Regular paper

Impact of Social Networks in Educational Media

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Abstract

This study aims to determine whether student participation on Twitter affects academic performance. The key goals of the training course were to acquire social networking knowledge and skills and to learn how to share information, be productive in discussions, and create an interest-based community. The initial sample comprised 286 students from Jordan universities, 68.4% of whom agreed to participate in the study. Undergraduate students accounted for 73.9%, and graduate students accounted for 26.1%. Only 14.3% of the students chose the Twitter-based learning model. This is a mixed-methods study that integrates quantitative and qualitative approaches. The undergraduate students were found to tweet more and have more likes, while graduate students had more followers and were following more accounts. Moreover, 21% of the participants were the most active. Spearman's correlation analysis revealed a connection between participation in social media and student performance. Therefore, the results of this study may help educational professionals and education managers.

Index Terms: Educational media, Social networks, Social technology, Twitter, Higher education.

I. INTRODUCTION

Since the 1990s, education systems in many countries have been undergoing important changes toward the realization of a broader range of educational opportunities. Technologies for higher education have been promoted as a means having the potential to modernize the teaching and learning processes. Concepts of and approaches to technology-based learning are central issues focused on in the literature. Furthermore, efforts to support educators in terms of modifying education concepts will result in a faster and more effective transformation of the higher education system [1].

As an easily available and extensive educational resource, the Internet has begun to dominate educational tools in schools and universities worldwide, with gradual progress from autonomous computer labs to technology-integrated classrooms [2]. As computer programs become more sophisticated and gadgets become more ubiquitous and accessible, millions of students receive the opportunity to access high-quality educational resources. Students born in 2000 or later are now sometimes referred to as Generation Z or digital natives, and grew up with easily accessible technology [3]. Hence, it is not surprising that these students are easily seizing opportunities for technological innovation, including in education. However, the impact of the Internet and online educational resources on educators is largely dependent on the age and technological literacy of these students [4].

Researchers emphasize that the dissemination of static knowledge is the most ineffective way to use the Internet and new technologies. Educators should use the Internet not only for communication but also as an indispensable compo-

nent of the learning environment. Specifically, teachers need the global network to go beyond the classroom [2], initiate virtual tours, conduct simulations, hold additional video lectures, contact experts on social media, and connect with other classes around the world via videoconferencing. Such an approach to Internet use will help learners learn beyond the classroom walls through nonlinear interconnected structures [5].

As information and communication technologies have become the driving force behind the progress and success of countries in the last decade, it is not surprising that social media are among the modern tools used in education. Described as "a technology of communication and for creating and exchanging user-generated content" [6], social media facilitates the distribution of information and helps create a new media space wherein interaction is based on participation. Social media are also referred to as "Internet-based channels that allow users to opportunistically interact and selectively self-present, either in real-time or asynchronously, with both broad and narrow audiences" [7].

The importance of social media for the current generation has prompted researchers to investigate their use in education [8]. They are rapidly changing the communication environment and significantly influence the academic life of students. Educational institutions attempt to incorporate social media in the classroom to facilitate development of critical thinking, cooperation, and self-learning skills [9]. The current trend involves students integrating social media with the various aspects of their academic life, and teachers increasingly using social media for teaching and learning [10]. Social media help educators connect with students and trigger thinking and discussion outside the classroom. Furthermore, they encourage students to interact with one another and also increase student engagement with the course. Social media are characterized by a complex interaction between factors and outcomes associated with student learning, educational institution policies, and teacher–student relationships (Fig. 1).

Currently, social media for education are platforms through which students communicate with their teachers and peers. Web 2.0 tools are ubiquitous and include Facebook, Twitter, LinkedIn, Jing, Google, Pinterest, Wikispaces, Instagram, and other conversational platforms. As Web 2.0 tools are free, easily adaptable, and can be structured in a teacher-controlled environment, they are popular among teachers [11]. The potential to merge education systems with digital learning can redefine education in ways previously unknown. Social media are used for the purposes of reaching a wider audience, motivating students, and increasing the transparency of communication [12].

The use of social media facilitates collaborative learning, support of metacognitive skills, and a boost to self-regulation among students. Literature concerning the impact of
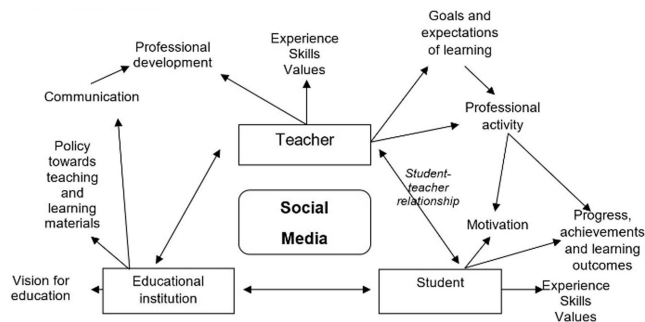

Fig. 1. Comparison between service disruption periods in each protocol: impact of link delay between local mobility anchor (LMA) and mobile access gateway (MAG). Conceptual model of interaction between factors and outcomes in social media learning, developed using data from (Van Den Beemt et al., 2020)

social media on the learning process and its participants states that social development is the most crucial factor in social media [13]. When combined with games, social media can facilitate scientific argumentation. Students can learn and practice argumentation via interactive and engaging environments [14]. Some of the main benefits of social media for improving student performance and educational improvement are [15-18]:

– *Communication and collaboration.* The biggest advantage of social media is that a student can connect with anyone at any time using a smartphone, tablet, or laptop. Learners can exchange questions, make calls, or send messages. Social media promote learning by offering access to shared documents, for example, on Google Docs.

– *Finding specific information on the Internet.* Social media provide information that can be useful to students. Through social media news feeds, students can find informational and relevant websites as well as answers to their questions.

– *Parental involvement.* Social media help parents stay involved in their children's learning. Through a school's Twitter or Facebook feed, parents can be updated on school-related activities, projects, and events, and be informed regarding school matters and learning processes.

– *Distance learning opportunities.* With the help of online tools and social media, today's teachers can engage students in distance learning, which has the potential to become an inseparable part of the modern education system. Lectures via Skype or webinars via WebinarJam provide students living in remote areas with access to education.

However, social media websites can have negative effects on learners, so it is imperative to exercise caution when implementing social networking and limit social media usage [19]. Particularly, social media websites can distract students from learning. This challenge impedes the success of Web 2.0 in higher education [20] and is the reason why many educators debate integrating social networking tools in

the classroom [8]. Many studies have involved asking students and teachers about their views regarding usage of social networking in education.

The use of social media for instructional purposes will have a positive effect on student achievements; yet, higher educational institutions resort to traditional platforms such as Course and Learning Management Systems (CMS/LMS) that do not include the pros of social networking, such as the ability to keep in touch with peers. One of the factors limiting the adoption of social media in higher education is that the full responsibility for the use of social media lies with teachers. The teachers are expected to independently explore the possibilities of using social networking in the formal learning setting [21]. Often, students express the idea that teachers do not have sufficient skills and knowledge to implement social networking tools. The participation of teachers on social networks and the use of humor in posts, on the other hand, have a positive effect on student engagement with those teachers' classes [22]. Besides the lack of experience and knowledge regarding social networking [23], there is often no adequate infrastructure, time, or ability to ensure student privacy and security. However, the negative impacts of social media can be reduced with careful planning and management [24]. There is ample evidence to suggest that social networking can be used to promote and improve learning and create an online learning space [25].

With regard to concrete social networks, many studies explore the capabilities of Facebook, the world's foremost social networking application, which allows for building social relationships based on personal and professional interests. Research shows that Facebook can impact learning positively if implemented to showcase and advertise educational projects and to seek out collaborators [26]. Facebook supports student learning by offering tools to seek content, connect with third-party experts, and create digital artifacts. Teachers can promote students' positive attitudes toward learning by allowing them to find resources, help friends answer questions, and share notes via Facebook or other social network platforms.

Notably, students mostly appreciate Facebook functions such as engagement, communication, and cooperation [27]. Through social networks, teachers can strengthen their relationships with students and thus improve student engagement [22]. This effect stems from communication and instant feedback [28]. An interesting research case is the use of Edmodo, a closed classroom community where students have unlimited access to personalized learning environments and teachers can post class assignments [29]. Twitter and Instagram, with their hashtags and tweets, are well-known microblogging tools used to collaborate with other learners online, quickly exchange ideas with students, and discuss lectures [30]. Learners can use these platforms to share their ideas about educational matters and observe the responses of large audiences.

On exploration of the local use of social media, it was found that Facebook is gaining popularity as a learning environment in Mexico and South Korea. Social networking as a communication phenomenon resulted in the creation of virtual communities wherein people can discuss a range of subjects. The use of social networking tools facilitated the development of inclusion strategies and sociocognitive skills [9]. In Mexico and South Korea, social media are used primarily for communication (58.3% and 45.5%, respectively) content sharing (25% and 20.5%), content creation (12.5% and 20.5%), and social capital formation (4.2% and 13.6%, respectively). Studies in East Asia report a rather ignorant attitude toward the use of social media for learning [31-33], whereas Western researchers indicate that students express both enthusiasm and privacy/security concerns [34]. A U.S. study on the role of online communities and social media in education found that most participants (Saudi females) enjoyed communicating via social media because this method of interaction promoted co-learning and cultural dialogue [35].

The foregoing defined the choice of research topics and research objectives. This work aims to examine how social media networks (e.g., Twitter) affect the performance of undergraduate and graduate students in the context of continuous assessment.

II. SYSTEM MODEL AND METHODS

The key objective of the study was to determine whether students' participation in social networks affected their performance. To this end, attention was paid to Twitter as the most popular social network in Jordan, more so because its short messaging feature met the goals of education, such as promoting communication skills, engaging students in discussions, and enabling instant feedback. As Twitter has a 140-character limit per tweet, tweets can be easily showcased for learning purposes. This meets the goal of modern education, that is, to study anywhere at any time.

Master's- and bachelor's-level courses took one semester. Virtual lessons were held using Blackboard, a flexible cloud environment that can easily adapt to meet the needs of blended learners [36]. LMSs are widely implemented in Jordan universities.

In addition to virtual class sessions, face-to-face consultations were held, and discussion-board assignments were provided. The key goals of the course were to acquire knowledge and skills of social networking and to learn how to share information, be productive in discussions, and create an interest-based community.

Student interest in interactions was considered a crucial factor. Hence, students were allowed to choose their pre-

ferred options for learning: virtual classroom sessions or Twitter-based learning.

The purpose of continuous assessment was to motivate students to create and maintain a Twitter account. Students were asked to select additional resources of social and educational interest and use hashtags when tweeting about learning. They were also encouraged to use the functionalities of the Scoop.it platform. Its content engine monitors global sources and uses artificial intelligence to understand the meaning and impact of the content found [37]. If students followed all the latest news within their chosen niche, they would find themselves overwhelmed with RSS feeds and tweets. To address this, the platform enables content curation [38]. For research purposes, it was sufficient to use functionalities of the basic Scoop.it account.

A. Sampling

The initial sample was composed of 286 random students who were invited to participate in the study. Of these, 68.4% (n = 196) agreed to participate. Most participants (73.9%) were men. Undergraduate students accounted for 73.9%, and graduate students accounted for 26.1%. Of all the participants, 14.3% (n = 41) participated in Twitter-based learning. The sampling error in the worst-case scenario (p = q = 0.5) was 1.2% for the total sample and 4.5% for students who participated in Twitter-based learning (Table 1).

B. Research Design and Tools

The study involves a mixed-methods design in which quantitative and qualitative data were obtained via statistical descriptive analysis, statistical relational analysis, and content analysis. Data processing was performed using SPSS Statistics [39]. Academic performance of participants was measured through academic achievements or grades, and Twitter activity metrics were obtained with application programming interfaces (APIs). The final grades and continuous assessment scores were processed at the end of the academic year 2019. Concurrently, the following metrics were extracted: number of tweets, number of followers, number of followed accounts, and likes. Among other objectives, the study aimed

to determine whether students continued to use Twitter for learning after completion of the course (whether the account was still active and whether new tweets were posted).

The relational analysis was based on averaged contrast values from an independent sample t-test. Factorial analysis of variance was employed to determine the effects of academic level and the type of continuous assessment activity. Spearman's correlation analysis [40] was used to analyze Twitter engagement, student performance, and duration of student involvement. Between-sample differences were found using a Mann-Whitney U-test [41]. The qualitative study involved analyzing how discussions were organized. A content analysis of tweets posted to the discussion board was performed. All tweets were grouped into topic clusters.

C. Limitations

Twitter imposes technical limits on tweets sent and received. Simultaneously, data were collected from a single source (i.e., API), which may affect accuracy. However, this limitation is not critical.

D. Ethical Issues

Each participant consented to participate in data collection and use. Information regarding personal achievements is confidential and is not disclosed.

III. RESULTS

According to a survey of students, the most popular social networking sites are as shown in Fig. 2.

Students use social networks mostly for communication (53.3%). Education accounted for 10.2% of the responses (Fig. 3).
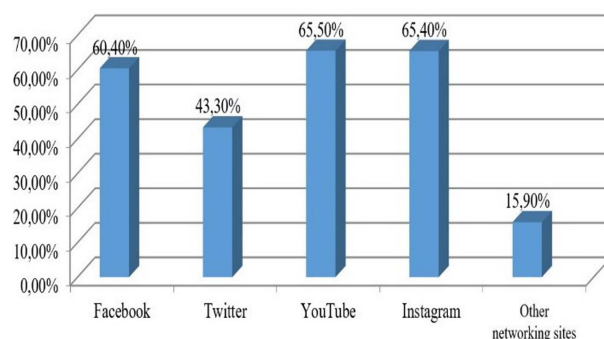
Table 1. Sampling and participants (developed by the authors)

Participants	Initial Sample		Final Sample		Participants in Twitter-based Learning	
	number	%	number	%	number	%
Bachelors	209	72.9	145	73,9	34	83.9
Masters	77	27.1	51	26,1	7	1.6
Total	286	100	196	68,4	41	14.3
Sampling error			1.2%		4.5%	

Fig. 2. Statistics of social media usage among students, % (developed by the authors)
Note: Students were allowed to choose more than one option; other services included Pinterest, LinkedIn, Cloud, Podcast, Wikis, and Blogs.
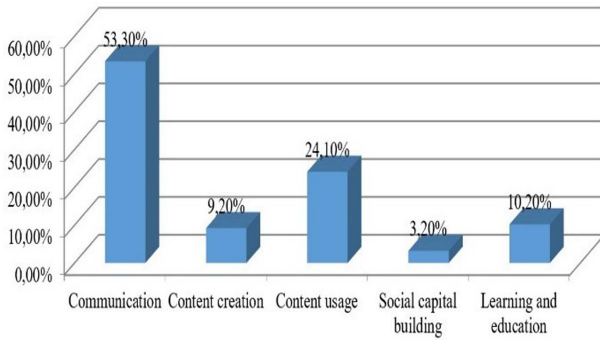
Fig. 3. Students' perspective on the uses of social media, % (developed by the authors).
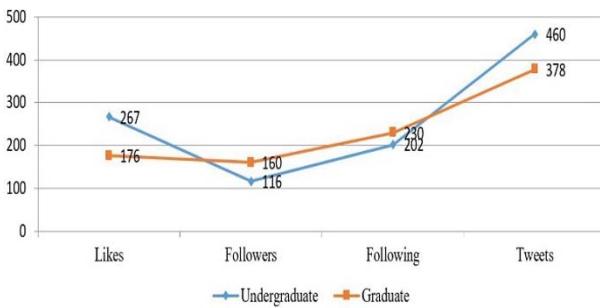

Fig. 4. Averaged results from descriptive analysis of Twitter activity (developed by the authors).

The analysis revealed that graduate students received higher scores [F (0.018) t = -7.224, sig. (bilateral) = 0.000], as evidenced by the Mann-Whitney U-test (0.000). Regarding Twitter activity, undergraduate students tweeted more and had more likes, while graduate students had more followers and were following more accounts (Fig. 4).

The Mann-Whitney U-test (0.003) results revealed a significant difference in the following [F (3.478) t = -2.254, sig. (bilateral) = 0.025]. The descriptive analysis showed that 56% of the participants were practically inactive on Twitter, 22% were engaged in traditional assignments, and 21% were

the most active on social media during the study. At the same time, active students had higher grades than those who were not active or focused on traditional sessions. Differences concerning continuous and final examinations are very significant ([F (7.030), sig. (bilateral) = 0.001]). Post-hoc tests showed differences between students who completed their tests and assignments using social media, students who completed them in virtual classrooms (sig. 0.023), and students who did not reach the completion level (sig. 0.001). Despite significant differences, an ANOVA showed a weak effect on the test score (Table 2).

Although active participants accounted for only 21% of the total participants, the average activity was rather high: student accounts had an average of 224.3 followers, 394.1 tweets sent over the course of the study, 190 likes, and 154.8 followed accounts. Spearman's correlation analysis revealed a significant relationship between participation in social networks and academic performance. The correlation between variables was significant at the 0.01 and 0.05 levels.

The use of social media was found to have a short-lasting positive effect on student involvement after completion of the learning activity. For instance, 85.1% of students maintained their Twitter accounts for four months after training. Two months later, the percentage of students who continued to tweet fell to 42%.

The analysis of student activity on discussion boards shows a steady downward trend during the study period. In the last month, students were the least engaged. The highest percentage of involvement was recorded during the first month of learning. During that period, students posted 51.2% of all messages (Fig. 5).

Notably, undergraduate students posted more tweets at the beginning of training (more than 60% during the first month), while graduate students were more active in the third month, posting more than 40% of the messages. The activity of graduate students increased a month before the final exam, which can be explained by the intent to obtain a higher score (Fig. 6).

Table 2. Tests of between-subject's effects (developed by the authors)

	Dependent variable	Type III sum of square	df	Standard deviation	F	Sig	Partial Eta-squared	Effect
Corrected model	Test score	40.9[1]	2	20.5	7	0.001	0.007	0.91
	Continuous assessment score	31925.1[2]	2	15962.5	14843.0	0	0.94	1
	Final grade	606.7[3]	2	303.4	104.9	0	0.098	1
Intercept	Test score	63381.0	1	63381.0	21815	0	0.93	1
	Continuous assessment score	47391.5	1	47391.5	44066.5	0	0.96	1
	Final grade	73901.9	1	73901.9	25539.4	0	0.93	1
Type of continuous assessment	Test score	40.7	2	20.3	7	0.001	0.007	0.91
	Continuous assessment score	31924.9	2	15962.5	14842.6	0	0.94	1
	Final grade	606.7	2	303.4	104.9	0	0.098	1

Note: [1] $R^2 = 0.007$ (adjusted $R^2 = 0.006$); [2] $R^2 = 0.938$ (adjusted $R^2 = 0.937$); [3] $R^2 = 0.098$ (adjusted $R^2 = 0.097$); computed using $\alpha = 0.05$.
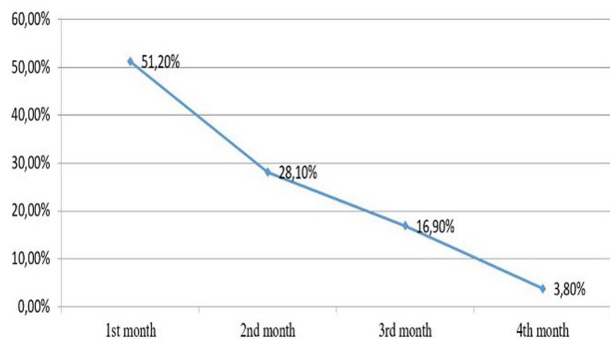
Fig. 5. Discussion board posting activity per month, % (developed by the authors).
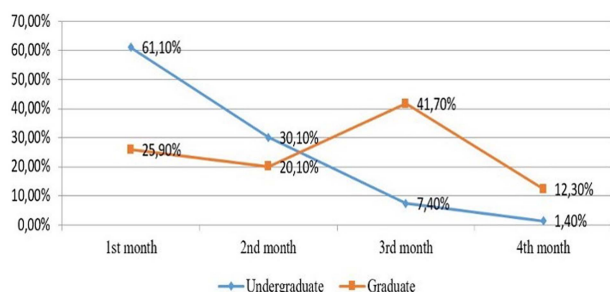

Fig. 6. Results from timeline analysis of discussion forum activity, % (developed by the authors).

The content analysis of messages posted to discussion boards revealed that undergraduate and graduate students shared a three-phase behavior pattern. At the same time, students tended to prioritize tasks. The *initial phase* of discussion was characterized by maximum involvement. Students asked questions to commence the assignment. The majority of these questions (31.8%) concerned the duration of the assignment or discussion schedule. Many organizational and technical issues were revealed.

Students asked how their Twitter URLs could be shared via Google Drive (26.8%) and how the topic (15.1%) could be adapted. They also expressed uncertainty (7.2%) and asked about creating a Twitter account to complete the assignment (8.3%). Undergraduate students raised concerns about using Google Drive and expressed uncertainty (18.1% and 3.9%, respectively), while graduate students were more concerned about when the assignment would commence (19.8%) and how long it would last (9.9%). As the deadline neared, the frequency of messages from graduate students increased. Through feedback, teachers provided students with information about the requirements as per the course outline.

In the *intermediate phase*, participants continued to use Twitter to seek clarifications regarding technical issues related to assignment completion (27.9%), the use of hashtags (19.9%), and read receipts (18.1%). Graduate students were worried about the timing of assignments (18.2%)

and requirements for bibliographical references (4.1%). Undergraduate students had trouble dealing with the functionality of the social networking site. They also tended to seek teacher approval and confirmation that assignments were completed correctly. Through feedback, teachers offered guides, document reminders, and links to discussion boards and video tutorials for Twitter beginners. The *final phase* witnessed minimum involvement. In this phase, the key questions asked concerned reports, how these had to be sent (41.9%), and assessments (24.8%). Approximately 33.1% of the activity within discussion forums was concentrated around knowledge application threads created by the teacher.

IV. DISCUSSION AND CONCLUSIONS

The use of social media as a learning tool was previously investigated by retrospective analysis. The focus was on engagement, learning community building, and perception [42]. Multicase blended research employed seven social media platforms (Pinterest, Facebook, Twitter, YouTube, LinkedIn, Second Life, and Skype) to explore how social media reinvigorate the traditional and online learning experience. Based on students' perceptions, a matrix was built to help conceptualize the social aspects of interaction, community, and attitude toward learning. Students were found to have an increased sense of involvement in joint projects on social media, which suggested that social networks can be used for employment. A focus group study provided a model for determining whether social media are an appropriate or inappropriate tool for classroom use [43]. The results showed that students were willing to use social networking sites for educational purposes if they were deemed suitable, that is, if these could be used without personal information being required. These were the most effective tools available and could be applied voluntarily.

The use of social media for teaching is a topic of academic interest. Simultaneously, this practice is challenged by insufficient Web 2.0 media literacy and confidentiality issues [11]. In 2016, an online survey was conducted among a sample of U.S. students; the results showed that social media was useful for communication, gathering information, and academic work [44]. The survey results analyzed using the structural equation modeling (SEM) method revealed a statistically significant negative relationship between time spent on social media and student performance. The attention span was correlated with characteristics that defined or influenced student behavior, such as perception of social networks, likes and dislikes, and ease of social media use. As a result, researchers suggested employing Book2U to improve the effectiveness of training, a platform which is easy to use if sufficient computer skills are lacking [45].

There exists a large body of research on the impact of social

media on motivation in learning. Many studies revealed that social media, especially Facebook and Twitter, have improved student motivation and engagement. The more students used Facebook, the more they felt connected to other students. Furthermore, the number of tweets sent during the study positively correlated with student engagement. Student achievements and the overall learning outcomes were found to have a positive relationship with student interaction and academic engagement [46]. A 2017 study on how social media contributes to teaching and learning incorporated Twitter and blogs into two training courses designed for students of Mzuzu University in Malawi.

The results showed that when deployed properly, Twitter and blogs are conducive to student-centered learning. Students were found to share and discuss learning materials, post their ideas, and communicate with one another and with their teachers. The fact that Twitter has a 140-character limit per tweet resulted in the promotion of critical thinking. Specifically, students had to learn how to express their points of view using a limited number of words or symbols [21].

Notably, student participation on Twitter or other social networking sites for learning purposes has the potential to help students expand their social capital on the Internet [47] and facilitate learning [32]. A significant finding is the use of social media, especially Facebook, for lesson planning. Research on writing and language highlights the improvement in student achievements and the growth of student interest in using social media for education [48]. The effective use of Facebook for teaching depends on a range of crucial factors such as curriculum, teacher attitude, and technical support. Without these, the potential of social media is unlikely to be unlocked.

The study found that undergraduate and graduate students performed similarly and had similar Twitter engagement scores, suggesting that academic level has little impact on involvement or performance. Data from comparative analyses of student activity provide teachers with the opportunity to adjust their social-media-based learning activities. It can be concluded that at present, Jordan universities pay insufficient attention to the promotion of student cooperation. The majority of students were found to prefer more traditional activities such as the analysis of learning materials rather than interaction on the platform. It is clear that the opportunity to participate in social media did not spark interest among the majority of students: only 14.3% of learners chose to learn in a Twitter-based environment. Students who completed Twitter-based assignments obtained higher continuous assessment and final grades. It was found that the higher the Twitter involvement, the better the student performance.

Despite the learning outcome, the availability of social media tutorials and the rise in awareness regarding the usefulness of social networking did not guarantee long-term engagement with Twitter after completion of the study. Most students (85.1%) retained their Twitter accounts, but more than half the participants reduced their activity two months after the end of the course.

Although the academic level of students had little effect on student participation on social media, the qualitative research disclosed a need to include a diverse range of learning activities to meet the academic level of the target audience. For example, undergraduate students demand precise instructions concerning the completion of assignments in social media. A variety of technical issues can affect the continuity of learning and learning outcomes. In the initial phase of work, teachers should be very specific regarding the duration of the assignment, the use of hashtags, and the attraction of followers or subscribers. Continuous technical support and timely feedback are essential elements of social media interaction between teachers and students.

Future research on social networking for students should consider variables such as the clarity of instruction and the suitability of learning activities. This study explored the practical and functional aspects of student activity on the platform. The goal was to teach students to interact on Twitter and form learning communities. Future work could examine the analytical component to make student participation more reflective and critical. Academic discussions on Twitter could be scheduled for a longer period of time, and the role of educators should be more prominent. This will permit better analysis of the teacher's role in student participation in social media.

Overall, the results of the study may be of interest to teachers and the management of educational institutions. To promote the use of social media in education, higher educational institutions should be informed about social media usage, associated trends, student perceptions, and best experiences in this field.

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