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Original Article

The Relationship between Social Media Usage and Academic Performance among Medical Students: A Cross-sectional Study

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ABSTRACT

Background: Social media applications and their use among students have increased in the last decade. However, their impact on academic performance remains unclear. This study aimed to investigate the relationship between social media usage and the academic performance of medical students at Fazaia Ruth Pfau Medical College, Karachi, Pakistan.

Methods: This is a cross-sectional study pertaining to 200 medical students' viewpoints of 2nd to 4th-year medical students of Fazaia Ruth Pfau Medical College in 2023. A research-made online questionnaire consisting of four demographic questions and three main components was designed to gather data. The data was collected from January to February 2023, and all 300 participants were asked to fill out an informed consent before participating in the study. Finally, 200 participants filled out the questionnaires completely. The Microsoft Office Excel software kit and SPSS Version 24 were used for data analyses.

Results: The students' most commonly used applications were YouTube, LMS (Moodle, etc.), Osmosis, WhatsApp, Instagram, Twitter, and Facebook, respectively, with an average of 4 to 5 hours using these applications for educational purposes. The survey also revealed that 54% of participants prefer e-learning, while 46% still value traditional books for comprehension. Using social media for educational activities showed a positive relation with academic performance (P=0.024).

Conclusion: It appears that the practical use of social media could significantly influence students' academic performance. According to the findings of this study, YouTube is the most crucial social media platform for students. This suggests that students prefer video-based platforms, and it would be advantageous to consider this for future educational planning and virtual learning.

Keywords: Social Media, Academic Performance, Grades, Students, Medical, E-learning

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Introduction

Social media is a network of websites and online applications that enables individuals to enhance information sharing, communication, and knowledge available on the World Wide Web. The impact of social media on students' academic performance is multifaceted. It presents educational advantages, such as providing access to resources, but it also poses distractions and raises mental health concerns. Educational institutions can assist by encouraging responsible use of social media, establishing distraction-free study environments, and providing instruction on digital literacy. Transparent discussions about the challenges posed by social media are essential (1).

Recently, hand-held devices have become increasingly popular among university students, including medical students. With the advancement of technology, social media such as e-books, online e-apps, and social media platforms have become easily accessible for university students, and medical colleges are promoting e-learning in their curricula. Many social media applications are used by students for their knowledge and clinical skill training, such as Facebook, Twitter, YouTube, Skype, etc. (2). According to a global survey in 2016, there were 2.31 billion social media users, representing a 31% global networking (2). One study reported that 90% of college students use Facebook (3). Cox and McLeod, in their study in 2014, observed that social media allows interactions between teachers, parents, and students and helps create an online learning network (4). Studies have reported that university students commonly use Facebook and WhatsApp applications. Social media usage among the age group of 18-29 years increased from 12% in 2005 to 90% in 2022 (5).

Academic performance can be positively or negatively impacted by how individuals use social media. Excessive use of social media can lead to addiction, especially among female users, as demonstrated by Azizi and colleagues in their study (6). On the other hand, Al Rahmi demonstrated in his research that student performance improved when social media was used responsibly, without excessive reliance (7). Dumpit and Fernandez, in their study, suggested that using social media encourages independent self-directed learning and the active production of knowledge (8).

Ali Elsayed stated that Students enrolled in medical colleges exhibited significantly greater awareness of how social media could distract them from their studies, impacting their daily routines. Additionally, they recognized that they cannot rely solely on social media for information, unlike their counterparts in non-medical fields (9). In the post-COVID era, almost all the school systems started online teaching and later on carried the hybrid system of teaching; as much as it has helped students, it also made clear that face-to-face teaching and one-to-one interaction between teacher and student is imperative to better understanding of the subject. The students, however, have developed the habit of using social media as a learning resource. It is still too early to predict its short and long-term benefits or disadvantages. Therefore, studies are needed to closely monitor the students' progress in academics and their choice of learning medium. This information would help to formulate their academic program accordingly for better outcomes. No such data is available from our region regarding these incentives, which justifies our study.

This article aims to examine the connection between the use of media tools for studying and the academic performance of medical students. It addresses four main questions:

- Is there a relationship between the use of social media and average grades of students?
- What learning resources do students prefer (printed or electronic)?
- Is there a difference in the learning resource preferences of students based on their average grades?
- Which social media platforms do students use the most?

Methods

Study Design and Setting

The present study is a cross-sectional study

of medical undergraduates at Fazaia Ruth Pfau Medical College, Karachi, Pakistan, conducted from January to February 2023. The chosen sample was then used for data collection, entry, and analysis.

Participants and Sampling

All medical undergraduates at Fazaia Ruth Pfau Medical College in the 2nd, 3rd, and 4th years of the MBBS (Bachelor of Medicine and Bachelor of Surgery) program who volunteered to complete the questionnaire were provided informed consent to participate in the study. Students in any other degree programs except MBBS were excluded from the study. The students who did not volunteer to complete the questionnaire or participants who filled out less than 80% of the questionnaire were also excluded.

The total number of students who met the inclusion criteria for the study was around 300. Based on the Morgan and Krejcie table and the Cochran formula, the estimated sample size was 169. However, considering the possibility of sample attrition and non-response in survey-based research, the researchers distributed the questionnaire to all 300 students. Ultimately, 200 students completed and returned the questionnaires.

This determination is based on statistical considerations for an effective and accurate representation, aiming for a 95% confidence level with a 5% margin of error. We utilized the finite population correction formula to determine the sample size for our survey. Additionally, a pilot testing phase was conducted with a small group of participants similar to the target population to assess the questionnaire's clarity, relevance, and comprehensibility.

Tools/Instruments

A research-made questionnaire was designed to collect data from the participants' views. The questionnaire included 2 sections of demographic data (age, gender, year of study, and average grades) and 3 main components: purpose of time spent on social media (educational/ recreational activities), preferred learning resources (printed books/e-resources), and preferred social media platforms (YouTube, LMS/Moodle, WhatsApp, Instagram, Twitter, Facebook, and Medscape).

"Grade" in demographic characteristics refers to the marks students receive in their annual exams, indicating their level of understanding and proficiency in their studies.

Validity and Reliability - Before administering the questionnaire to the full sample, a pre-testing phase and questionnaire for refinement were conducted over a week. A small, selected sample of students (included in the final study) was asked to complete the questionnaire. This pre-testing phase helped to identify any ambiguities, misunderstandings, or issues with the questionnaire's design, which were addressed and rectified (Face validity).

The Content Validity Index (CVI) of 0.8 was calculated from 10 educational experts. Based on the proportion of items rated 3 or 4, indicating a high level of agreement on relevance and clarity. Additionally, the Content Validity Ratio (CVR) was computed, resulting in an average of 0.58, confirming the necessity of the included items. These measures collectively validated the content of the survey instrument.

Data Collection

A total of 200 medical undergraduates completed the e-questionnaire. Participants were allowed to complete the questionnaire using electronic devices such as phones, tablets, or computers, making it convenient for them.

Data Analysis

We used Microsoft Excel and IBM-SPSS version 23 for data analysis. The calculation of Pearson's correlation coefficients was done to explore relationships between variables (e.g., time spent on social media and academic grades), and the use of statistical tests such as the Chi-Square ($\chi 2$) test. A P-value of ≤ 0.05 was considered as significant.

Ethics – All medical students in the MBBS program who volunteered to complete the questionnaire were given informed consent to participate in the study. Ethical approval was obtained from the Fazaia Ruth Pfau Medical College Research Committee, and all the selected participants were provided with information about the study's purpose and procedures before participating.

Results

Demographic Characteristics

The final sample in this study comprised 200 participants. Among them, 60% were female, and 40% were male. Most participants (60% in both male and female groups) fell within the 19–21 age range (Figure 1). The majority of participants were in their fourth year of the MBBS program. The status of the study year and average grade of students are shown in Table 1.

Findings from Research Questions

Question 1. Is there a relationship between the time spent on social media and average grade of students?

As Table 2 shows, students spend different amounts of time using social media for educational and non-educational purposes.

There was a statistically significant relationship between time spent on social media use for educational purposes and the grades (P=0.024), suggesting that students who used social media for educational purposes could perform well in the assessments at the end of the course.

In the study, participants' recreational social media usage time varied, as 32.50%

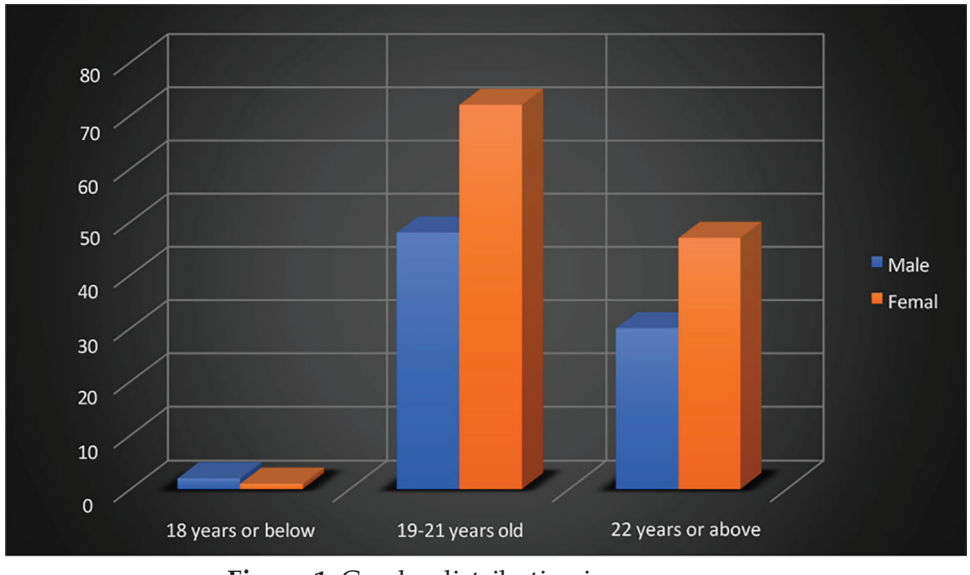

Figure 1: Gender distribution in age groups

Table 1: Distribution of students in the academic year

Variables	Gender (N=200)				Total	
	Male (80)		Female 120)			
	No.	%	No.	%	No.	%
Year of study						
2nd year	19	23.75	17	14.17	36	18.00
3rd year	29	36.25	44	36.67	73	36.50
4th year	32	40.00	59	49.17	91	45.5
Average grades						
Above 80%	10	12.50	23	19.17	33	16.50
Between 70-79%	48	60.00	74	61.67	122	61.00
Between 60-69%	19	23.75	21	17.50	40	20.00
Between 50-59%	1	2.50	1	0.83	3	1.50
Less than 50%	1	1.25	1	1.25	2	1.00

Table 2: Relationship between the time spent on social media and average grade of students

Time spent on social media * Average grade	Gender				Total (200)		P value
	Male (80)		Female (120)				
	No.	%	No.	%	No.	%	
Purpose of educational activities							
Less than 2 hours	16	20.00	15	12.50	31	15.50	0.024
Between 2-3 hours	23	28.75	43	35.83	66	33.00	
Between 4-5 hours	37	46.25	55	45.83	92	46.00	
Between 6-7 hours	3	3.75	5	4.17	8	4.00	
More than 7 hours	1	1.25	2	1.67	3	1.50	
Purpose of recreational activities							
Less than 2 hours	33	41.25	32	26.67	65	32.50	0.631
Between 2-3 hours	28	35.00	35	29.17	28.35	14.18	
Between 4-5 hours	14	17.50	30	25.00	44	22.00	
Between 6-7 hours	3	3.75	15	12.50	18	9.00	
More than 7 hours	2	2.50	8	6.67	10	5.00	

of students spent less than 2 hours while only 5% spent more than 7 hours on these activities. Based on the P-value of 0.631, there is insufficient statistical evidence to support that using social media for recreational activities significantly impacts students' grades (Table 2).

Question 2. Which type of learning resources do students prefer (Printed or electronic)?

Most students relied on study resources for both formative and summative assessments. There was a significant difference in students' choice of printed books or electronic resources, with approximately 53.50% in favor of e-resources, compared to those who primarily used books, i.e. 46.50%. The chi-square test results of $\chi 2 \approx 53.685$ (with the degree of freedom=1) and a p-value of 0.028 strongly support a significant association between students' preferences for study resources and the choice of e-resources over traditional books (Table 3).

Question 3. Is there a difference in the learning resource preferences of students based on their average grades?

As shown in Table 4, a higher percentage of students who preferred e-resources achieved grades between 70-79% compared to those who preferred learning through printed books.

Question 4. Which social media platforms do students use the most?

As Figure 2 shows, YouTube (i.e., 47.84% ~ 48%) and LMS/Moodle (~35%) were the most commonly used social media platforms

Table 3: Difference between the Preferred learning resources by the students

Learning resources	Total Students (200)		$\chi 2$	P value
	No.	%		
Printed books	93	46.50	53.685	0.028
E-resources	107	53.50		

Table 4: Students' preferred learning resources according to their average grades

Preferred learning resource * Average Grades	Printed books		E-resources	
	No.	Percentage	No.	Percentage
Above 80%	20	21.51	13	12.15
Between 70-79 %	52	55.91	70	65.42
Between 60-69 %	18	19.35	22	20.56
Between 50-59 %	3	3.23	2	1.87
Total	93	46.5	107	53.5

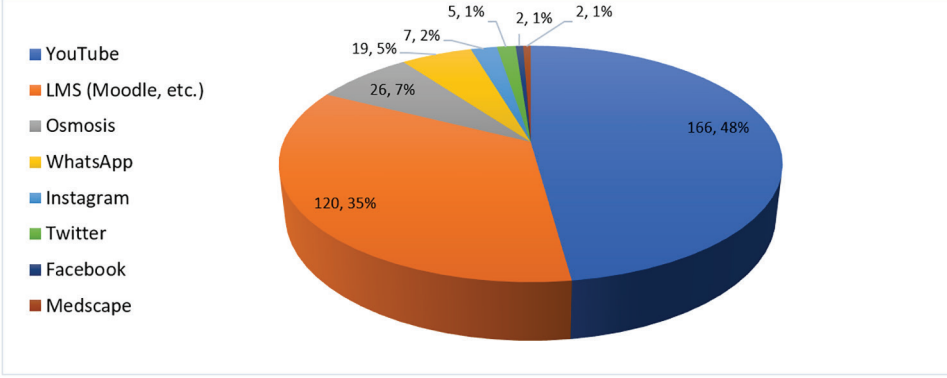

Figure 2: Preferred social media platform used by students

by students, and the least used platforms were Twitter (~5.1%), Facebook, and Medscape (~2.1%).

Discussion

In the past decade, social media platforms and their user bases have experienced significant growth, becoming an essential part of students' daily lives. The findings of our study offer several intriguing observations. Medical students typically rely on textbooks and their notes to study for exams. The resources provided on the e-learning website serve as supplementary sources of information for the students (5, 10). The education level and gender are also being added to make it more comprehensive.

According to a study conducted in Pakistan, excessive use of social media leading to addiction can increase academic procrastination, decrease both sleep time and quality, and ultimately lead to higher levels of academic stress. A notable correlation was observed between the utilization of social media for educational purposes and students' current academic performance (11). The growing interest of the younger generation in integrating social media into their studies is supported by the endorsement of medical educators who emphasize using social media as educational resources to improve learning and academic performance among medical students.

Our findings showed that providing e-learning material through YouTube, Facebook, Osmosis, Instagram, and other apps was popular among students as informative learning aids, as 53.50% of students used social media applications for studies. E-learning allows students to access a wider range of learning materials and mediums, which has become increasingly important, especially after COVID-19. However, 43% of students still express a preference for traditional books. Employing social media as an e-learning tool enhances the likelihood of cultivating learners with diverse skills, including the ability to generate ideas, articulate arguments, engage in opinion exchanges, and foster critical thinking. However, there is growing apprehension about the ability of e-learning to support effective learning consistently. Research indicates that students learn better when they take a deep approach to learning rather than a superficial one (12). The rise of social media has led to decreased participation in outdoor activities among students, raising concerns about their physical health (13).

This study reveals that YouTube is the most commonly used social media platform by the participants. Most users (47.84%) reported using YouTube, which indicates the platform's growing popularity among students. This finding is consistent with the fact that YouTube has the largest number of users worldwide. Meanwhile, only 0.58% of participants reported using Facebook. This suggests that students adapt their e-learning methods to keep up with advancing technology. A study conducted in China revealed that Facebook is the favored platform for learning among students (13). Studies in Europe, Asia, and the United States have also shown Facebook

as the most followed site for college-going students (13, 14). Social media applications continuously update their features, enhance their user experience, and broaden their information accessibility to attract a larger user base and establish themselves as more popular than other platforms.

Approximately 7.5% of users prefer Osmosis for e-learning. This application provides videos, quizzes, flashcards, notes, and various other materials covering various medical and health subjects, including physiology, pathology, pharmacology, and clinical practice. In this study, 5.48% of participants were identified as users of WhatsApp. WhatsApp is a versatile platform that enables users to communicate, form peer groups, discuss and obtain feedback, and share information about medical education. Instagram, on the other hand, is only used by 2.02% of participants. This platform enables users to share photos, comment on them, and send messages to other users.

Many students currently use social media platforms for various purposes, such as browsing news, fashion, or sports during their spare time. However, it is worth noting that, based on our findings, 47.84% of students did not deactivate YouTube even during crucial periods like exams. This statistic highlights the strong dependence of students on YouTube, which can be attributed to its rich collection of video content and its ability to enhance the learning process through visual and auditory aids. Despite its benefits, addiction to social media, including YouTube, has been linked to decreased academic productivity among students (15). In contrast to YouTube, the Edmodo application has received criticism for its plain and unappealing layout, as well as its slow response times. Furthermore, one major drawback of Edmodo is the absence of text messaging features, which limits its functionality as a communication tool for students and educators. These limitations have led to user dissatisfaction and hindered the overall user experience.

Our research contradicts previous studies indicating a negative relationship between social media or YouTube (15, 16) and students' grades. These studies linked this adverse correlation to students spending too much time on social media, engaging in activities like chatting with friends, commenting on posts, and social interactions instead of using social media to supplement their university lectures or seek resources to enhance their medical knowledge. However, some studies have found positive effects of social media (17, 18) or YouTube on students' grades. These studies explained the favorable correlation by highlighting students' use of social media for academic purposes, such as collaborating with peers to complete assignments and fostering enhanced interactions with their teachers. Therefore, it functioned as an electronic learning tool rather than a source of distraction. Time spent on social media positively correlated with time spent on YouTube, reflecting the common features of these social media applications and students' use of multiple social media (18). In a recent cross-sectional online survey in Babylon, Iraq (19), the use of social media among 2nd-year medical students was 100%, and 42% of them thought that social media had a positive effect on their academic performance, while 33% believed that it had a negative effect, and the remaining 25% thought that social media did not affect their university grades at all.

Furthermore, students also need to be sensitized about the negative implications of social media early in their medical profession. Major negative aspects and barriers to the use of social media include addiction to social media, which acts as a distractor and diverts the attention of the students. Individuals have to update their profiles continuously, and the sharing of personal information increases cyberbullying, which is very stressful and has bad effects on the personal mental health of youth (20). Cyberbullying can have severe adverse effects on the behavior of learners. The impact of multitasking and managing social media during academic activities varies in terms of their effects on academic performance. Students who use social media excessively struggle with face-to-face communication (21, 22).

Limitations and Suggestions

The findings of this study apply to a specific group of medical students from Fazaia Ruth Pfau Medical College in Karachi, Pakistan. It should be acknowledged that these findings do not provide a comprehensive representation of all medical students or individuals from diverse educational backgrounds, cultures, or geographical regions. The data collected in the study could be influenced by biases and inaccuracies, as students do not always provide completely honest or accurate responses, especially when discussing their social media usage and academic behaviors. Additionally, our study considered all social media platforms together without considering their unique features. A more detailed analysis of individual platforms could provide valuable insights into their impact on academic performance.

To further enhance student engagement and cater to their evolving preferences, conducting continuous research and adapting e-learning methods is crucial. This will ensure that educational platforms align with technological advancements and cater to the needs of students. Addressing social media addiction and its impact on academic productivity is also essential. We need to develop effective strategies and programs that raise awareness about the negative effects of excessive social media use, such as cyberbullying and distraction, which can help students optimize their social media usage for educational purposes. Medical educators can also play a significant role by incorporating social media constructively into the medical curriculum. This can be done by developing learner-centric modules and implementing effective learning strategies that utilize social media platforms, thereby enhancing student engagement and facilitating a more interactive learning experience.

Conclusion

Students are increasingly using social media for both academic and non-academic purposes. Our study revealed that using media tools positively impacts the grades of medical students of Fazaia Ruth Pfau Medical College, Karachi. Accordingly, the practical use of social media could significantly influence students' academic performance. Our research also revealed that YouTube is the most preferred social media platform among students, indicating a preference for video-based platforms. Therefore, it is important for virtual learning and educational planners to consider the significance of YouTube, as well as other video-based platforms, in improving academic performance.

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Authors' Contribution

RK and MA designed the study. HZ and SN collected the data. MAh analyzed the data. FZ and RK drafted the manuscript. SSK critically analyzed and finalized it. All authors reviewed the manuscript and approved the final version. All the authors take full responsibility for the content and writing of this article.

Ethical Considerations

Ethical approval was obtained from the Fazaia Ruth Pfau Medical College Research Committee, with ethical code No. FRPMC-IRB-2023-19. Before participating in the study, each selected participant was provided with information about the study's purpose and procedures. Informed consent was obtained from each participant.

Conflict of Interest

The authors have no conflict of interest.

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Availability of Data and Materials

The data supporting the findings of this study is readily available by reaching out to the corresponding author, available upon reasonable request.

References

1 Ahmed YA, Ahmad MN, Ahmad N, Zakaria NH. Social media for knowledge-sharing: A systematic literature review. Telemat Inform. 2019 Apr 1; 37:72-112. doi: 10.1016/j.tele.

2 Golenhofen N, Heindl F, Grab-Kroll C, Messerer DAC, Backers TM, Böckers A. The use of a mobile learning tool by medical students in undergraduate anatomy and its effects on assessment outcomes. Anat Sci Educ. 2019; 13(1):8–18. doi:10.1002/ase.1878. PubMed PMID: 30913369.

3 Junco, R. Student Class Standing, Facebook Use, and Academic Performance. J Appl Dev Psychol. 2015; 36, 18-29. doi: 10.1016/j.appdev.2014.11.001.

4 Cox D, McLeod S. Social Media Strategies for School Principals. NASSP Bull. 2013; 98(1):5–25. doi:10.1177/0192636513510596.

5 May AM. On networking the writing center: Social media usage and non-usage. Writ Cent J. 2022; 40(2). doi:10.7771/2832-9414.1022.

6 Azizi SM, Soroush A, Khatony A. The relationship between social networking addiction and academic performance in Iranian students of medical sciences: a cross-sectional study. BMC Psychol. 2019;7:1–8. doi: 10.1186/ s40359-019-0305-0. PubMed PMID: 31053171; PubMed Central PMCID: PMC6500070

7 Al-Rahmi W, Othman M. The impact of social media use on academic performance among university students: a pilot study. J Inf Syst Res Innov. 2013;4(12):1–0. doi: 10.1080/20450249.2013.11873868.

8 Dumpit, D., & Fernandez, C. Analysis of the use of social media in higher education institutions (HEIs) using the technology acceptance model. Int J Educ Technol High Educ,14(1)10. doi: 10.1186/s41239-017-0045-2.

9 Ali Elsayed Mansour et al. The impact of using social media on the academic performance of Qassim University students, Unaizah, Saudi ArabiaInt J Med Dev Ctries. 2020;4(12):2085–2093. doi: 10.24911/IJMDC.51-1600133225.

10 Takieddin SZ, Alghamdi FS, Fida HL, Alghamdi MK, Kamfar RA, Alsaidlani RH, Khojah IM. Effects of social networking services on academic performance and self-esteem: A cross-sectional study among medical students. J Family Med Prim Care. 2022 Oct; 11(10):6221-6226. doi: 10.4103/jfmpc.Jfmpc_528_22. PubMed PMID: 36618167. PubMed Central PMCID: PMC9810851.

11 Dilawar S, Liang G, Elahi MZ, Abbasi AZ, Shahani R, Gonlepa MK. Interpreting the impact of extraversion and neuroticism on social media addiction among university students of Pakistan: A mediated and moderated model. Acta Psychol (Amst). 2022 Oct; 230:103764. doi: 10.1016/j.actpsy.2022.103764. PubMed PMID: 36270141.

12 Gormley GJ, Collins K, Boohan M, Bickle IC, Stevenson M. Is there a place for e-learning in clinical skills? A survey of undergraduate medical students' experiences and attitudes. Med Teach. 2009; 31(1). doi:10.1080/01421590802334317. PubMed PMID: 19253150.

13 Bernik A, Radosevic D, Bubas G. Introducing gamification into e-learning university courses. 2017 40th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO). 2017; doi:10.23919/mipro.2017.7973515.

14 Ashraf MA, Khan MN, Chohan SR, Khan M, Rafique W, Farid MF, et al. Social media improves students' academic performance: Exploring the role of social media adoption in the open learning environment among international medical students in China. Healthcare (Basel). 2021; 9(10):1272. doi: 10.3390/healthcare9101272. PMID: 34682952 PMCID: PMC8535783

15 Mohammed AT. Patterns and motives of the use of Iraqi university students to social networks. Al-Mustansiriya J Arts. 2015; 0(68):1-40.
16 Helou AM. The influence of social networking sites on students' academic performance in Malaysia. Int J Electron Commerce Stud 2014; 5(2):247–54. doi:10.7903/ijecs.1114.
17 León SA, Fontelo P, Green L, Ackerman M, Liu F. Evidence-based medicine among internal medicine residents in a community hospital program using smartphones. BMC Med Inform Decis Mak. 2007; 7(1). doi:10.1186/1472-6947-7-5. PubMed PMID: 17313680; PubMed Central PMCID: PMC1805745.
18 Khan T, Kend M, Robertson S. Use of social media by university accounting students and its impact on learning outcomes. Account Educ. 2016; 25(6):534–67. doi:10.1080/09639284.2016.1230880.
19 Alahmar AT. The impact of social media on the academic performance of second-year medical students at College of Medicine, University of Babylon, Iraq. J Med Allied Sci. 2016; 6: 77–83. doi: 10.5455/jmas.236927.
20 Latif MZ, Hussain I, Saeed R, Qureshi MA, Maqsood U. Use of smartphones and social media in medical education: trends, advantages, challenges, and barriers. Acta Inform Med. 2019 Jun; 27(2):133. doi:10.5455/aim.2019.27.133-138. PubMed PMID: 31452573; PubMed Central PMCID: PMC6688444.
21 Michikyan M, Subrahmanyam K, Dennis J. Facebook use and academic performance among college students: A mixed-methods study with a multi-ethnic sample. Comput Human Behav. 2015; 45:265–72. doi:10.1016/j.chb.2014.12.033.
22 Chatterley T, Chojecki D. Personal digital assistant usage among undergraduate medical students: Exploring trends, barriers, and the advent of smartphones. J Med Libr Assoc. 2010; 98(2):157–60. doi:10.3163/1536-5050.98.2.008. PubMed PMID: 20428281; PubMed Central PMCID: PMC2859274.