*, 1132–1142. [\[CrossRef\]](#)
30. Faura-Martínez, U.; Lafuente-Lechuga, M.; Cifuentes-Faura, J. Sustainability of the Spanish university system during the pandemic caused by COVID-19. *Educ. Rev.* **2021**, *74*, 645–663. [\[CrossRef\]](#)
31. Hayes, R.A.; Carr, C.T. Getting called out: Effects of feedback to social media corporate social responsibility statements. *Public Relat. Rev.* **2021**, *47*, 101962. [\[CrossRef\]](#)
32. Al-Rahmi, W.M.; Yahaya, N.; Alturki, U.; Alrobai, A.; Aldraiweesh, A.A.; Omar Alsayed, A.; Kamin, Y. Bin Social media—Based collaborative learning: The effect on learning success with the moderating role of cyberstalking and cyberbullying. *Interact. Learn. Environ.* **2020**, 1–14. [\[CrossRef\]](#)
33. Wu, A.; Maddula, V.; Kieff, M.R.; Kunzel, C. An online program to improve international collaboration, intercultural skills, and research knowledge. *J. Dent. Educ.* **2021**, *85*, 948–951. [\[CrossRef\]](#) [\[PubMed\]](#)
34. Pérez-López, R.; Gurrea-Sarasa, R.; Herrando, C.; Martín-De Hoyos, M.J.; Bordonaba-Juste, V.; Acerete, A.U. The generation of student engagement as a cognition-affect-behaviour process in a Twitter learning experience. *Australas. J. Educ. Technol.* **2020**, *36*, 132–146. [\[CrossRef\]](#)
35. Macias, C.; Shin, M.; Bennett, L.H. “They Were Teaching Me!”: Reimagining Collaborative Inquiry with Elementary Students in Science Teacher Education. *J. Sci. Teach. Educ.* **2022**, *33*, 466–487. [\[CrossRef\]](#)
36. Sohaei, S.; Mirabolghasemi, M.; Gohari, M.M. Adoption of Educational Social Network Sites in Teaching and Learning: A Task-Technology Fit Perspective. *J. Soft Comput.* **2020**, *8*, 1–11.
37. Wang, D.; Li, B. Behavioral Selection Strategies of Members of Enterprise Community of Practice—An Evolutionary Game Theory Approach to the Knowledge Creation Process. *IEEE Access* **2020**, *8*, 153322–153333. [\[CrossRef\]](#)
38. Costley, J.; Courtney, M.; Fanguy, M. The interaction of collaboration, note-taking completeness, and performance over 10 weeks of an online course. *Internet High. Educ.* **2022**, *52*, 100831. [\[CrossRef\]](#)
39. Janssen, J.; Kirschner, P.A. Applying collaborative cognitive load theory to computer-supported collaborative learning: Towards a research agenda. *Educ. Technol. Res. Dev.* **2020**, *68*, 783–805. [\[CrossRef\]](#)
40. Lacka, E.; Wong, T.C.; Haddoud, M.Y. Can digital technologies improve students' efficiency? Exploring the role of Virtual Learning Environment and Social Media use in Higher Education. *Comput. Educ.* **2021**, *163*, 104099. [\[CrossRef\]](#)
41. Zgheib, G.E.; Dabbagh, N. Social media learning activities (Smla): Implications for design. *Online Learn. J.* **2020**, *24*, 50–66. [\[CrossRef\]](#)
42. Giannikas, C. Facebook in tertiary education: The impact of social media in e-Learning. *J. Univ. Teach. Learn. Pract.* **2020**, *17*, 23–36. [\[CrossRef\]](#)
43. Xu, B.; Chen, N.S.; Chen, G. Effects of teacher role on student engagement in WeChat-Based online discussion learning. *Comput. Educ.* **2020**, *157*, 103956. [\[CrossRef\]](#)
44. Xie, J.; Meng, F.; Sun, J.; Ma, X.; Yan, G.; Hu, Y. Detecting and modelling real percolation and phase transitions of information on social media. *Nat. Hum. Behav.* **2021**, *5*, 1161–1168. [\[CrossRef\]](#)
45. Awotunde, J.B.; Ogundokun, R.O.; Ayo, F.E.; Ajamu, G.J.; Ogundokun, O.E. UTAUT model: Integrating social media for learning purposes among university students in Nigeria. *SN Soc. Sci.* **2021**, *1*, 2–27. [\[CrossRef\]](#)
46. Lee, J.E.; Recker, M. The effects of instructors' use of online discussions strategies on student participation and performance in university online introductory mathematics courses. *Comput. Educ.* **2021**, *162*, 104084. [\[CrossRef\]](#)



47. Greenhalgh, S.P.; Nnagboro, C.; Kaufmann, R.; Gretter, S. Academic, social, and cultural learning in the French #bac2018 Twitter hashtag. *Educ. Technol. Res. Dev.* **2021**, *69*, 1835–1851. [\[CrossRef\]](#)
48. Bailey, D. Interactivity during COVID-19: Mediation of learner interactions on social presence and expected learning outcome within videoconference EFL courses. *J. Comput. Educ.* **2022**, *9*, 291–313. [\[CrossRef\]](#)
49. Dečman, M. Factors that increase active participation by higher education students, and predict the acceptance and use of classroom response systems. *Int. J. High. Educ.* **2020**, *9*, 84–98. [\[CrossRef\]](#)
50. Lai, H.M. Understanding what determines university students' behavioral engagement in a group-based flipped learning context. *Comput. Educ.* **2021**, *173*, 104290. [\[CrossRef\]](#)
51. Maliszewski Lukszo, C.; Hayes, S. Facilitating Transfer Student Success: Exploring Sources of Transfer Student Capital. *Community Coll. Rev.* **2020**, *48*, 31–54. [\[CrossRef\]](#)
52. Purwani, W.A.; Dewi, A.R. The Development of Lesson Plan Using Blended Learning Model at The University of Billfath. *Tell Teach. Engl. Lang. Lit. J.* **2021**, *9*, 112. [\[CrossRef\]](#)
53. Qiu, H.; Li, Q.; Li, C. How technology facilitates tourism education in COVID-19: Case study of nankai University. *J. Hosp. Leis. Sport Tour. Educ.* **2021**, *29*, 100288. [\[CrossRef\]](#) [\[PubMed\]](#)
54. Fedynich, L.; Bradley, K.S.; Bradley, J. Graduate Students' Perceptions of Online Learning. *Res. High. Educ. J.* **2015**, *27*, 1–13.
55. Khalid, M.N.; Quick, D. Teaching Presence Influencing Online Students' Course Satisfaction at an Institution of Higher Education. *Int. Educ. Stud.* **2016**, *9*, 62. [\[CrossRef\]](#)
56. Su, B.; Bonk, C.J.; Magjuka, R.J.; Liu, X.; Lee, S.H. The importance of interaction in web-based education: A program-level case study of online MBA courses. *J. Interact. Online Learn.* **2005**, *4*, 1–19.
57. Long, G.L.; Marchetti, C.; Fasse, R. The importance of interaction for academic success in online courses with hearing, deaf, and hard-of-hearing students. *Int. Rev. Res. Open Distance Learn.* **2011**, *12*, 1–19. [\[CrossRef\]](#)
58. Sahibzada, U.F.; Jianfeng, C.; Latif, K.F.; Shafait, Z.; Sahibzada, H.F. Interpreting the impact of knowledge management processes on organizational performance in Chinese higher education: Mediating role of knowledge worker productivity. *Stud. High. Educ.* **2020**, *33*, 1–18. [\[CrossRef\]](#)
59. Marttila, E.; Koivula, A.; Räsänen, P. Does excessive social media use decrease subjective well-being? A longitudinal analysis of the relationship between problematic use, loneliness and life satisfaction. *Telemat. Inform.* **2021**, *59*, 101556. [\[CrossRef\]](#)
60. Chou, S.W. Understanding relational virtual community members' satisfaction from a social learning perspective. *J. Knowl. Manag.* **2020**, *24*, 1425–1443. [\[CrossRef\]](#)
61. Greenhow, C.; Galvin, S. Teaching with social media: Evidence-based strategies for making remote higher education less remote. *Inf. Learn. Sci.* **2020**, *121*, 513–524. [\[CrossRef\]](#)
62. Davis, F.D.; Bagozzi, R.P.; Warshaw, P.R. User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Manag. Sci.* **1989**, *35*, 982–1003. [\[CrossRef\]](#)
63. Kim, W.G.; Park, S.A. Social media review rating versus traditional customer satisfaction: Which one has more incremental predictive power in explaining hotel performance? *Int. J. Contemp. Hosp. Manag.* **2017**, *29*, 784–802. [\[CrossRef\]](#)
64. Hamilton, M.; Kaltcheva, V.D.; Rohm, A.J. Social Media and Value Creation: The Role of Interaction Satisfaction and Interaction Immersion. *J. Interact. Mark.* **2016**, *36*, 121–133. [\[CrossRef\]](#)
65. Alawamleh, M.; Al-Twait, L.M.; Al-Saht, G.R. The effect of online learning on communication between instructors and students during COVID-19 pandemic. *Asian Educ. Dev. Stud.* **2022**, *11*, 380–400. [\[CrossRef\]](#)
66. Lepp, A.; Barkley, J.E.; Karpinski, A.C. The relationship between cell phone use and academic performance in a sample of U.S. college students. *SAGE Open* **2015**, *5*, 2158244015573169. [\[CrossRef\]](#)
67. Alamri, M.M.; Almaiah, M.A.; Al-Rahmi, W.M. The Role of Compatibility and Task-Technology Fit (TTF): On Social Networking Applications (SNAs) Usage as Sustainability in Higher Education. *IEEE Access* **2020**, *8*, 161668–161681. [\[CrossRef\]](#)
68. Abdullahi, Y.Y.; Musa, M.M.; Abubakar, I.B.; Yusif, N.D. The Impact of Social Media on Academic Performance among Undergraduate Students of Bayero University, Kano. *Asian J. Multidimens. Res.* **2019**, *8*, 54.
69. Lottering, R.A. Using social media to enhance student engagement and quality. *S. Afr. J. High. Educ.* **2020**, *35*, 109–121. [\[CrossRef\]](#)
70. Lin, X.; Kishore, R. Social media-enabled healthcare: A conceptual model of social media affordances, online social support, and health behaviors and outcomes. *Technol. Forecast. Soc. Chang.* **2021**, *166*, 120574. [\[CrossRef\]](#)
71. Madge, C.; Breines, M.R.; Dalu, M.T.B.; Gunter, A.; Mittelmeier, J.; Prinsloo, P.; Raghuram, P. WhatsApp use among African international distance education (IDE) students: Transferring, translating and transforming educational experiences. *Learn. Media Technol.* **2019**, *44*, 267–282. [\[CrossRef\]](#)
72. Hair, J.F.; Gabriel, M.; Patel, V. AMOS covariance-based structural equation modeling (CB-SEM): Guidelines on its application as a marketing research tool. *Braz. J. Mark.* **2014**, *13*, 43–45.
73. Krejcie, R.V.; Morgan, D.W. Determining Sample Size for Research Activities. *Educ. Psychol. Meas.* **1970**, *30*, 607–610. [\[CrossRef\]](#)
74. Cooper, D.; Schindler, P.; Sun, J. *Business Research Methods*; McGraw-Hill: New York, NY, USA, 2006.
75. Al-Rahmi, W.M.; Yahaya, N.; Alamri, M.M.; Alyoussef, I.Y.; Al-Rahmi, A.M.; Kamin, Y. Bin Integrating innovation diffusion theory with technology acceptance model: Supporting students' attitude towards using a massive open online courses (MOOCs) systems. *Interact. Learn. Environ.* **2021**, *29*, 1380–1392. [\[CrossRef\]](#)

76. AAl-Rahmi, W.M.; Yahaya, N.; Aldraiweesh, A.A.; Alturki, U.; Alamri, M.M.; Bin Saud, M.S.; Bin Kamin, Y.; Aljeraiwi, A.A.; Alhamed, O.A. Big Data Adoption and Knowledge Management Sharing: An Empirical Investigation on Their Adoption and Sustainability as a Purpose of Education. *IEEE Access* **2019**, *7*, 47245–47258. [[CrossRef](#)]
77. Al-Rahmi, W.M.; Alzahrani, A.I.; Yahaya, N.; Alalwan, N.; Kamin, Y. Bin Digital communication: Information and communication technology (ICT) usage for education sustainability. *Sustainability* **2020**, *12*, 5052. [[CrossRef](#)]
78. Jahan, S.; Ali, S.A.; Hussaini, T. Impact of Internet Usage on the Academic Performance of Undergraduate Students in Karachi. *Univers. J. Educ. Res.* **2021**, *9*, 579–585. [[CrossRef](#)]
79. Al-Rahmi, W.; Yahaya, N.; Alamri, M.; Aljarboa, N.A.; Kamin, Y.; Moafa, F.A. A Model of Factors Affecting Cyber Bullying Behaviors Among University Students. *IEEE Access* **2018**, *7*, 2978–2985. [[CrossRef](#)]
80. Stevens, V. Modeling Social Media in Groups, Communities, and Networks. *Electron. J. Engl. Second. Lang. Model.* **2009**, *13*, 1–16.
81. Raut, V.; Patil, P. Patil Prafulla Use of Social Media in Education: Positive and Negative impact on the students. *Int. J. Recent Innov. Trends Comput. Commun.* **2016**, *4*, 281–285.
82. Bouton, E.; Tal, S.B.; Asterhan, C.S.C. Students, social network technology and learning in higher education: Visions of collaborative knowledge construction vs. the reality of knowledge sharing. *Internet High. Educ.* **2021**, *49*, 100787. [[CrossRef](#)]
83. Al-rahmi, A.M.; Al-rahmi, W.M.; Alturki, U.; Aldraiweesh, A.; Almutairy, S.; Al-adwan, A.S. Exploring the factors affecting mobile learning for sustainability in higher education. *Sustainability* **2021**, *13*, 7893. [[CrossRef](#)]
84. Al-Rahmi, A.M.; Shamsuddin, A.; Alturki, U.; Aldraiweesh, A.; Yusof, F.M.; Al-Rahmi, W.M.; Aljeraiwi, A.A. The influence of information system success and technology acceptance model on social media factors in education. *Sustainability* **2021**, *13*, 7770. [[CrossRef](#)]
85. Bond, M. Facilitating student engagement through the flipped learning approach in K-12: A systematic review. *Comput. Educ.* **2020**, *151*, 103819. [[CrossRef](#)]
86. Sokhulu, L.H. Students' experiences of using digital technologies to address their personal research needs during the COVID-19 lockdown. *Afr. Identities* **2021**, *19*, 436–452. [[CrossRef](#)]
87. Makumane, M.A. Students' perceptions on the use of LMS at a Lesotho university amidst the COVID-19 pandemic. *Afr. Identities* **2021**, 1–18. [[CrossRef](#)]
88. Khoza, S.B.; Mpungose, C.B. Digitalised curriculum to the rescue of a higher education institution. *Afr. Identities* **2020**, 1–21. [[CrossRef](#)]