Information Management and Business Review (ISSN 2220-3796)
Vol. 16, No. 2, pp. 260-275, SI(2) 2024

The Mediating Role of Social Media Usage as a Learning Tool on Students' Academic Performance: A Structural Equation Modelling (SEM-AMOS) Approach

Siti Hasma Hajar Binti Mat Zin[1]*, Siti Haslini Binti Zakaria[2], Nor Hidayah Binti Hassim[1], Rumaizah Binti Che Md Nor[3], Suhanah Binti Rosnan[4] and CT Munirah Niesha Binti Mohd Shafee[1]
[1]School of Computing and Mathematics, College of Computing, Informatics and Mathematics, Universiti Teknologi Mara, Johor Branch, Segamat Campus, Johor, Malaysia
[2] School of Computing and Mathematics, College of Computing, Informatics and Mathematics, Universiti Teknologi Mara, Kelantan Branch, Machang Campus, Kelantan, Malaysia
[3]School of Computing and Mathematics, College of Computing, Informatics and Mathematics, Universiti Teknologi Mara, Sarawak Branch, Samarahan Campus, Sarawak, Malaysia
[4]School of Computing and Mathematics, College of Computing, Informatics and Mathematics, Universiti Teknologi Mara, Melaka Branch, Jasin Campus, Melaka, Malaysia
*hasmahajar@uitm.edu.my

Abstract: Social media is used in many aspects of modern life. Lately, higher education has also expanded its focus to include globalized online learning using social media. Educational establishments have acknowledged that social media gives students a chance to interact with teachers, other students, and higher authorities. However, there is little information available on it in educational settings, especially in the classroom. Only a small number of studies in Malaysia have specifically examined social media, even though many studies have looked at how social media influences the academic performance of university students. Therefore, we conducted this quantitative study to determine whether social media usage mediates the relationship between educational variables and academic performance among students enrolled in Malaysian public higher education institutions. We conducted a cross-sectional study at UiTM Segamat, involving 388 respondents. The findings demonstrate that social media usage mediates the relationship between students' performance and perceived usefulness, perceived enhanced communication, and resource sharing. Social media use does not mediate perceived ease of use, collaborative learning, or perceived enjoyment of students' performance. To use social media as a teaching tool, particularly in higher education institutions, the research findings bring new knowledge to the field. The higher education community may share knowledge anytime and anywhere. This platform allows educators and students to interact with one another after learning sessions, which will help the student succeed academically.

Keywords: *Social media, student performance, learning tool, mediation*

1. Introduction and Background

Social media platforms have become common in many aspects of life in our global society. According to Selwyn (2012), a social media application enables users to categorize, identify, and recommend previously created information in addition to producing, editing, and sharing original textual, visual, and audio content. Nawir, Herman, & Bo'do (2024) asserted that social media has evolved into a crucial tool for exchanging ideas and knowledge, as well as for fostering interpersonal connections; in particular, interaction now forms a fundamental aspect of social media, rather than merely a byproduct of the platform. People now rely more on sites like Facebook, Instagram, Twitter, WhatsApp, Telegram, and TikTok for social networking, entertainment, and information gathering because of social media's explosive expansion in recent years. Lately, higher education has also expanded its focus to include globalized online learning. Social media is one of the most significant online resources for connecting individuals and encouraging the sharing and receiving of knowledge. Social media is an internet platform where people can communicate and share knowledge. It also refers to a platform where teachers and students can share text, visual, and audio content for teaching and learning activities.

Higher education institutions, including universities, have realized that social media gives students a platform to interact with teachers, other students, and the administration. As stated by Ilakkuvan, Johnson, Villanti, Evans, & Turner (2019) young adults use social media for more than three hours a day on average. Simultaneously, advancements in technology have brought about a significant transformation in the

educational experience of university students, as these technologies have facilitated easier communication and teamwork (Lavidas, Papadakis, Manesis, Grigoriadou, & Gialamas, 2022, Tülübaş, Karakose, & Papadakis, 2023). Students also use social media platforms for a variety of purposes, including information access, group discussions, resource sharing, and enjoyment. This sparked a discussion about their use, as well as the potential short- and long-term benefits and drawbacks. Numerous studies have shown that students' use of social media can have both positive and negative effects. According to Kolhar, Kazi, & Alameen (2021), 97% of the students' use of social media was addictive; 57% were addicted to it; and only 1% used it for learning. This gives an idea of the vast volume of social media usage and its effects on college students. Other research has also examined various aspects of social media use and its impact on college students. A nationwide study (Shensa, et al., 2017) linked high social media use to depression. Another study (Martin, 2017) found that almost half of university students in Malaysia stated that their preferred educational experience was an always-on learning environment that gave them access to learning materials from any location and on any device. Furthermore, another survey found that social media has evolved into an opportunity for less formal, two-way contact between students, potential students, teachers, and institutions. Teachers utilize these tools to establish professional learning communities and disseminate captivating content about the subjects their students are learning in class (Parr, 2014).

Researchers have conducted numerous studies to investigate the impact of students' social media usage on their academic performance. Social media has an impact on academic life for students in higher education, according to a survey by Hill, et al., (2024). According to Boateng & Amankwaa (2016), students in higher education frequently use social media, and those who responded to the study felt that social media had a significant impact on how their academic lives developed. This demonstrates how important and necessary social media use is to students' academic success today. Chowdhury (2024) shows that social media plays a crucial role in fostering communication, information sharing, and content creation among university students in Bangladesh. Although social media is becoming more and more important, research on its actual effects on learning is lacking, and social media use in higher education is still in the early stages. There are few publications about the use of social networking sites in learning environments, especially in the classroom. Only a few studies have specifically examined social media usage in Malaysia, even though numerous studies have looked at how social media affects university students' academic performance. We do not fully understand the extent to which social media acts as a mediator in influencing students' academic achievement. It is essential to consider the possible effects of social media on student academic performance. Therefore, we conducted this quantitative study to examine the mediating effects of social media usage on the relationships between educational variables and academic performance among students enrolled in public higher education institutions.

2. Literature Review

Student Academic Performance

Nowadays, social media use significantly impacts daily life, particularly for university students, who frequently use it as a learning tool to enhance their academic performance. The grade point average (GPA) can theoretically serve as an indicator to measure academic performance. GPA is defined as a measurement of academic achievement and the accomplishment of pedagogical objectives (Alghamdi, Karpinski, Lepp, & Barkley, 2020). Mehra, Gupta, & Avikal (2023) evaluate academic performance using scores, grades, marks, and CGPA from both curricular and extracurricular activities. Meanwhile, Kumar, Agarwal, & Agarwal (2021) propose that academic performance encompasses learning new information, developing abilities and skills, achieving excellent grades, advancing in a professional career, and demonstrating a desire and commitment to further education.

Numerous studies have examined the variables affecting students' academic achievement. Affuso, et al. (2023) found a positive association between student academic achievement and parental supervision and educator assistance. However, interactions with Internet use, perceived stress, and a poor diet seem to hurt academic performance (Maniaci, et al., 2023). Many studies have indicated that, due to COVID-19, only online learning readiness has a significant association with academic performance among college or university students (Wang, Xia, Guo, Xu, & Zhao, 2023). Students' cognitive engagement and academic performance are highly affected by their attitude, motivation, self-efficacy, and technological use (Aguilera-Hermida, 2020).

Social Media Usage

Technology has helped to create flexible educational possibilities that allow students to learn remotely through many platforms, such as social (Alghamdi, Karpinski, Lepp, & Barkley, 2020). Bonsaksen, et al., (2023) specifically, measure social media use by the amount of time students spend on it within a given time frame. The average social media use is considered to be less than 3 hours per day (Bruggeman, Van Hiel, Van Hal, & Van Dongen, 2019).(Course-Choi & Hammond (2021) define social media usage as the use of online community-building platforms for communication, information and data exchange, and amusement with both friends and strangers.

The relationship between social media use and academic achievement is a topic of significant debate. According to a study by Zhao (2023), university students who use social media excessively run the risk of developing a social media addiction and seeing a decline in their academic performance. Yao & Wang (2023) reported similar results, stating that excessive smartphone use and information overload are positively connected with technostress. Technostress, in turn, influences bad sleep quality and the perception of one's academic achievement. However, (Sabah (2023) found that social media use and education enhance learning, raise students' satisfaction with their education, and improve students' judgments of their performance. In addition, Alneyadi, Wardat, Alshannag, & Abu-Al-Aish (2023) recommended that smart applications such as social media can improve children's understanding of scientific concepts; thus, parents and teachers should encourage their use.

Collaborative Learning

Social media-based collaborative learning and teaching have drawn a lot of interest from educators. There are both positive and negative effects of social media-based collaborative learning and teaching on academic achievement, as shown by several studies that have investigated this issue. According to Al-Adwan, et al. (2020), an activity is a procedure in which a group of students works together to accomplish certain tasks, including problem-solving, in a more participatory setting. According to Chowdhury (2024), overusing social media negatively affects students' perceptions of their academic accomplishments by lowering academic engagement, increasing distraction, and decreasing study time. Chowdhury (2024) claimed that social media gives students a forum to express their ideas, get feedback on their work, and connect with individuals from other backgrounds, all of which help them become better communicators. Students who use social media can develop their critical thinking abilities. Engaging in online dialogues and debates helps students develop their ability to assess different points of view and formulate their ideas. Furthermore, students can share knowledge and learn from one another more readily while using social media platforms for collaborative learning because they facilitate it so well. Because the various social media platforms provide strong support for this kind of learning, students can exchange knowledge and learn more readily when using social media for collaborative learning (Al-Adwan, et al., 2020). Kumar, Agarwal, & Agarwal (2021) pointed out that the results show that student involvement and active, collaborative learning have a significant and positive link. Students' learning performance does eventually increase since they may have access to additional resources and data through group learning and involvement. The results of this study's examination of engagement and cooperation lend support to the application of constructivist theory. The findings show that incorporating social elements into group discussions enhances learning outcomes through cooperation and involvement.

Perceived Enhanced Communication

Students are using social media platforms like Facebook, Instagram, and TikTok more frequently for connection and communication. Through social media, researchers have investigated the impact of perceived improved communication on academic achievement. Salikhova, et al., (2023) claim that using social media can be bad for academic success. Additionally, they point out that excessive usage of social media can lead to distractions and make it difficult to focus when studying. Nonetheless, research by Guo, Shen, & Li (2018) suggests that using social media can enhance academic performance. Academic communities are seen to gain from communication since it facilitates prompt communication and member engagement in a collaborative learning environment, according to (Al-Adwan, et al., 2020). If users actively use social media platforms and build virtual relationships, they should be able to obtain diverse sets of information from a variety of sources.

Salikhova, et al. (2023) have discovered that social media can help with peer-to-peer cooperation and communication, making it simple for students to share resources and ideas. As a result, students may become

more motivated, engaged, and willing to share knowledge, ultimately improving their academic achievement. Overall, perceived improved communication through social media use has a wide range and complexity of consequences for academic achievement. Although Aldahdouh, Nokelainen, & Korhonen (2020) claim that excessive social media use may negatively impact students' academic performance, and other research indicates that social media use might benefit academic achievement by encouraging collaboration and communication among students.

Perceived Enjoyment

According to Alalwan, et al. (2019), perceived enjoyment is the satisfaction one feels from utilizing a certain technology that improves learning outcomes. Al-Rahmi, et al. (2022) claim that people use social media because they think it will make them happy. Sarwar, Zulfiqar, Aziz, & Ejaz Chandia (2019) define perceived enjoyment as the level of enjoyment one expects from using technology, regardless of any potential performance issues. Some users think that by using social media, they may perform and produce better work. They demonstrate their satisfaction and enjoyment by focusing on the process of using the device to complete tasks.

Users' enjoyment of social media directly impacts their academic achievement. When students find social media use in the classroom enjoyable, their behavioral intention to use it completely is shown to increase (Alalwan, et al., 2019). Social media use has a significant impact on student's performance since it promotes online interaction and encourages collaborative learning. Perceived enjoyment exhibits a major impact with social media because it is so user-friendly for creating communities and sharing resources (Sarwar, Zulfiqar, Aziz, & Ejaz Chandia, 2019). Social media makes it easy for students to share knowledge, trade information, and have discussions, so they are willing to use it for learning.

Perceived Ease of Use and Perceived Usefulness

Perceived usefulness is a belief that a specific system can improve work performance, according to (Al-Rahmi, et al., 2022). The same definition is supported by Tahar, Riyadh, Sofyani, & Purnomo (2020) who also adds that the intention of the user to use electronic devices was influenced by their perceived usefulness. The concept of perceived ease of use refers to the user's perception that a system can operate without any input from them (Al-Rahmi, et al., 2022). Stated differently, a system's interest level increases with its ease of use.

There is a significant correlation between academic performance, perceived usefulness, and ease of use. The study by (Alalwan, et al., 2019) found that the number of activities that university students and researchers participate in has increased because of perceived usefulness and perceived ease of use. The study was conducted through active collaboration and communication for learning. Hence, it improves the student's learning performance. Furthermore, the ease and usefulness of social media for learning and teaching reflect teachers' and students' intentions. A study by (Ajibade & Zaidi, 2023) found that a greater value for perceived usefulness and perceived ease of use is indicative of a stronger inclination to adopt and use social media.

Recourse Sharing

Resource sharing, according to Arshad & Akram (2018) is the willingness of an individual to disseminate their thoughts and academic content to the public via any means, especially social media. Kaplan & Haenlein (2010) describe social media as a platform that encompasses various forms of media content, enabling users to view all available content from content creators. This assertion aligns with (Ganapathi, 2019) perspective. He said that people can use various social media platforms to share resources and user-generated material. Online games and social media sites such as Facebook, Twitter, and Instagram, according to (Cao, Ajjan, & Hong, 2013), serve as platforms that foster collaborative learning, information gathering, and the growth of online social and professional networks. When it comes to creating and debating content for peer learning and evaluation, students most frequently use Instagram, Pinterest, Snapchat, and WhatsApp as learning tools. These findings suggest that using social media in the classroom can be a creative and engaging way to teach and learn.

According to Khan, Ashraf, Seinen, Khan, & Laar (2021) understanding social media use during a pandemic is essential. Their research indicates that social media was important to the pandemic because it allowed students to learn better in challenging circumstances. According to AlAwadhi & Dashti (2021) the Telegram app was a useful tool for information sharing, as well as a reliable source of both textual and non-textual information. This platform has the potential to transcend time and location constraints while saving money, effort, and time.

Telegram's diverse information generates creative ideas that could enhance the efficiency of teaching methods and speed up language acquisition. However, this finding contradicts (Jumabaeva & Ismailova, 2024) findings. According to their findings, social media and user-generated content websites are becoming more and more significant for students, but not for academic reasons. Students use social media for entertainment and communication.

3. Research Methodology

Study Design and Sampling Method

This is a cross-sectional study where the data were gathered once over four weeks. The population in this consists of all students from the Segamat Campus of Universiti Teknologi Mara (UiTM), Johor Branch. This study employs convenience sampling. We employ this method since it is the most accessible. A minimum sample size according to the model's complexity was given by (Hair, Anderson, Babin, & Black, 2010).

Table 1: Model Characteristics using SEM.

Model Characteristics (Number of latent constructs and items)	Minimum Sample Required
No more than five latent constructs. Over three items are present in every construct	100
No more than seven latent constructs. There are more than three items in each construct	150
No more than seven latent constructs. A specific construct (under the identified model) contains fewer than three items	300
A large number of latent constructs. In some constructs (under the identified model), there are less than three items	500

Based on Table 1, we selected an observational minimum of 300 participants for this study. Therefore, a total of 388 respondents took part in the survey.

Research Instrument

For our investigation, we gathered primary data via an online questionnaire. We created a Google Form to gather data from the study's online survey respondents. This method was chosen for the study because it was appropriate and offered several benefits. The advantages include the ability to send the questionnaire to a large number of respondents simultaneously via email, which reduces the necessary expenditure, as well as the convenience of having busy respondents finish the questionnaire whenever it's convenient for them.

To meet the goals, we modified a series of questions from earlier studies. We used an amended version of (Al-Adwan, et al., 2020)'s survey as the questionnaire. There were three sections on the questionnaire. The first part (part A) includes five questions on demographic data, including gender, education level, faculty, course, and current CGPA. The second section, Section B, contains four questions. This section refers to the respondents' prior experience using social media and the Internet. Section C, the final part, is divided into eight sections. The instrument comprises 32 items that assess the degree of agreement among respondents on eight variables: collaborative teaching, perceived enhanced communication, perceived enjoyment, perceived ease of use, perceived usefulness, sharing of resources, usage of social media, and student performance. The interval scale matrix with pre-coded numerical scales in the responses was employed in this part to determine the extent of each respondent's perspective; a 5-point scale was selected. Strongly disagreeing receives one point, and strongly agreeing receives five points.

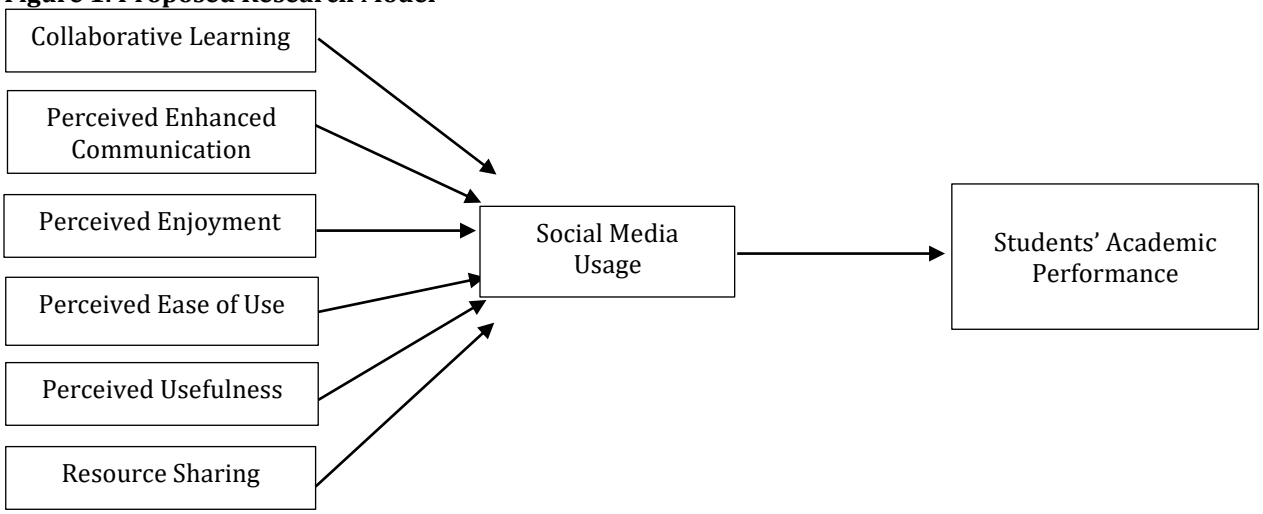
The following are the research objectives in this study:

- To determine whether social media usage mediates the relationship between perceived ease of use and student performance.
- To determine whether social media usage mediates the relationship between perceived usefulness and student performance.
- To determine whether social media usage mediates the relationship between collaborative learning and student performance.

- To determine whether social media usage mediates the relationship between perceived enhanced communication and student performance.
- To determine whether social media usage mediates the relationship between perceived enjoyment and student performance.
- To determine whether social media usage mediates the relationship between resource sharing and student performance.

Figure 1 displays the suggested research model for this study. The dependent variable is student performance (STP), and the six independent variables, which are resources (RES), collaborative learning (COL), perceived ease of use (PEOU), perceived enhanced communication (PEC), perceived enjoyment (PEE), and perceived usefulness (PU), are mediated by social media usage (SMU).

Figure 1: Proposed Research Model



Reliability Test

The study of the components and characteristics of measurement scales is known as reliability analysis. Cronbach's alpha, which is obtained from the average correlation of standardized test items, is used when assessing a test. If the items are not standardized, the average covariance between them is used. Cronbach's alpha is a correlation coefficient with a range of values from 0 to 1. This investigation employs Cronbach's alpha for multipoint-scaled items. A more accurate dependability measurement tool has coefficients that are nearly equal to 1. The lower the coefficients (around 0), the less effective the instrument is (Hair Jr, Page, & Brunsveld, 2016). According to Conroy (2015), a pilot test requires a minimum sample size of 30 respondents due to the high degree of correlation between the scale items. Consequently, 39 individuals took part in the pilot test for this study. The analysis determined the Cronbach's alpha reliability coefficients for the following domains: collaborative learning, perceived enhanced communication, perceived enjoyment, perceived ease of use, perceived usefulness, resource sharing, and student academic performance, yielding results of 0.805, 0.828, 0.710, 0.887, and 0.826, respectively. All the instruments' Cronbach's alpha ratings are good, indicating that they are useful and reliable for further study.

Method of Data Analysis

The collected data will be analyzed using SPSS software and AMOS software. Several types of analyses were used in this study, including descriptive analysis, reliability tests, tests of normality, confirmatory factor analysis (CFA), and structural equation modeling (SEM).

Descriptive Statistics

Descriptive statistics transform unprocessed data into a format that provides details on a group of variables under specific circumstances. Descriptive analysis examines the respondents' demographic profile using frequency or percentage tables, cross-tabulations, and charts. We used frequency distribution analysis to examine the demographic profile of the respondents. The following profiles will be examined: students' CGPA, faculty, course, gender, and level of education.

Normality Test

The test of normality is used to investigate whether the dependent variables are normally distributed or not. This is because all parametric tests require the variables analyzed to be normally distributed. If the absolute values of kurtosis and skewness are 2.0 or less, the data is considered normally distributed, as per (Hair, Black, & Babin, 2010). Alternatively, non-parametric analysis needs to be employed in the analysis if the variables are not normal.

Structural Equation Modelling (SEM)

Factor analysis and multiple regression analysis are combined in this test. We employ it to explore the structural relationship between latent constructs and observable variables. Evaluating the measurement model and the structural model are the two phases in the SEM process. The relationship between the response items and the underlying latent construct is demonstrated by the measurement model. Before creating the structural model, the researcher needs to evaluate the model for validity, dependability, and one-dimensionality. As per (Awang, Afthanorhan, Lim, & Zainudin, 2023), the study needs to ensure that the measurement model for every latent construct in the model is accurate, reliable, and unidimensional before proceeding with the SEM. Meanwhile, the structural model reveals the relationships between the study's constructs. The theoretical framework's hypotheses guide the assembly of the construct into a structural model. Confirmatory factor analysis (CFA) is used for validation. To be considered valid, the measurement model for the eight latent components needs to satisfy the requirements for concept validity, convergence validity, and discriminant validity. To run the CFA, there are two methods. One approach is to do the CFA process for each latent construct in the research independently. The choice of which strategy to use is left up to the individual researcher, as the second method involves running the CFA procedure for all constructs concurrently. In this study, we explore the mediating effects of social media usage on the correlations between educational variables and academic performance among students, as well as the relative strengths of all factors impacting student performance using SEM.

4. Results

Factor Analysis

Table 1: Exploratory Factor Analysis (EFA) with Factor Loading > 0.6

Constructs	No of Item	KMO	Bartlett's Test
Perceived Ease of Use	4	0.787	0.000
Perceived Usefulness	4	0.712	0.000
Collaborative Learning	4	0.788	0.000
Perceived Enhanced Communication	4	0.602	0.000
Perceived Enjoyment	4	0.757	0.000
Resources Sharing	4	0.749	0.000
Social Media Use	4	0.689	0.000
Student Performance	4	0.606	0.000

Reliability Analysis

The scale analysis used in the research for measuring is assessed using Cronbach's alpha. The internal consistency measure for each construct must be greater than or equal to 0.6. As suggested by (Sekaran & Bougie, 2016) and (Awang, Afthanorhan, Lim, & Zainudin, 2023) instruments having Cronbach's alpha values higher than 0.6 are considered reliable for use. All the instruments for perceived ease of use, perceived usefulness, collaborative learning, perceived enhanced communication, perceived enjoyment, resource sharing, social media use, and student performance are verified by the reliability analysis in Table 2, which shows that the results are highly reliable, with all the instruments scoring more than 0.7.

Table 2: Assessment of Reliability for All Construct

Constructs	No of Item	Cronbach's Alpha
Perceived Ease of Use	4	0.887
Perceived Usefulness	4	0.826
Collaborative Learning	4	0.805

Perceived Enhanced Communication	4	0.828
Perceived Enjoyment	4	0.811
Resources Sharing	4	0.900
Social Media Use	4	0.758
Student Performance	4	0.803

Normality Assessment

The normality of data is accessed and shown in Table 3.

Table 3: Normality Test

Constructs	No of Item	Cronbach's Alpha
Perceived Ease of Use	4	0.887
Perceived Usefulness	4	0.826
Collaborative Learning	4	0.805
Perceived Enhanced Communication	4	0.828
Perceived Enjoyment	4	0.811
Resources Sharing	4	0.900
Social Media Use	4	0.758
Student Performance	4	0.803

Measurement Model

Confirmatory factor analysis is used to analyze a measurement model that incorporates all the constructs. In this part, all the items of the measurement model with a factor loading greater than 0.6 will remain in the model, while the items that failed to fulfill the requirement will drop from the measurement model, as shown in Figure 1. Table 4 shows that, following the suggestions of (Awang, Afthanorhan, Lim, & Zainudin, 2023), the fitness indices satisfy the requirements for validity for each construct after eliminating one item (COL1) with a factor loading value less than 0.6 (COL1 = 0.53).

Figure 1: Pooled CFA for Measurement Model of All Constructs

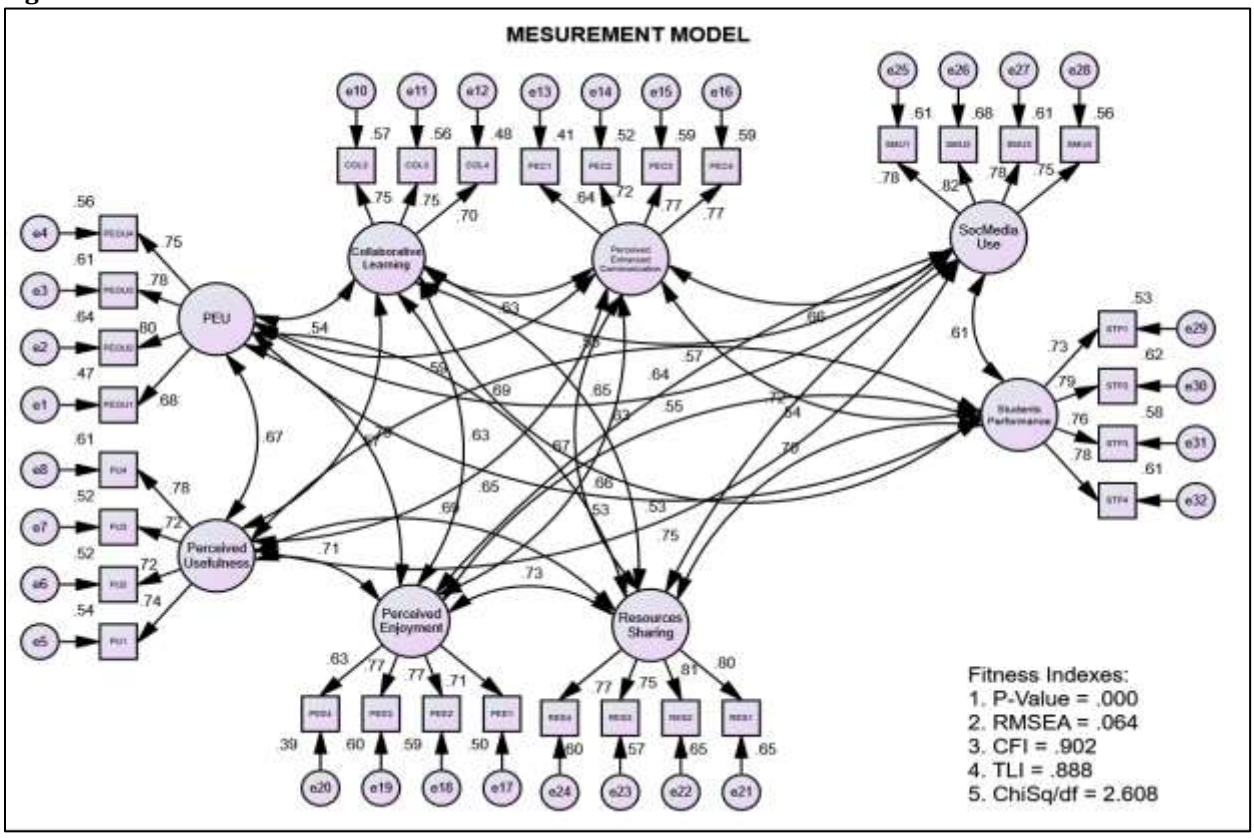


Table 4: Evaluation of Fitness Indexes for the Measurement Model in Figure 1

Name of Category	Index	Index Value	Interpretation
Absolute Fit	RMSEA	0.064	The level of requirements is met
Incremental Fit	CFI	0.902	The level of requirements is met
Parsimonious Fit	Chisq/df	2.608	The level of requirements is met

According to Tables 5 and 6, the measuring model has strong discriminant and convergent validity. The results show that the measurement model satisfies the CFA's validity and reliability requirements:

- Every item's factor loading exceeds 0.6, indicating its significance and relevance to the corresponding structures.
- All constructs have average variance extracted (AVE) values greater than 0.5, meeting the required level.
- The constructs exhibiting a composite reliability (CR) over 0.7 prove the dependability and internal consistency of each construct's elements.

These findings suggest that the measuring model's validity and reliability are higher. The items and constructs have been precisely defined and quantified (Hair, Black, & Babin, 2010).

Table 5: Composite Reliability and Convergent Validity

Construct	Item	Factor Loading	CR	AVE
Perceived Ease of Use	PEOU1	0.700		
	PEOU2	0.803	0.875	0.637
	PEOU3	0.880		
	PEOU4	0.800		
Perceived Usefulness	PU1	0.736		
	PU2	0.718	0.828	0.547
	PU3	0.718		
	PU4	0.783		
Collaborative Learning	COL2	0.754		
	COL3	0.749	0.777	0.538
	COL4	0.696		
Perceived Enhanced Communication	PEC1	0.639		
	PEC2	0.724	0.816	0.527
	PEC3	0.766		
	PEC4	0.766		
Perceived Enjoyment	PEE1	0.710		
	PEE2	0.800	0.820	0.535
	PEE3	0.773		
	PEE4	0.630		
Resources Sharing	RES1	0.804		
	RES2	0.807	0.865	0.615
	RES3	0.753		
	RES4	0.772		
Social Media Use	SMU1	0.784		
	SMU2	0.823	0.864	0.615
	SMU3	0.778		
	SMU4	0.749		
Students Performance	STP1	0.726		
	STP2	0.787	0.849	0.584
	STP3	0.764		
	STP4	0.779		

Table 6: Discriminant Validity Index

Construct	PEOU	PU	COL	PEC	PEE	RES	SMU	STP
Perceived Ease of Use	**0.798**							
Perceived Usefulness	0.670	**0.740**						
Collaborative Learning	0.540	0.570	**0.733**					
Perceived Enhanced Communication	0.590	0.650	0.630	**0.730**				
Perceived Enjoyment	0.790	0.710	0.630	0.660	**0.731**			
Resources Sharing	0.690	0.690	0.650	0.670	0.730	**0.784**		
Social Media Use	0.630	0.640	0.570	0.660	0.640	0.720	**0.784**	
Students Performance	0.530	0.550	0.530	0.54	0.550	0.700	0.610	**0.764**

Structural Model

Once the measurement model's validity and reliability have been established, the study's research hypothesis is tested using a structural model. Figure 2 displays the path coefficient that links each exogenous construct to the endogenous construct. In this study, the relationship between exogenous and endogenous constructs is mediated by just three hypotheses, whereas the remaining three hypotheses are not supported by the findings of the hypothesis testing, as summarized in Table 7.

Figure 2: Structural Model of Students' Performance

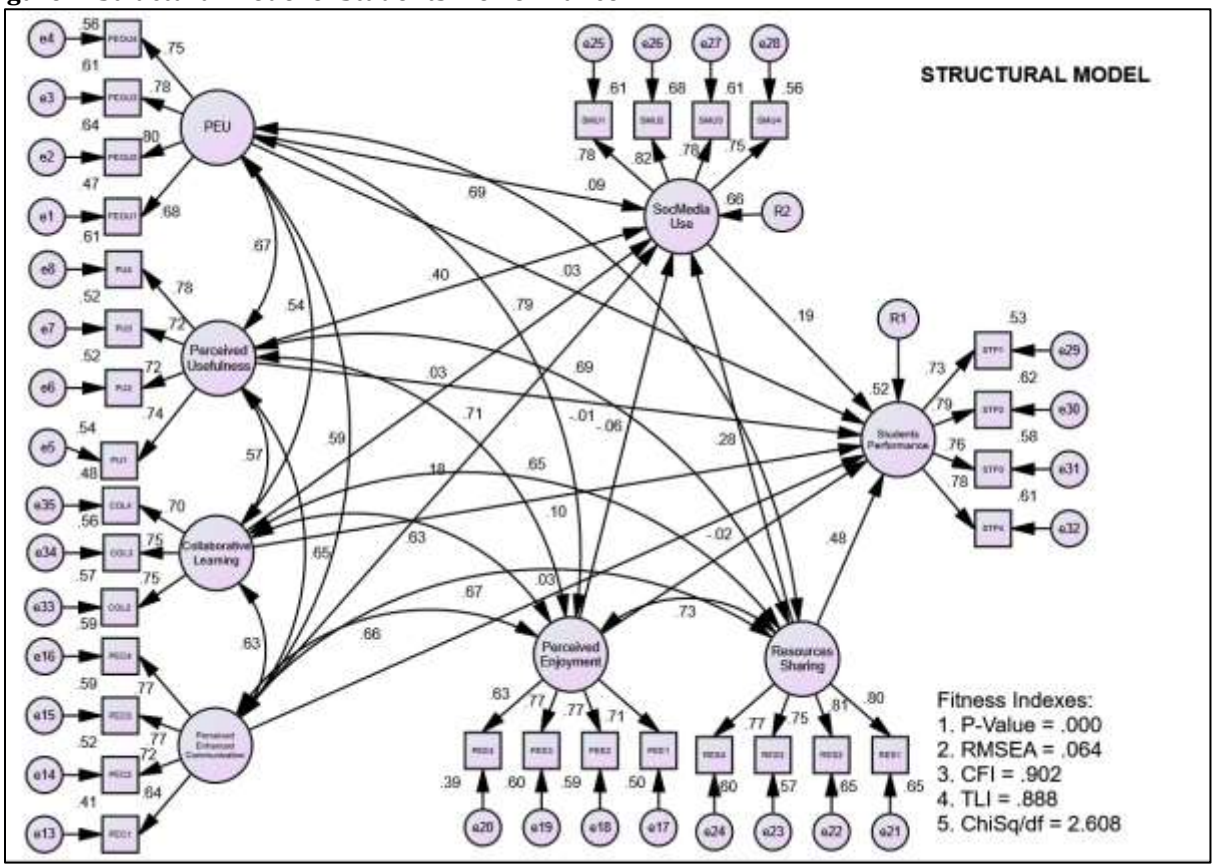


Table 7: Structural Path Coefficients for Students' Performance

Variable	Path	Variable	B	P-value	Result
Perceived Ease of Use	➔	Students Performance	0.034	0.745	**Not Significant**
Perceived Ease of Use	➔	Social Media Use	0.117	0.308	**Not Significant**
Social Media Use	➔	Students Performance	0.154	0.045	**Significant**
Conclusion:	1. Indirect effects (PEU to SMU) are not significant while indirect effects (SMU to SP) are significant. 2. The direct effect (PEU to SP) is not significant. 3. Thus, there is no mediation effect in this relationship.				
Perceived Usefulness	➔	Students Performance	-0.007	0.939	**Not Significant**
Perceived Usefulness	➔	Social Media Use	0.456	0.000	**Significant**
Social Media Use	➔	Students Performance	0.154	0.045	**Significant**
Conclusion:	1. Both indirect effects (PU to SMU and SMU to SP) are significant. 2. The direct effect (PU to SP) is not significant. 3. Thus, the type of mediation is full mediation.				
Collaborative Learning	➔	Students Performance	0.080	0.218	**Not Significant**
Collaborative Learning	➔	Social Media Use	0.034	0.629	**Not Significant**
Social Media Use	➔	Students Performance	0.154	0.045	**Significant**
Conclusion:	1. Indirect effects (CL to SMU) are not significant while indirect effect (SMU to SP) is significant. 2. The direct effect (CL to SP) is not significant. 3. Thus, there is no mediation effect in this relationship.				
Perceived Enhance Communication	➔	Students Performance	0.032	0.712	**Not Significant**
Perceived Enhance Communication	➔	Social Media Use	0.231	0.013	**Significant**
Social Media Use	➔	Students Performance	0.154	0.045	**Significant**
Conclusion:	1. Both indirect effects (PEC to SMU and SMU to SP) are significant. 2. The direct effect (PEC to SP) is not significant. 3. Thus, the type of mediation is full mediation.				
Perceived Enjoyment	➔	Students Performance	-0.021	0.846	**Not Significant**
Perceived Enjoyment	➔	Social Media Use	-0.068	0.553	**Not Significant**
Social Media Use	➔	Students Performance	0.154	0.045	**Significant**
Conclusion:	1. Indirect effects (PE to SMU) are not significant while indirect effect (SMU to SP) is significant. 2. The direct effect (PE to SP) is not significant. 3. Thus, there is no mediation effect in this relationship.				
Resources Sharing	➔	Students Performance	0.408	0.000	**Significant**
Resources Sharing	➔	Social Media Use	0.298	0.000	**Significant**
Social Media Use	➔	Students Performance	0.154	0.045	**Significant**
Conclusion:	1. Both indirect effects (RS to SMU and SMU to SP) are significant. 2. The direct effect (RS to SP) is significant. 3. Thus, the type of mediation is partial mediation.				

The findings of this research showed that social media use significantly mediates the relationship between perceived usefulness and students' performance and perceived enhanced communication with students' performance. While social media uses only significantly partially mediate the relationship between resource sharing and students' performance. Meanwhile, another three variables which are perceived ease of use, collaborative learning, and perceived enjoyment, are not mediated by social media use for students' performance.

Therefore, the results of the findings show that social media use mediates the relationship between only three variables, which are perceived usefulness, perceived enhanced communication, and resource sharing, on students' performance.

Discussion

In this study, social media usage mediates the relationship between perceived usefulness and students' performance. The ease of usage of social media in the classroom primarily justifies its encouragement, as it positively impacts students' performance. Moreover, a technical system's perceived ease of use is related to how conveniently it can display and provide information. In other words, e-learning systems are more convenient and practical for students to use when they feel more at ease with them. These findings are consistent with those of (Arshad & Akram, 2018) and (Rahman, Ramakrishnan, & Ngamassi, 2020). When students think social media is easy to use and useful for their education, they are more inclined to include it in their studies. (Almaiah, Al-Lozi, Al-Khasawneh, Shishakly, & Nachouki, 2021) found that students view online learning platforms as useful when they find that they enhance their performance and achievement by increasing their overall learning productivity. Learning materials need to be created more creatively in the current era of technological development and advancement so that students can easily access, use, and understand them (Sukendro, et al., 2020). Furthermore, (Tahar, Riyadh, Sofyani, & Purnomo, 2020) claimed that when people believe that using technology would improve the quality of their work, this is known as perceived usefulness. Thus, people are more eager to use an e-learning platform that they find more valuable. University students enhance their learning performance and usefulness once they have access to virtual learning portals that support their overall learning productivity. To improve student satisfaction, online learning platforms must be easy to use and typically involve attempts to engage students in an intuitive way (Nuryakin, Rakotoarizaka, & Musa, 2023).

The results of this study also showed that there is a relationship between students' performance and perceived improved communication that is mediated by social media use. According to the students who participated in this survey, social media communication is significant and can increase output as well as academic success. Perceptions of enhanced communication, including sharing, cooperation, and involvement, significantly influence students' intentions to use social media in higher education. It has been found that social media use enhances people's abilities for creativity, communication, online learning, and resource access, all of which influence students' academic achievement. Students are more involved and engaged with their instructors and peers because they have access to a wider range of learning resources and communication channels. (Sarwar, Zulfiqar, Aziz, & Ejaz Chandia, 2019) agree with this. Sharing educational materials on social media platforms increases students' online access because they are readily available and cost-free. This increases students' engagement and connection with educators and other students by giving them access to a greater variety of learning tools and communication channels. According to (Conradie, Lombard, & Moller, 2013), students regularly use their mobile devices for communication, engagement, sending new content, and receiving notifications when teachers or other students interact with the course materials. Furthermore, (Malik, Ahmad, Kamran, Aliza, & Elahi, 2020) agreed that students can share their work and accomplishments on social media platforms, inspiring others to be creative and perform well academically. They also claim that social media provides a wide range of benefits that can improve students' creativity, general academic performance, and motivation to learn.

Besides that, this study shows that social media usage mediates the relationship between resource sharing and student performance. Resource sharing can be categorized into two constructs, which are material sharing and knowledge sharing. Nowadays, social media platforms are being extensively used to create networks of people who share knowledge, bringing people together who have similar interests, and encouraging idea sharing. These results were consistent with (Haque, et al., 2023) and (Ali-Hassan, H., & Wade, 2015). The findings supported the theory that academic achievement for students is favorably correlated with the social value of knowledge sharing in social media-related factors. The usefulness of information obtained over the internet is what defines its worth, particularly if it aids in the user's skill and ability development by solving difficulties (Zhang, Li, Wu, & Li, 2017). Another study by (Maqableh, Jaradat, & Azzam, 2021) showed that knowledge has a beneficial and significant effect on students' academic performance. Social media will develop into a useful teaching and learning resource in higher education. Through document sharing, student participation, and knowledge expansion, this medium fosters knowledge exchange. (Eid & Al-Jabri, 2016) asserted a positive

correlation between information sharing, file sharing, and offline and online interactions. Their study indicates that students frequently share educational content, such as lecture notes, homework assignments, project papers, and instructional videos, on social media platforms. Dropbox, WhatsApp, and YouTube are commonly used for document sharing. The students often use electronic devices for learning and resource sharing (Muca, et al., 2022). As reported by (Sivakumar, Jayasingh, & Shaik, 2023), social media can improve student motivation and performance by encouraging knowledge sharing, encouraging student involvement, and acting as a useful tool for information transmission.

Meanwhile, no mediation effect of social media usage exists between perceived ease of use and student performance. (Liu, Zaigham, Rashid, & Bilal, 2022) agreed. Their research indicates that perceived ease of use does not significantly impact the effectiveness of social media collaborative learning. The fact that students use social media mostly for information and communication could be one reason for this rejection. Aside from that, perceived enjoyment is not mediated by social media use for students' performance. Students might experience many of the same negative impacts that professionals face at work when using social media in the classroom. Cengage Learning (2014) found that 59% of students employ social media in the classroom. (Brooks, 2015) found a negative correlation between students' performance and social media entertainment, potentially causing people to suffer if they react to these disruptions or diversions. Additionally, this study showed that there is no mediating influence between social media use and student performance or collaborative learning. This rejection is because the students in this study were less experienced in collaborative learning. Many students actively dislike dealing with the issues that arise from working in groups and instead prefer to work alone.

5. Managerial Implications and Recommendations

The use of social media has become an essential part of modern life. It is one of the best marketing tools, in addition to being a communication tool. Nowadays, teachers are finding new ways to communicate with parents, students, and other parties on social media. Using social media to establish ties with students all over the world is a fantastic idea. It offers the opportunity to teach information and experience to students in a way that best suits their needs. Additionally, because of social media, students may gain experience with remote collaboration. In today's increasingly digital world, students need to be able to work independently and swiftly adjust to new situations. While there are numerous considerations to make before integrating social media into the classroom, we are certain that doing so will support students' development of increasingly complex technology skills. This study's focus on students at a single public institution in Segamat, Johor, restricts its broad applicability to other contexts. Therefore, additional demographic groupings, such as employees or students from different universities, can be the subject of future research. This study solely concentrated on the factors that act as mediators between two variables. Thus, future research can investigate the factors in social media usage that influence students' academic performance.

Conclusion

We conducted this study to examine the mediating effects of social media usage on the relationships between educational variables and academic performance among students enrolled in public higher education institutions. The researchers conclude that social media usage mediates the relationship between perceived usefulness, perceived enhanced communication, resource sharing, and student performance at UiTM Segamat. Meanwhile, social media use does not act as a mediating factor between students' performance and perceived ease of use, collaborative learning, or enjoyment. To use social media as a teaching tool, especially in higher education institutions, the study's findings contribute new knowledge to the field. The higher education community may share knowledge anytime and anywhere. After learning sessions, educators and students can engage with one another using this platform, which will help the student improve their academic performance more successfully. For students who need to improve their grades and academic performance, this study can help teachers advise their students on how to use the Internet properly for academic objectives. Besides that, this study will be helpful to the government since it wants to make sure that every youthful generation can adopt new technology as it spreads swiftly throughout the world. If people can adapt to technology, it will help improve the nation's economy.

Acknowledgment: The authors express their thanks to the Research Ethics Committee (REC) of Universiti Teknologi MARA (UiTM) for allowing the study. The ethics approval code for this study is REC/11/2023 (ST/MR/282). Thank you to all participating students for their invaluable responses.

References

Affuso, G., Zannone, A., Esposito, C., Pannone, M., Miranda, M. C., De Angelis, G., . . . Bacchini, D. (2023). The effects of teacher support, parental monitoring, motivation and self-efficacy on academic performance over time. *European Journal of Psychology of Education,, 38*(1), 1-23.

Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to COVID-19. *International Journal of Educational Research Open, 1*, 100011.

Ajibade, S., & Zaidi, A. (2023). Technological acceptance model for social media networking in e-learning in higher educational institutes. *International Journal of Information and Education Technology, 13*(2).

Al-Adwan, A. S., Albelbisi, N. A., Aladwan, S. H., Horani, O., Al-Madadha, A., & Al Khasawneh, M. H. (2020). Investigating the impact of social media use on student's perception of academic performance in higher education: evidence from Jordan. *Journal of Information Technology Education: Research, 19*, 953-975.

Alalwan, N., Al-Rahmi, W. M., Alfarraj, O., Alzahrani, A., Yahaya, N., & Al-Rahmi, A. M. (2019). Integrated three theories to develop a model of factors affecting students' academic performance in higher education. *IEEE Access, 7*, 98725-98742.

AlAwadhi, S., & Dashti, M. (2021). The Use of the Telegram Application as an Information-Sharing Tool. *Journal of Information & Knowledge Management, 20*(2), 2150024.

Aldahdouh, T. Z., Nokelainen, P., & Korhonen, V. (2020). Technology and social media usage in higher education: The influence of individual innovativeness. *Sage Open, 10*(1), 2158244019899441.

Alghamdi, A., Karpinski, A. C., Lepp, A., & Barkley, J. (2020). Online and face-to-face classroom multitasking and academic performance: Moderated mediation with self-efficacy for self-regulated learning and gender. *Computers in Human Behavior, 102*, 214-222.

Ali-Hassan, H., N. D., & Wade, M. (2015). Linking dimensions of social media use to job performance: The role of social capital. *The Journal of Strategic Information Systems, 24*(2), 65-89.

Almaiah, M. A., Al-Lozi, E. M., Al-Khasawneh, A., Shishakly, R., & Nachouki, M. (2021). Factors affecting students' acceptance of mobile learning applications in higher education during COVID-19 using ann-sem modeling technique. *Electronics, 10*(24), 3121.

Alneyadi, S., Wardat, Y., Alshannag, Q., & Abu-Al-Aish, A. (2023). The effect of using smart e-learning app on the academic achievement of eighth-grade students. *Journal of Mathematics, Science and Technology Education, 19*(4), em2248.

Al-Rahmi, A. M., Shamsuddin, A., Wahab, E., Al-Rahmi, W. M., Alismaiel, O. A., & Crawford, J. (2022). Social media usage and acceptance in higher education: A structural equation model. *In Frontiers in Education, 7*.

Al-Rahmi, W. M., Yahaya, N., Alturki, U., Alrobai, A., Aldraiweesh, A. A., Omar Alsayed, A., & Kamin, Y. B. (2022). Social media–based collaborative learning: The effect on learning success with the moderating role of cyberstalking and cyberbullying. *Interactive Learning Environments, 30*(8), 1434-1447.

Arshad, M., & Akram, M. S. (2018). Social media adoption by the academic community: Theoretical insights and empirical evidence from developing countries. *International Review of Research in Open and Distributed Learning, 19*(3).

Awang, Z., Afthanorhan, W. M., Lim, S. H., & Zainudin, N. F. (2023). *SEM Made Simple 2.0 A Gentle Approach of Structural Equation Modelling.* Gong Badak: Penerbit Unisza.

Boateng, R., & Amankwaa, A. (2016). The impact of social media on student academic life in higher education. *Global Journal of Human-Social Science, 16*(4), 1-8.

Bonsaksen, T., Ruffolo, M., Price, D., Leung, J., Thygesen, H., Lamph, G., . . . Geirdal, A. Ø. (2023). Associations between social media use and loneliness in a cross-national population: do motives for social media use matter? *Health psychology and behavioral medicine, 11*(1), 2158089.

Brooks, S. (2015). Does personal social media usage affect efficiency and well-being? *Computers in human behavior, 46*, 26-37.

Bruggeman, H., Van Hiel, A., Van Hal, G., & Van Dongen, S. (2019). Does the use of digital media affect psychological well-being? An empirical test among children aged 9 to 12. *Computers in Human Behavior, 101*, 104-113.

Cao, Y., Ajjan, H., & Hong, P. (2013). Using social media applications for educational outcomes in college

teaching: A structural equation analysis. *British Journal of Educational Technology, 44*(4), 581-593.
Chowdhury, E. K. (2024). Examining the benefits and drawbacks of social media usage on academic performance: a study among university students in Bangladesh. *Journal of Research in Innovative Teaching & Learning*.
Conradie, P. W., Lombard, A., & Moller, M. (2013). Learners' perceptions of mobile devices for learning in higher education-towards a mobile learning pedagogical framework.
Conroy, R. (2015). Sample size: A rough guide. Retrieved from http://www. beaumontethics. ie/docs/application/sample size calculation. pdf
Course-Choi, J., & Hammond, L. (2021). Social media use and adolescent well-being: A narrative review of longitudinal studies. *Cyberpsychology, Behavior, and Social Networking, 24*(4), 223-236.
Eid, M. I., & Al-Jabri, I. M. (2016). Social networking, knowledge sharing, and student learning: The case of university students. *Computers & Education, 99*, 14-27.
Ganapathi, J. (2019). User-generated content's impact on the sustainability of open educational resources. *Open Praxis, 11*(2), 211-225.
Guo, R., Shen, Y., & Li, L. (2018). Using social media to improve student-instructor communication in an online learning environment. *International Journal of Information and Communication Technology Education (IJICTE), 14*(1), 33-43.
Hair Jr, J., Page, M., & Brunsveld, N. (2016). Essentials of business research methods. *Routledge, 3*.
Hair, J. F., Black, W. C., & Babin, B. J. (2010). *Multivariate Data Analysis: A Global Perspective* (Vol. 7). Pearson Education.
Haque, M. A., Zhang, X., Akanda, A. E., Hasan, M. N., Islam, M. M., Saha, A., . . . Rahman, Z. (2023). Knowledge Sharing among students in social media: the mediating role of family and technology supports in the academic development nexus in an emerging country. *Sustainability,, 15*(3), 9983.
Hill, K., Xie, J., Gallo, K., Wood, S., Parlow, M., Hynes, J., & Stewart, S. (2024). The role of a major social media platform on students' academic performance: Perception versus reality. *European Journal of Interactive Multimedia and Education, 5*(1), e02401.
Ilakkuvan, V., Johnson, A., Villanti, A. C., Evans, W. D., & Turner, M. (2019). Patterns of social media use and their relationship to health risks among young adults. *Journal of Adolescent Health, 64*(2), 158- 164.
Jumabaeva, C., & Ismailova, R. (2024). Web 2.0 in higher education: Difference in usage and perception between Kazakh and Kyrgyz students. *E-Learning and Digital Media*, 20427530241239397.
Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons, 53*(1), 59-68.
Khan, M. N., Ashraf, M. A., Seinen, D., Khan, K. U., & Laar, R. A. (2021). Social media for knowledge acquisition and dissemination: The impact of the COVID-19 pandemic on collaborative learning driven social media adoption. *Frontiers in Psychology, 12*, 648253.
Kolhar, M., Kazi, R. N., & Alameen, A. (2021). Effect of social media use on learning, social interactions, and sleep duration among university students. *Saudi Journal of Biological Sciences, 28*(4), 2216- 2222.
Kumar, S., Agarwal, M., & Agarwal, N. (2021). Defining and measuring the academic performance of Hei students-a critical review. *Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12*(6), 3091-3105.
Lavidas, K., Papadakis, S., Manesis, D., Grigoriadou, A. S., & Gialamas, V. (2022). The effects of social desirability on students' self-reports in two social contexts: Lectures vs. lectures and lab classes. *Information, 13*(10), 491.
Liu, S., Zaigham, G. H., Rashid, R. M., & Bilal, A. (2022). Social media-based collaborative learning effects on student performance/learner performance with the moderating role of academic self-efficacy. *Frontiers in Psychology, 13*, 903919.
Malik, M. J., Ahmad, M., Kamran, M. R., Aliza, K., & Elahi, M. Z. (2020). Student use of social media, academic performance, and creativity: the mediating role of intrinsic motivation. *Interactive Technology and Smart Education, 17*(4), 403-415.
Maniaci, G., La Cascia, C., Giammanco, A., Ferraro, L., Palummo, A., Saia, G. F., . . . La Barbera, D. (2023). The impact of healthy lifestyles on academic achievement among Italian adolescents. *Current Psychology, 42*(6), 5055-5061.
Maqableh, M., Jaradat, M., & Azzam, A. A. (2021). Exploring the determinants of students' academic performance at university level: The mediating role of internet usage continuance intention. *Education and Information Technologies, 26*, 4003-4025.

Martin, T. (2017). Shift to student-centered learning. *The Star Online,* 1-3.

Mehra, A., Gupta, O., & Avikal, S. (2023). Finding the combined effect of academic and non-academic performance on management students' placement: A fuzzy logic approach. *The International Journal of Management Education, 21*(3), 100837.

Muca, E., Cavallini, D., Odore, R., Baratta, M., Bergero, D., & Valle, E. (2022). Are veterinary students using technologies and online learning resources for didactic training? A mini-meta-analysis. *Education Sciences, 12*(8), 573.

Nawir, R. H., Herman, A., & Bo'do, S. (2024). Palu Mayor's Public Communication Through Instagram Social Media Account@ Hadiantorasyid. *International Journal of Education Humanities and Social Science, 7*(1), 118 - 133.

Nuryakin, N., Rakotoarizaka, N. L., & Musa, H. G. (2023). The Effect of Perceived Usefulness and Perceived Easy to Use on Student Satisfaction The Mediating Role of Attitude to Use Online Learning. *Asia Pacific Management and Business Application, 11*(3), 323-336.

Parr, C. (2014). 6 trends that will accelerate the adoption of technology in higher education. *THE: Times Higher Education.*

Rahman, S., Ramakrishnan, T., & Ngamassi, L. (2020). Impact of social media use on student satisfaction in Higher Education. *Higher Education Quarterly, 74*(3), 304-319.

Sabah, N. M. (2023). The impact of social media-based collaborative learning environments on students' use outcomes in higher education. *International Journal of Human-Computer Interaction, 39*(3), 667-689.

Salikhova, N. R., Grigoryeva, O. V., Semenova-Poliakh, G. G., Salikhova, A. B., Smirnikova, O. V., & Sopun, S. M. (2023). Communication tools and social media usage: Assessing self-perceived communication competence. *Online Journal of Communication and Media Technologies, 13*(4), e202343.

Sarwar, B., Zulfiqar, S., Aziz, S., & Ejaz Chandia, K. (2019). Usage of social media tools for collaborative learning: The effect on learning success with the moderating role of cyberbullying. *Journal of Educational Computing Research, 57*(1), 246-279.

Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach.* John Wiley & Sons.

Selwyn, N. (2012). Social media in higher education. *The Europa world of learning, 1*(3), 1-10.

Shensa, A., Escobar-Viera, C. G., Sidani, J. E., Bowman, N. D., Marshal, M. P., & Primack, B. A. (2017). Problematic social media use and depressive symptoms among US young adults: A nationally-representative study. *Social science & medicine, 182*, 150-157.

Sivakumar, A., Jayasingh, S., & Shaik, S. (2023). Social media influence on students' knowledge sharing and learning: An empirical study. *Education Sciences, 13*(7), 745.

Sukendro, S., Habibi, A., Khaeruddin, K., Indrayana, B., Syahruddin, S., Makadada, F. A., & Hakim, H. (2020). Using an extended Technology Acceptance Model to understand students' use of e-learning during Covid-19: Indonesian sports science education context. *Heliyon, 6*(11).

Tahar, A., Riyadh, H. A., Sofyani, H., & Purnomo, W. E. (2020). Perceived ease of use, perceived usefulness, perceived security and intention to use e-filing: The role of technology readiness. *The Journal of Asian Finance, Economics and Business, 7*(9), 537-547.

Tülübaş, T., Karakose, T., & Papadakis, S. (2023). A holistic investigation of the relationship between digital addiction and academic achievement among students. *European Journal of Investigation in Health, Psychology and Education, 13*(10), 2006-2034.

Wang, Y., Xia, M., Guo, W., Xu, F., & Zhao, Y. (2023). Academic performance under COVID-19: The role of online learning readiness and emotional competence. *Current Psychology, 42*(34), 30562-30575.

Yao, N., & Wang, Q. (2023). Technostress from smartphone use and its impact on university students' sleep quality and academic performance. *The Asia-Pacific Education Researcher, 32*(3), 317-326.

Zhang, C. B., Li, Y. N., Wu, B., & Li, D. J. (2017). How WeChat can retain users: Roles of network externalities, social interaction ties, and perceived values in building continuance intention. *Computers in Human Behavior, 69*, 284-293.

Zhao, L. (2023). Social media addiction and its impact on college students' academic performance: The mediating role of stress. *The Asia-Pacific Education Researcher, 32*(1), 81-90.