



Actual use of social media for engagement to enhance students' learning

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Abstract

Learners can interact and connect with one another in new ways thanks to social media. This study employs two models to investigate the factors that contribute to students' involvement in order to improve their learning: constructivism and the technology acceptance model (TAM). Therefore, the objective of this research is to create a model of real use of social media for engagement by conducting an empirical examination into students' adoption of actual use of social media for education. A survey was distributed to 410 university students in order to achieve this goal. A quantitative research approach and partial least squares structural equation modeling were used to acquire the results (PLS-SEM). The outcomes of our empirical examination suggest that determining discriminant validity has become a widely accepted prerequisite for analysing latent factor connections. The studies also demonstrated that using social media to engage students and improve their learning in higher education is extremely beneficial. The findings revealed real use of social media for interaction via interactions variables and TAM model acceptance. Students' pleasure with learning was also favourably associated to their actual usage of social media and involvement, according to the findings. As a conclusion, the result of R-Square's perceived usefulness was 0.611%, students' engagement was 0.561%, actual use of social media was 0.582%, students' satisfaction was 0.611%, and students' learning was 0.627%. This study's findings and ramifications are presented.

Keywords Social media use · Engagement · Students' learning · Structural equation modeling (SEM) and higher education

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1 Introduction

Currently, students have ample opportunities to access new technology, and according to studies, students have a positive attitude toward new technology use (Farwell & Waters, 2010). Even before technological contexts emerged, collaboration and social exchanges were claimed to be central to learning (Friesen & Lowe, 2012). In addition to the fact that the majority of students use social media to establish and maintain connection with friends and family (Li, 2012), such positive attitudes facilitate students in learning to utilize social media in their classes and research. In this context, scholars have tried to examine social media based on several viewpoints via their definitions, uses and impacts. In fact, several studies have investigated teaching through social media in universities as a part of educational work for gathering related material (Miah et al., 2012). Some academic and educational publications have shown how the academic sector can utilize social media (Minocha & Petre, 2012). According to (Al-Rahmi et al., 2015e), due to the significance of working memory in education, future studies should endeavor to examine such a connection. Along a similar line of reasoning, (Yu et al., 2010) found that online social networking can enhance the psychological well-being of students and their skill development as well as learning outcomes. Some scholars have used social media tools to share information, resources, and media with each other; discuss their teaching methods and students; solicit support from and offer guidance to others; engage in social commentary; build professional personas; link with others; and highlight their engagement in different online networks (Al-rahmi et al., 2015b; Veletsianos, 2012). Within the social realm, interactive Internet websites, services, tools, and practices support collaboration, constructivism, community development, information sharing and the exchange of ideas (Al-Rahmi et al., 2020). Social media technologies facilitating social interactions facilitate collaboration and deliberation among stakeholders (Bryer & Zavattaro, 2011). Data on involvement and the contribution of social media to increasing students' learning is acquired from social media users. As a result, the primary purpose of this research is to develop a structure of social media usage for involvement in higher education to affect students' learning. Among research students, social media is frequently used for educational or non-educational objectives. As a result, this research aims to learn more about resources that may be utilized in the classroom, such as Facebook, Twitter, and YouTube (Liu, 2010). The two principles provided in this study (TAM) are constructivism and the adoption and use of technology, which propose a set of key elements as a guide for interaction and social media use for participation, impacting satisfaction and boosting students' learning. Furthermore, the goal of this study is to contribute to the expanding body of information on using social media for participation. It also makes a practical contribution by looking into how social media usage affects students' learning in higher education. The importance of our studies relating social media with university research students in cooperating student engagement among students and faculty members, as well as obtaining more knowledge and knowledge sharing, necessitates further investigation of factors influencing users in such academic settings.

1.1 Problem Background

This study's problem backdrop may be divided into three components. The first section is on the lack of usage of social media for engagement with consideration of relevant constructivism theory and the TAM (Haq & Chand, 2012; Nemetz et al., 2012). Haq and Chand (2012) stated that students at the University of the Punjab, Lahore, Pakistan, agreed that using social media negatively affected their education at a rate of 61%, while 39% students agreed that using social media positively affected their learning. Similarly, (Kirschner & Karpinski, 2010) showed that students of Midwestern University, US, agreed at a rate of 74.3% that the utilization of several social media platforms had a negative impact on students' learning, while only 25.7% of students agreed that using social media had a positive impact. Moreover, Ricaurte-Quijano & Carli-Álvarez (2016) showed that although the majority of students are Wikipedia users, there is still a lack of knowledge about its function, structure and user community and a negative perception of Wikipedia. The lack of useful instrument methods to measure such factors in such a context in a scientific study (Giannakos & Vlamos, 2013) (Yeh et al., 2011) and the lack of actual use of social media for student engagement while considering relevant interactive and perceptual factors are discussed in the second part (Haq & Chand, 2012; Nemetz et al., 2012). The final section looks at the prospect of modeling social media approval alongside constructivist theory using a theoretical model of constructs relevant to active "constructivism" and perceptual "TAM" aspects that present in both social media and academic settings (Zakaria et al., 2010). Furthermore, there appears to be a dearth of models for study in knowledge-based social media and how it affects learning capacity in higher education (Al-Rahmi et al., 2020) (Zakaria et al., 2010). Teaching staff and students in many developing countries are being encouraged for the first time to socially communicate for academic objectives as a result of COVID-19. In the lack of an online learning management system, social media may present a tremendous opportunity for these schools to socially connect with their students and enhance online learning (Manca, 2020). As a consequence, peer-to-peer interactions, actual usage of social media, usefulness and convenience of use, perceived utility, student happiness, and student learning are all studied in this study.

2 Theoretical model and hypotheses

According to constructivism, students build knowledge rather than simply taking up information. People develop their own representations and incorporate new knowledge into their prior knowledge as they meet and reflect just on environment. Therefore, the current study exposed that the integration of social media is interrelated to the engagement among university students. Variables of social media include interactions with peers (IP), interactions with lecturers (IL), actual use of social media (ASU), engagement (EN), perceived ease of use (PE), perceived usefulness (PU), students' satisfaction (SS) and enhancing students' learning (SL). Social media networks enhance students' interactivity and bolster novice students in building knowledge, as in social constructivism (Noar & Zimmerman, 2005). This study will

also use the TAM familiarized by Davis et al. (1992). As a result, post structuralist (Vygotsky et al., 1978) will be used to establish a central concept: learning is a creative and active process. Some surveys have revealed that perceived usefulness and perceived ease of use possess a critical part in manipulating satisfaction and people’s actual use of social media as an innovative and new technology (Yeh et al., 2011). As a result, via an empirical inquiry of students’ acceptance of the real use of social media for learning, this study intends to construct a model that assesses social media have used to determine the level of involvement Fig. 1.

Moreover, (Jonassen, 1997) suggested a model to design a web-based constructivist learning environment in which problems are connected with circumstances, knowledge resources that help build cognitive tools, information construction, and social aid. As stated by (Tsai, 2011) (Jonassen, 1997) model was replicated and updated for building constructivist environments to develop an active collective learning technique. Jonassen’s model developed a collaborating stage for the implementation of constructivist learning higher education and is presented in Fig. 2.

2.1 Constructivist theory

Constructivism is a learning theory based on the premise that the knower constructs knowledge via brain processing (Kirschner & Karpinski, 2010). The constructivist approach proposes that improving knowledge necessitates active learners’ participation (Kirschner & Karpinski, 2010). Among the diverse strands of constructivism, the social cognitive theory of Bandura (Ricaurte-Quijano & Carli-Álvarez, 2016) has been related to the use of technology. Therefore, in this study, we chose factors from this approach because they have a strong relationship with social media users. Interaction, cooperation, and engagement all have a link, as does perceived utility

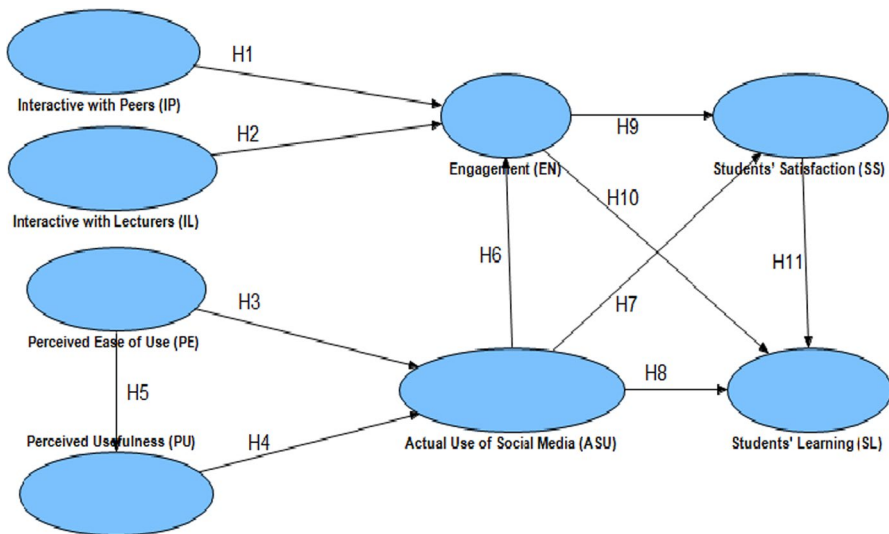


Fig. 1 Research Model and Hypotheses

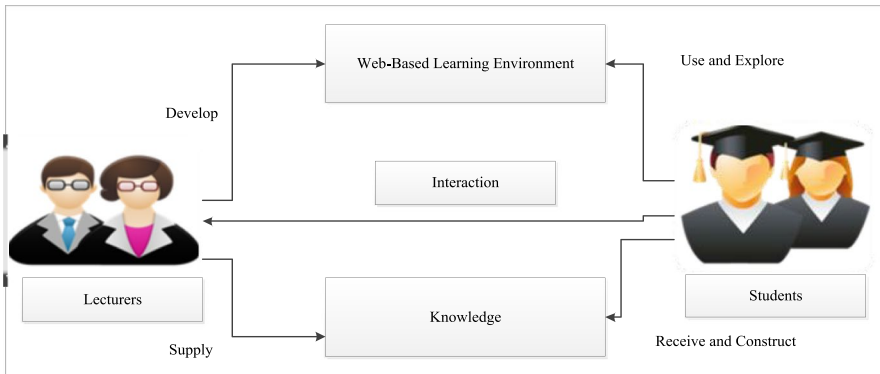


Fig. 2 Constructivist Educational Model (Al-Rahmi, et al., 2015)

and consumer of use. Furthermore, the construction of a model for social media use completely hypothesized an expectancy theory and constructivism. This approach may be used to investigate the acceptability and adoption of new social media usage in greater depth (Yampinij et al., 2012). (Al-rahmi et al., 2015f).

2.2 Interactivity with peers and lecturers

Interactions and communication reinforce active participation, a necessary component in students' learning (Hrastinski, 2009). According to (Liu, 2003), Using social media helps facilitate peer interaction and lecturers, as well as increasing knowledge-sharing capabilities. Engaging learning is an instructional approach that involve social networking and web—based learning among students, and it includes a variety of learning styles (Liu, 2003). Those students who register in online courses were found to spend increasing time utilizing online materials as well as social media to support their learning materials in comparison to their peers in face-to-face courses (Abraham et al., 2019; Liu et al., 2011). Peer collaboration with the help of social media offers opportunities for community development among students (Top, 2012). The scientists propose hypotheses in light of the preceding discussion:

H1: There is a strong link between student interaction with peers and their level of engagement.

H2: There is a strong link between students' interaction with lecturers and their level of engagement.

2.3 Engagement

When students are learning from peers or lecturers, they show a high level of attention, curiosity, interest, optimism, and passion, which extends to their desire to learn and learning of the students (Nemetz et al., 2012). Social media comprises various web-based tools and services created for the promotion of community development

via collaboration and sharing of information (Arnold & Paulus, 2010). According to current studies, social media use in the educational field can result in increased student engagement (Pozzi et al., 2016) (Al-rahmi et al., 2015g). Social media engagement can also assist in cementing students' relationships with peers, creating a virtual community of learners and eventually contributing to the level of overall learning (Fewkes & McCabe, 2012). The researchers offer the following hypothesis in light of the preceding discussion:

H9: There is indeed a strong link between student satisfaction and engagement.

H10: There is a strong link between student engagement and their learning.

2.4 Technology Acceptance Model (TAM)

The TAM is a framework for understanding how people accept and use technologies in data systems (Davis et al., 1992). According to (Doll & Torkzadeh, 1988), actual use of social media and emotional attitude reflect actual use of the system. The TAM, originally introduced by, is one of the most widely recognized and utilized models for studying the actual usage behavior of innovative technologies (Davis, 1989). It is based on the application of the principle of reasoned action by a group of people (Ajzen & Fishbein, 1980), and as it pays attention to the external features that can affect actual use of social media and behavior, many variations have been developed (Jan & Contreras, 2011). One of the well-received and important modifications of the TAM was the addition of social impact techniques in predicting the usage behavior of its regular operators and their affective attitude toward a novel technique (Venkatesh et al., 2002). The latter objective is understood as the belief that learning how to use the novel technique will require little effort (Tsai et al., 2012).

2.5 Actual Use Social Media, Ease of Use, and Usefulness

Perceived usefulness is the degree to which a person believes that utilizing the system would improve his or her work performance (Davis et al., 1992). Perceived ease of use is the degree to which the individual believes that using a technology would be painless (Davis et al., 1992). Furthermore, actual system usage is influenced by behavioral intentions, which are influenced by attitudes toward system use. In the TAM, attitudes about usage are directly influenced by beliefs in the technology, perceived utility, and perceived ease of use (Davis et al., 1992). According to previous research (Zeithaml, 2000), new media is a straightforward way to use technology to enhance students' learning environment. Many studies on the TAM have found that perceived ease of use is linked to perceived usefulness (Nysveen et al., 2005). On the subject of social media, we employ numerous social media platforms to operationalize the real use of social media-related behaviors for this investigation (Fishbein & Ajzen, 1977). As an outcome, by student engagement, the usage of social media improves student engagement and learning. The researchers offer the following possibilities after examining the preceding conversation:

H3: There is indeed a significant link among perceived usefulness and ease of use of social media and intent to use it.

H4: There is a strong link between perceived social media value and actual use of social media.

H5: There is an important connection between perceived ease to utilize with perceived usefulness.

H6: There is an important connection between actual uses of social media with engagement.

H7: There is an important connection between actual uses of social media with students' satisfaction.

H8: There is an important connection between actual uses of social media with students' learning.

2.6 Students' learning and satisfaction

A student's learning is the consequence of education; it is also the degree to which a student, instructor, or institution has attained their educational goals (Al-rahmi et al., 2015b). The feeling of fun and success in the learning environment is known as student satisfaction (Doll & Torkzadeh, 1988). (Al-Rahmi et al., 2015d). Additionally, (Almenara & Díaz, 2014) reported that students of the University of Sevilla used social software for learning purposes. It is possible that by emphasizing learners' needs and implementing determinative evaluations through the formation of schoolroom communities, learners' engagement will be enabled, and students' accomplishments, information supervision and knowledge sharing will be improved. According to (Al-rahmi, et al., 2015d), the usage of social media impacts research students' learning. Few concrete academic experiments have been devoted to the use of Twitter in university classrooms in the U.S. and Spain (Tur et al., 2017) (Malik et al., 2019). Furthermore, the use of social media facilitates a positive relationship between students learning as well as gratification (Yampinij et al., 2012). The scientists hypothesize the following in light of the preceding discussion:

H11: There is a strong link between student or learner satisfaction and academic achievement.

3 Research methodology

In this study, the students have been experiencing how social media use enhances their learning. The tools of actual social media use, such as Facebook, Twitter, and Blogger, have been encouraged by many universities, for educational purposes. As a result, via an empirical inquiry of students' acceptance of the real use of social media for learning, this study intends to construct a model that assesses social media have used to determine the level of involvement. In this study, the content of the questionnaire (instrument validation) was evaluated through two experts who were senior lecturers in the computing departments at university; see the questionnaire in the appendix. According to (Tur et al., 2017), the recommended sample was

determined to be 380 respondents from university students. The questionnaires were distributed to 520 students, of whom 76 returned uncompleted questionnaires and 34 did not return questionnaires; thus, the number of responses ultimately used for the analysis was 410. A 5-point Likert scale was used to compute the questionnaire items (1: strongly disagree; 2: disagree; 3: neutral; 4: agree; 5: strongly agree). Collaborative characteristics, demographic items, and TAM factors made up all of the items. Hand-circulated questionnaires were distributed. Respondents were asked about their experiences with using social media for active collaborative engaging learners, as well as their perceptions of its influence on their satisfaction, particularly students' learning. Therefore, the number of responses was higher than the recommended number. The main statistical procedure used in this study was partial least squares structural equation modelling (sem (PLS-SEM) in Smart PLS package 3.0, which has been applied in two stages: the first phase was internal consistency, concurrent validity, and classifier validity of the measures, and the second stage was construct validity, concurrent validity, as well as discriminant validity of the measures. The structural model was investigated in the second step. This strategy was proposed by (Hair Jr et al., 2017). The following sections provide details of the analyses.

3.1 Model measurements and instrumentations

Interactivity with peers (IP), interactivity with lecturers (IL), engagement (EN), perceived ease of use (PE), perceived usefulness (PU), actual use of social media (ASU), students' satisfaction (SS), and students' learning (SL) were all measured using constructivist theory and the technology acceptance model (TAM). Furthermore, the metric employed in previous studies was applied in this research (Al-rahmi et al., 2015f). With the aid of PLS-SEM in Smart PLS 3.0, the validity and reliability of the measurement model were confirmed in the first stage. Construct validity was established using loadings, Cronbach's alpha, convergent validity, and convergence validity prior conducting hypothesis testing to assess the model's goodness-of-fit (Fornell & Larcker, 1981). As per the suggestion, the criterion test was employed to confirm discriminant validity.

3.2 Sample characteristics

The questionnaire samples were finished by 410 respondents. Among the respondents, 180 were male and 230 were female, representing 43.90% and 56.10% of the whole sample, respectively. A total of 107 respondents (26.1%) fell in the 21- to 24-year-old age category, whereas 114 respondents (27.8%) of the respondents were in the 25- to 30-year-old category. A total of 123 respondents (30%) were in the 30- to 35-year-old category, and 66 respondents (16.1%) were older than 35 years. A total of 97 (23.7%) respondents were in a full research-based master's program, 123 (30%) respondents were in a mixed-mode master's program, 111 (27.1%) respondents were in a master's teaching program, 69 (16.8%) respondents were in a PhD program, and 10 (2.4%) respondents were in a post-doctoral program. Approximately 97.8% of the sample used social media to facilitate their learning.

4 Result and Analysis

In this study, (SEM) was utilized as the chief statistical method, followed by two stages. The first stage included construct validity, convergent validity, and discriminant validity of the measures. The structure modeling approach was the second stage. This procedure was followed in accordance with (Hair Jr et al., 2017).

4.1 Construct validity of the measurements

The term "construct validity" describes how successfully the items generated assess a structure and can properly assess what they were supposed to evaluate (Hair Jr et al., 2017). More precisely, items that are considered for measuring a construct must have greater weight in their corresponding construct than in other constructs. Later, the researchers performed an extensive assessment of the literature to produce items that had already been recognized and verified in past research. According to Hair et al. (2017), the comparative incremental fit index ($CFI \geq 0.90 = 0.943$), Tucker-Lewis coefficient ($TLI \geq 0.90 = 0.963$), root mean square error of approximation (RMSEA) for a good fit < 0.10 & for a very good fit < 0.05 (0.041), and root mean-square residual (RMR) Close to 0 can be used to fit model approximation (0.032). Based on factor analysis, all of the items were accurately allocated to their corresponding constructs. In compared to other constructs, each object has a lot of loadings in its own constructions (Table 1). All of the selected items were well loaded on their constructs, interactions with peers (IP), interactions with lecturers (IL), actual use of social media (ASU), engagement (EN), perceived ease of use (PE), perceived usefulness (PU), students' satisfaction (SS) and enhancing students' learning (SL), see Table 1.

4.2 Convergent validity of the measurements

Table 2 reveals composite reliability index ranging from 0.893 to 0.941, which is greater than the suggested 0.7 criterion by (Hair Jr et al., 2017). Furthermore, Cronbach's Alpha values ranged from 0.897 to 0.932, above the suggested 0.7 threshold by (Gliem & Gliem, 2003). The average variance extracted (AVE) values ranged between 0.632 and 0.768, above the suggested value of 0.5, indicating that all factor loadings were significant/important and exceeded 0.5, as suggested by (Hair Jr et al., 2017). The CFA findings for the measurement model are shown in Table 2.

4.3 Discriminant validity of the measures

The 'discriminant validity' component assesses how different every perception, together with its indications, is from other perceptions, as well as their signals (Bagozzi et al., 1991). If the AVE result is greater than 0.5 and significant at $p = 0.001$, discriminant validity is maintained for all constructs (Fornell & Larcker,

Table 1 Loadings and Cross-Loadings of The Items

No	Variables	Code	GM	SU	EN	PE	PU	IU	RS	AP
1	Interactive with Peers	IP 1	0.860	0.480	0.534	0.503	0.429	0.360	0.491	0.489
2		IP 2	0.888	0.426	0.578	0.440	0.431	0.428	0.469	0.482
3		IP 3	0.903	0.497	0.512	0.352	0.366	0.302	0.433	0.590
4		IP 4	0.874	0.509	0.463	0.333	0.410	0.375	0.427	0.411
5		IP 5	0.853	0.475	0.322	0.318	0.368	0.326	0.367	0.318
6		IP 6	0.832	0.337	0.441	0.328	0.347	0.370	0.367	0.332
7	Interactive with Lecturers	IL 1	0.320	0.817	0.401	0.358	0.366	0.438	0.347	0.401
8		IL 2	0.507	0.796	0.489	0.366	0.410	0.320	0.432	0.369
9		IL 3	0.522	0.847	0.504	0.508	0.408	0.329	0.379	0.479
10		IL 4	0.402	0.912	0.465	0.422	0.428	0.374	0.380	0.446
11		IL 5	0.455	0.811	0.482	0.369	0.325	0.322	0.329	0.348
12		IL 6	0.470	0.830	0.447	0.399	0.426	0.590	0.460	0.470
13	Engagement	EN 1	0.631	0.592	0.868	0.427	0.444	0.503	0.512	0.492
14		EN 2	0.419	0.484	0.901	0.410	0.426	0.490	0.438	0.428
15		EN 3	0.480	0.373	0.874	0.403	0.355	0.428	0.397	0.479
16		EN 4	0.316	0.401	0.793	0.359	0.359	0.381	0.326	0.469
17		EN 5	0.429	0.477	0.849	0.478	0.366	0.439	0.438	0.492
18		EN 6	0.428	0.444	0.821	0.392	0.458	0.310	0.479	0.359
19	Perceived Ease of Use	PE 1	0.350	0.365	0.450	0.837	0.458	0.428	0.496	0.480
20		PE 2	0.311	0.410	0.384	0.852	0.400	0.470	0.394	0.411
21		PE 3	0.308	0.339	0.355	0.910	0.332	0.370	0.301	0.359
22		PE 4	0.410	0.380	0.320	0.819	0.451	0.402	0.358	0.395
23		PE 5	0.480	0.420	0.427	0.833	0.489	0.580	0.469	0.382
24		PE 6	0.368	0.321	0.316	0.864	0.428	0.349	0.397	0.410
25	Perceived Usefulness	PU 1	0.460	0.429	0.318	0.520	0.818	0.505	0.469	0.389
26		PU 2	0.411	0.381	0.422	0.479	0.810	0.449	0.486	0.558
27		PU 3	0.594	0.490	0.501	0.511	0.798	0.427	0.520	0.414
28		PU 4	0.426	0.418	0.522	0.484	0.873	0.428	0.438	0.380
29		PU 5	0.304	0.380	0.418	0.400	0.904	0.428	0.469	0.309
30		PU 6	0.407	0.405	0.422	0.428	0.917	0.457	0.495	0.489
31	Actual Use of Social Media	ASU 1	0.317	0.421	0.482	0.420	0.344	0.807	0.352	0.406
32		ASU 2	0.300	0.337	0.484	0.485	0.486	0.790	0.500	0.326
33		ASU 3	0.336	0.406	0.489	0.479	0.475	0.794	0.539	0.388
34		ASU 4	0.401	0.505	0.422	0.525	0.569	0.858	0.581	0.527
35		ASU 5	0.492	0.312	0.411	0.428	0.426	0.877	0.359	0.349
36		ASU 6	0.304	0.388	0.320	0.426	0.457	0.900	0.347	0.401
37	Students' Satisfaction	SS 1	0.397	0.500	0.420	0.460	0.468	0.402	0.869	0.479
38		SS 2	0.320	0.331	0.472	0.467	0.500	0.350	0.828	0.496
39		SS 3	0.393	0.429	0.362	0.375	0.497	0.549	0.841	0.511
40		SS 4	0.415	0.553	0.473	0.428	0.560	0.538	0.803	0.428
41		SS 5	0.361	0.485	0.331	0.321	0.460	0.428	0.909	0.441
42		SS 6	0.402	0.494	0.440	0.485	0.428	0.379	0.803	0.501

Table 1 (continued)

No	Variables	Code	GM	SU	EN	PE	PU	IU	RS	AP
43	Students' Learning	SL 1	0.442	0.488	0.495	0.596	0.469	0.369	0.568	0.911
44		SL 2	0.340	0.403	0.317	0.560	0.466	0.349	0.445	0.887
45		SL 3	0.442	0.481	0.490	0.468	0.498	0.486	0.458	0.796
46		SL 4	0.507	0.499	0.492	0.475	0.430	0.427	0.530	0.871
47		SL 5	0.493	0.482	0.512	0.491	0.417	0.522	0.461	0.807
48		SL 6	0.558	0.507	0.488	0.425	0.450	0.479	0.577	0.866

1981). The associations among items pertaining to any two concepts must be lower than the base square values of mean variance dispersed by the construct items, pursuant to (Hair Jr et al., 2017). See Table 3 for further information.

4.4 Structural model analysis

The following phase involved examining hypothesized correlations among selected constructs once the goodness-of-fit of the measurement model had been established. SmartPLS 3.0 was used to confirm the predicted model using the PLS approach. The route coefficients were then determined, as shown in Fig. 3 and Table 4.

The results supported all eleven hypotheses. Specifically, the results indicated that activity with peers and group members was significantly and positively linked with engagement ($\beta=0.247$, $t=2.340$, $p<0.001$). Hence, the first hypothesis was supported. The results showed that interactivity with lecturers and mentors was positively and significantly associated with engagement ($\beta=0.382$, $t=4.429$, $p<0.001$). Hence, the second hypothesis was supported. Similarly, hypothesis 3 was also supported, as the results indicated that perceived ease of use was absolutely related to an intent to utilize social media ($\beta=0.493$, $t=4.602$, p less than 0.001). With regard to hypothesis 4, the results showed that perceived usefulness positively and significantly related to actual use of social media ($\beta=0.377$, $t=2.771$, $p<0.001$), indicating consistent results with the proposed hypothesis. The fifth hypothesis proposed a significant connection between perceived 'ease of utilize' and 'usefulness', and the result was consistent with ($\beta=0.712$, $t=13.420$, $p<0.001$). The next result displayed an intent to utilize social media significantly or positively interrelated through engagement ($\beta=0.512$, $t=4.503$, p value less than 0.001); therefore, the sixth hypothesis was also supported. For the seventh hypothesis, the data obtained, such as actual use of social media significantly or positively interrelated with learners' and researchers' gratification ($\beta=0.448$, $t=4.994$, p value less than 0.001), indicated a consistent outcome with hypothesis. In this regard, students need to be encouraged to be more interactive and engaging through social media. Additionally, the results/data showed that the actual use of social media was significantly and positively associated with students' learning ($\beta=0.465$, $t=5.211$, p value less than 0.001); thus, the eighth hypothesis was supported. The next result showed that engagement was significantly and positively related to students' satisfaction

Table 2 Convergent Validity

No	Variables	Code	Factors Loading	Cronbach's Alpha	Composite Reliability	AVE	R. Square
1	Interactive with Peers	IP 1	0.860	0.931	0.926	0.768	0.000
2		IP 2	0.888				
3		IP 3	0.903				
4		IP 4	0.874				
5		IP 5	0.853				
6		IP 6	0.832				
7	Interactive with Lecturers	IL1	0.817	0.911	0.893	0.639	0.000
8		IL 2	0.796				
9		IL 3	0.847				
10		IL 4	0.912				
11		IL 5	0.811				
12		IL 6	0.830				
13	Engagement	EN 1	0.868	0.899	0.930	0.702	0.560
14		EN 2	0.901				
15		EN 3	0.874				
16		EN 4	0.793				
17		EN 5	0.849				
18		EN 6	0.821				
19	Perceived Ease of Use	PE 1	0.837	0.910	0.897	0.643	0.000
20		PE 2	0.852				
21		PE 3	0.910				
22		PE 4	0.819				
23		PE 5	0.833				
24		PE 6	0.864				
25	Perceived Usefulness	PU 1	0.818	0.914	0.941	0.698	0.611
26		PU 2	0.810				
27		PU 3	0.798				
28		PU 4	0.873				
29		PU 5	0.904				
30		PU 6	0.917				
31	Actual Use of Social Media	ASU 1	0.807	0.932	0.922	0.691	0.582
32		ASU 2	0.790				
33		ASU 3	0.794				
34		ASU 4	0.858				
35		ASU 5	0.877				
36		ASU 6	0.900				
37	Students' Satisfaction	SS 1	0.869	0.897	0.907	0.632	0.617
38		SS 2	0.828				
39		SS 3	0.841				
40		SS 4	0.803				
41		SS 5	0.909				
42		SS 6	0.803				

Table 2 (continued)

No	Variables	Code	Factors Loading	Cronbach's Alpha	Composite Reliability	AVE	R. Square
43	Students' Learning	SL 1	0.911	0.921	0.904	0.673	0.627
44		SL 2	0.887				
45		SL 3	0.796				
46		SL 4	0.871				
47		SL 5	0.807				
48		SL 6	0.866				

Table 3 Discriminant Validity

Variables	Code	SL	EN	IP	ASU	PE	PU	SS	IL
Students' Learning	SL	0.898							
Engagement	EN	0.611	0.882						
Interactive with Peers	IP	0.593	0.518	0.911					
Actual Use of Social Media	ASU	0.529	0.602	0.530	0.897				
Perceived Ease of Use	PE	0.639	0.597	0.594	0.640	0.903			
Perceived Usefulness	PU	0.539	0.596	0.496	0.510	0.602	0.869		
Students' Satisfaction	SS	0.614	0.529	0.490	0.577	0.680	0.599	0.889	
Interactive with Lecturers	IL	0.522	0.630	0.594	0.532	0.589	0.510	0.552	0.893

($\beta=0.291$, $t=2.496$, $p<0.001$); thus, hypothesis nine was supported. The tenth hypothesis proposed that engagement had a significant and positive connection with students' learning, and the obtained results supported the hypothesis with ($\beta=0.438$, $t=5.218$, p value less than 0.001). Finally, the eleventh hypothesis proposed that students' satisfaction significantly and positively linked with their educational or students' learning and based on the result, such a hypothesis was supported (here, $\beta=0.480$, $t=5.611$, p value less than 0.001).

4.5 Analysis of factors

The findings demonstrate that the majority of students agree or agree wholeheartedly that social media interaction with peers is beneficial to learning. As a result, this study defines interactivity with peers as a student's belief that interacting with peers through social media would enrich his or her learning. These findings are in line with those of (Liu et al., 2011) (Top, 2012), who argued that peer interaction was beneficial for educational purposes. Table 5 shows the results.

Furthermore, the findings reveal that the majority of students agree or strongly agree that interacting with professors on social media was beneficial to their

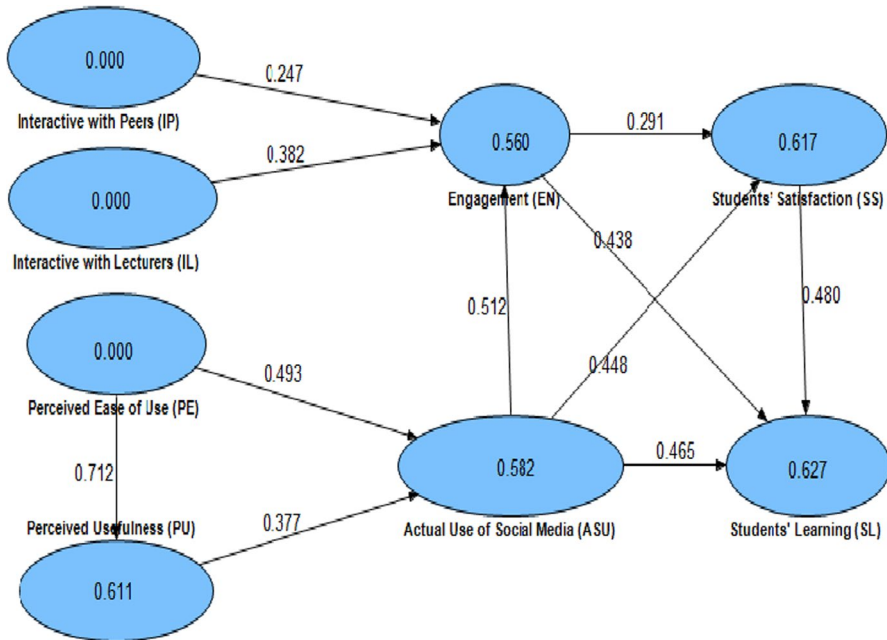


Fig. 3 Research Model with Results

learning. As a result, this report examines interactive elements with lecturers as a student's belief that conversing with lecturers through social media would enrich his as well as her teaching. These findings support the findings of (Abraham et al., 2019), who claimed that lecturers' interactivity was beneficial for educational purposes. Table 6 shows the results.

Similarly, the findings suggest that the majority of participants agreed or strongly agree that using social media for learning was beneficial. As a result, this study defines interaction as the extent to which a student believes that engaging in social media will enrich his or her learning. These results are consistent with (Al-Rahmi et al., 2020), who argued that students' engagement through social media was useful for educational purposes. See Table 7.

The findings demonstrate that the majority of individuals agreed or strongly agreed that using social media makes learning more engaging. As a result, ease of use is described in this study as a student's belief that perceived ease of use will boost his or her learning. These findings back up those of (Al-rahmi et al., 2015f), who found that perceived ease of use was linked to ease of usage of social media for academic purposes. The findings are shown in Table 8.

Likewise, the results indicated that the majority of students agree or strongly agree that social media is good to learning. As a result, in this study, usefulness is defined as the degree to which a student believes perceived usefulness would improve his or her learning. These findings are in line with those of (Davis, 1989) and (Nysveen et al., 2005), who suggested that perceived utility was important for educational usage of social media. Table 9 shows the results.

Table 4 Hypotheses Testing

H	Independent	Relationship	Dependent	Path coefficient	Standard Error	T Value	P Value	Result
H1	IP	→	EN	0.247	0.111	2.340	0.017	Supported
H2	IL	→	EN	0.382	0.089	4.429	0.000	Supported
H3	PE	→	ASU	0.493	0.108	4.602	0.000	Supported
H4	PU	→	ASU	0.377	0.107	2.771	0.004	Supported
H5	PE	→	PU	0.712	0.052	13.42	0.000	Supported
H6	ASU	→	EN	0.512	0.064	4.503	0.000	Supported
H7	ASU	→	SS	0.448	0.059	4.994	0.000	Supported
H8	ASU	→	SL	0.465	0.053	5.211	0.000	Supported
H9	EN	→	SS	0.291	0.117	2.496	0.011	Supported
H10	EN	→	SL	0.438	0.079	5.218	0.000	Supported
H11	SS	→	SL	0.480	0.085	5.611	0.000	Supported

Table 5 Measuring Interactivity with Peers

Factor	Code	1	2	3	4	5	Mean	S.D
		<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)		
Interactive with Peers	IP1	4 (1.0%)	14 (3.4%)	89 (21.7%)	153 (37.3%)	150 (36.6%)	4.05	0.898
	IP2	4 (1.0%)	28 (6.8%)	75 (18.3%)	163 (39.8%)	140 (34.1%)	3.99	0.942
	IP3	4 (1.0%)	31 (7.6%)	76 (18.5%)	188 (45.9%)	111 (27.1%)	3.90	0.916
	IP4	4 (1.0%)	23 (5.6%)	63 (15.4%)	183 (44.6%)	137 (33.4%)	4.04	0.895
	IP5	2 (0.5%)	24 (5.9%)	75 (18.3%)	174 (42.4%)	135 (32.9%)	4.01	0.890
	IP6	6 (1.5%)	26 (6.3%)	66 (16.1%)	161 (39.3%)	151 (36.8%)	4.04	0.957

Table 6 Measuring Interactivity with Lecturers

Factor	Code	1	2	3	4	5	Mean	S.D
		<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)		
Interactive with Lecturers	IL1	2 (0.5%)	12 (2.9%)	59 (14.4%)	201 (49.0%)	136 (33.2%)	4.11	0.791
	IL2	1 (0.2%)	18 (4.4%)	61 (14.9%)	174 (42.4%)	156 (38.0%)	4.14	0.843
	IL3	1 (0.2%)	20 (4.9%)	56 (13.7%)	188 (45.9%)	145 (35.4%)	4.11	0.835
	IL4	2 (0.5%)	17 (4.1%)	84 (20.5%)	149 (36.3%)	158 (38.5%)	4.09	0.873
	IL5	2 (0.5%)	14 (3.4%)	69 (16.9%)	151 (36.8%)	174 (42.4%)	4.13	0.797
	IL6	2 (0.5%)	8 (1.9%)	76 (18.5%)	173 (42.2%)	151 (36.8%)	4.08	0.892

Table 7 Measuring Engagement

Factor	Code	1	2	3	4	5	Mean	S.D
		<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)		
Engagement	EN1	3 (0.7%)	19 (4.6%)	78 (19.0%)	143 (34.9%)	167 (40.7%)	4.10	0.917
	EN2	2 (0.05%)	20 (4.9%)	90 (22.0%)	150 (36.6%)	148 (36.1%)	4.03	0.906
	EN3	4 (1.0%)	15 (3.7%)	73 (17.8%)	163 (39.8%)	155 (37.8%)	4.10	0.885
	EN4	10 (2.4%)	19 (4.6%)	50 (12.2%)	189 (46.1%)	142 (34.6%)	4.13	0.773
	EN5	9 (2.2%)	14 (3.4%)	60 (14.6%)	189 (46.1%)	138 (33.7%)	4.11	0.771
	EN6	13 (3.2%)	13 (3.2%)	50 (12.2%)	164 (40.0%)	170 (41.5%)	4.20	0.811

Similarly, the results show that the majority of respondents agreed or strongly agreed that utilizing social media to learn was useful. As a result, the degree to which a student believes that practical usage of social media would improve his or her education is defined in this study. These findings support those of (Venkatesh et al., 2002) (Fishbein & Ajzen, 1977), who claimed that using social media for educational purposes was advantageous. The findings are shown in Table 10.

The findings demonstrate that majority of the students agree or agree wholeheartedly that utilizing social media for studying improved their satisfaction. As a result,

Table 8 Measuring Perceived Ease of Use

Factor	Code	1	2	3	4	5	Mean	S.D
		<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)		
Perceived Ease of Use	PE1	2 (0.5%)	11 (2.7%)	65 (15.9%)	169 (41.2%)	163 (39.8%)	4.22	0.782
	PE2	3 (0.7%)	23 (5.6%)	53 (12.9%)	170 (41.5%)	161 (39.3%)	4.13	0.893
	PE3	3 (0.7%)	14 (3.4%)	75 (18.3%)	156 (38.1%)	162 (39.5%)	4.17	0.852
	PE4	2 (0.5%)	13 (3.2%)	68 (16.6%)	156 (38.0%)	171 (41.7%)	4.29	0.719
	PE5	6 (1.5%)	11 (2.7%)	66 (16.1%)	149 (36.3%)	178 (43.4%)	4.18	0.897
	PE6	3 (0.7%)	17 (4.2%)	89 (21.7%)	145 (35.4%)	156 (38.0%)	4.07	0.889

Table 9 Measuring Perceived Usefulness

Factor	Code	1	2	3	4	5	Mean	S.D
		<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)		
Perceived Usefulness	PU1	2 (0.5%)	4 (1.0%)	67 (16.3%)	159 (38.8%)	178 (43.4%)	4.24	0.816
	PU2	7 (1.7%)	20 (4.9%)	40 (9.7%)	164 (40.0%)	179 (43.7%)	4.11	0.791
	PU3	2 (0.5%)	11 (2.7%)	65 (15.9%)	184 (44.9%)	148 (36.1%)	4.26	0.766
	PU4	2 (0.5%)	13 (3.2%)	81 (19.8%)	167 (40.7%)	147 (35.9)	4.08	0.850
	PU5	2 (0.5%)	12 (2.9%)	97 (23.7%)	142 (34.6%)	157 (38.3%)	4.13	0.809
	PU6	5 (1.2%)	11 (2.7%)	70 (17.1%)	152 (37.1%)	172 (42.0%)	4.20	0.793

Table 10 Measuring Actual Use of Social Media

Factor	Code	1	2	3	4	5	Mean	S.D
		<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)		
Actual Use of Social Media	ASU1	4 (1.0%)	8 (2.0%)	81 (19.8%)	135 (32.9%)	182 (44.4%)	4.20	0.789
	ASU2	10 (2.4%)	22 (5.3%)	68 (16.5%)	148 (36.1%)	162 (39.5%)	4.18	0.882
	ASU3	5 (1.2%)	10 (2.4%)	96 (23.4%)	157 (38.3%)	142 (34.6%)	4.11	0.788
	ASU4	4 (1.0%)	12 (2.9%)	88 (21.5%)	135 (32.9%)	171 (41.7%)	4.05	0.830
	ASU5	2 (0.5%)	17 (4.1%)	76 (18.5%)	155 (37.8%)	160 (39.0%)	4.03	0.866
	ASU6	3 (0.7%)	8 (2.0%)	80 (19.5%)	174 (42.4%)	145 (35.4%)	4.13	0.856

the degree with which a student feels that using social media would improve his or her learning is defined in this study. These findings support the findings of (Tur et al., 2017), who claimed that using social media for educational purposes was simple and effective. Table 11 shows the results.

Finally, the findings demonstrate that the majority of the students agree or agree wholeheartedly that utilizing social media for studying was beneficial to their learning. As a result, the extent with which a student feels that using social media will improve his or her learning is defined in this study. These findings support the

Table 11 Measuring Students' Satisfaction

Factor	Code	1	2	3	4	5	Mean	S.D
		<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)		
Students' Satisfaction	SS1	2 (0.5%)	13 (3.2%)	67 (16.3%)	204 (49.8%)	124 (30.2%)	4.34	0.703
	SS2	3 (0.7%)	13 (3.2%)	79 (19.3%)	153 (37.3%)	162 (39.5%)	4.24	0.740
	SS3	5 (1.2%)	9 (2.2%)	49 (12.0%)	180 (43.9%)	167 (40.7%)	4.16	0.689
	SS4	2 (0.5%)	12 (2.9%)	57 (13.9%)	192 (46.8%)	147 (35.9%)	4.19	0.740
	SS5	3 (0.7%)	6 (1.5%)	60 (14.7%)	190 (46.3%)	151 (36.8%)	4.06	0.797
	SS6	2 (0.5%)	6 (1.5%)	50 (12.2%)	224 (54.6%)	128 (31.2%)	4.16	0.772

findings of (Ding & Cao, 2017), which claimed that students' usage of social media for educational reasons was beneficial. Table 12 shows the results.

5 Discussion and implications

We created a model by investigating the correlations among independent factors and engagement, satisfaction, and social media use in this study. This model demonstrated the favorable relationship between involvement with peers and lecturers and engagement. It also indicated a favorable association between reported ease of use and perceived utility of social media, as well as satisfaction. The model also provides actual connections between our theories about student learning. As a result, we attained the study's goal. Furthermore, the model we created incorporated an expectancy theory and a realist view of social media use. A model like this could be used to delve deeper into the acquiescence and implementation of new social media usage. Furthermore, the TAM's creators (Davis et al., 1992) claimed that technology adoption necessitates seeing from both active and perceptual perspectives (Vygotsky et al., 1978). (Davis, 1989). As a result, the created model takes into account both interaction and perceptual aspects of social media use. The data showed that 11 hypotheses positively and significantly supported interactivity, engagement and usefulness with regard to peers, which in turn enhanced students' learning and their

Table 12 Measuring Students' Learning

Factor	Code	1	2	3	4	5	Mean	S.D
		<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)	<i>f</i> (%)		
Students' Learning	SL1	2 (0.5%)	10 (2.4%)	57 (13.9%)	184 (44.9%)	157 (38.3%)	4.19	0.779
	SL2	2 (0.5%)	10 (2.4%)	54 (13.2%)	200 (48.8%)	144 (35.1%)	4.21	0.673
	SL3	5 (1.2%)	5 (1.2%)	70 (17.1%)	191 (46.6%)	139 (33.9%)	4.12	0.771
	SL4	5 (1.2%)	6 (1.5%)	72 (17.6%)	199 (48.6%)	128 (31.2%)	4.11	0.732
	SL5	4 (1.0%)	6 (1.5%)	70 (17.1%)	186 (45.4%)	144 (35.1%)	4.15	0.745
	SL6	6 (1.5%)	20 (4.9%)	80 (19.5%)	191 (46.6%)	113 (27.6%)	4.00	0.761

satisfaction. Therefore, we advise universities and colleges to encourage lecturers to facilitate interactions with their students through social media—instructors can conduct successful learning activities using a social media network, which facilitates interactivity among students and lecturers for educational purposes. In addition, students perceived ease to utilize, in addition to perceived usefulness, as affecting their purpose to utilize social media for engagement. Furthermore, the study also recommends that social media become an essential phenomenon in students' or learners' learning atmosphere (Al-rahmi et al., 2015c). (Pozzi et al., 2016), the results confirm that those students who performed peer review were more inactive in groups, because those students gave much effort to work on organizational subjects, including discourse simplification. Moreover, if pupils have a good mindset and utilize social media for academic reasons (i.e., have high levels of involvement and perceived usefulness), their happiness and learning will improve. As a result, students' use of social media for cooperation will help them learn more effectively. These results contradict the findings of some previous studies that have found that social media usage results in lower levels of students' learning (Al-rahmi et al., 2015g). Through these results, we believe that they vary according to factors such as environment, culture, time and place of study. However, consistent with (Al-Rahmi et al., 2015a) (Janssen et al., 2010), both learners and students use social media to increase collaboration as well as to enhance students' learning. A network-based social media network is preferred since online tools of this kind have been recognized to possess noteworthy benefits to students' learning along with developing their skills via social interactions and perceptive engagement (Lockyer & Paterson, 2008). The findings are explored in terms of the approach to uses and gratifications, as well as the uniqueness of various social media and social networking sites (SNSs). In terms of intensity of use, daily time spent on the network, and use motivations, study examines the variations between Facebook, Twitter, Instagram, and Snapchat (Alhabash & Ma, 2017). Academics, on the other hand, looked to be lagging behind managers in terms of using Office 365 online services. In addition, social media use improved students' levels of engagement, which increased their respective academic outputs. Additionally, this finding is applicable for interactivity between the learners and their instructors, as social media facilitates the transfer of clarified instruction and information. Blog, forum, social network sites, bookmarking sites websites, video portals, and chat portals are examples of social media services that let users cooperate efficiently (Anandhan et al., 2018). Additionally, integrating the technology acceptance model with innovation diffusion theory is directly associated with students' actual use of social media and E-Learning websites (Al-Rahmi, et al., 2015d). Furthermore, in computer science education, online collaborative learning technologies primarily focus on delivering learning resources and creating an interactive simulation environment for learning (Al-Rahmi et al., 2020). Additionally, online engagement is shown to have advanced effectiveness compared to face-to-face learning, as demonstrated by the development of research skills and the exchange of ideas among students in online communities. Social media and massive open online courses (MOOCs) are also used by students to obtain essential instructions, including directions from their instructors/peers. Furthermore, using social media creates an atmosphere that is marked by engagement, which can help

the students work in clusters to complete tasks and to efficiently finish assignments, therefore enhancing their learning (Al-Rahmi, et al., 2015b) (Bermudez et al., 2016). Using accessible social media may also help instructors and students clear up their concerns, learn about current events, and provide global connectedness and competition (Al-rahmi et al., 2015g).

6 Conclusion and future work

Our questionnaire's key contribution was the development of a model and the measurement of students' education through social media activity. We proposed nine parameters to evaluate and analyze media platforms use among students in order to enhance their understanding via involvement in this investigation. Furthermore, students had higher trust in collaborating with group members to accomplish their learning assignments while using the social media network, resulting in increased involvement, participation, reason for using social media, usefulness, and accessibility of the use. Students can share data and understanding with classmates and instructors via media platforms. As a result, future research should expand on this finding. We believe that this study, as well as the consequences it entails, will serve as a first approach for creating successful student participation in higher education. Furthermore, according to the result of this research, social media platforms are accessible tools that may be used by all learners. As an outcome, we urge that future studies extends these methodologies and makes them adaptable to an universal educational environment so that they may be duplicated in a variety of contexts throughout the world. In conclusion, the following are the consequences of this study:

- Academic staff should promote students' use of media platforms in their educational approaches, and managers can encourage students to utilize social media to solve issues, exchange knowledge, and give input to better their educational experiences, productivity, and investigative abilities.
- It is recommended that institutions of higher education embrace learners who are acquainted with utilizing social media for studying rather than pushing those who are not to do so. This is due to the fact that educational institutions must include social media technologies into the learning experience.
- Both technologies and materials are important to students' views on social media use and overall intents to utilize it. Learners could take advantage of the opportunities to utilize social media to enhance their education.
- The findings of this research have been related to student perspectives, which may differ from instructor perspectives, and distinctions in research areas were not taken into account. Future research can duplicate this research in other countries and cultures to address its shortcomings and broaden its conclusions.

Authors contributions In this paper the contributions by single author.

Declarations

Competing interests section The author declare that they have no conflict of interest.

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