



Investigating the Impact of Technology and Social Networks on Student Engagement in Universities: A Narrative Review Study

Meysam Abdali¹, Esmayil Zeynali¹, Khalil Kalavani ^{1,*}

¹ Khoy University of Medical Sciences, Khoy, Iran

*Corresponding Author: Khoy University of Medical Sciences, Khoy, Iran. Email: k.kalavani@kmu.ac.ir

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Abstract

Context: Given the increasing use of technology and social networks among students, and their substantial influence on academic interactions, this narrative review examines the effects of social networks on student engagement in universities. It synthesizes both the positive and negative effects of social networks across academic, cultural, and civic dimensions within a comprehensive framework.

Evidence Acquisition: In 2025, a comprehensive narrative review was conducted using the framework proposed by Arksey and O'Malley. Scientific databases, relevant reports, cited sources, and manually identified texts were searched. Two reviewers applied the inclusion and exclusion criteria, and disagreements were resolved through discussion or consultation with a third reviewer. Data were extracted using a standardized form and were organized thematically in tables.

Results: Social networks function as a double-edged sword. They can enhance student engagement by facilitating academic communication, increasing cultural participation, and strengthening civic campaigns. Conversely, they may reduce academic focus, increase social isolation, and diminish trust in academic institutions. Individual student characteristics and university policies moderate the direction and magnitude of these effects.

Conclusions: University administrators should implement evidence-informed policies that leverage the benefits of social networks while mitigating their adverse effects. By identifying individual characteristics and institutional policies as key moderating factors, this review provides a practical framework for managing social network use at universities in the digital era.

Keywords: Technology, Social Networks, Students, University, Engagement

1. Context

In the contemporary communication environment, social networks have become a transformative influence in higher education. These platforms are integral to students' lives and shape their academic, cultural, and social interactions. The use of social networks in higher education increased substantially after the COVID-19 pandemic (1-3). Social media comprises online platforms that facilitate communication, information sharing, and interaction among users (4-6). In academic settings, platforms such as Facebook, Instagram, Twitter, and LinkedIn are increasingly used. Recent evidence indicates that most students use at least one social

platform daily and that a substantial proportion of these interactions relates to academic activities (7, 8).

Student engagement is multidimensional. Academic engagement includes participation in classroom interactions, involvement in group research activities, and the use of digital educational resources. Students use Telegram groups to exchange academic materials and course-related content (9). Sociocultural engagement includes participation in student associations, attendance at university events, and cross-cultural interactions. Students commonly receive information about university events through Instagram (10-12). Civic engagement includes voluntary activities, social campaigns, and public-benefit programs. Social

media has been associated with increased participation in civic activities (13, 14).

The influence of social networks on engagement in academic environments, particularly across educational, cultural, and social domains, has not been comprehensively synthesized. Some studies describe social networks as powerful tools for improving student interactions (15-17), whereas others report adverse effects, including reduced physical presence and impaired academic concentration (18-20). These conflicting findings, the lack of a unified perspective, and limited attention to the moderating role of university policies indicate the need for a comprehensive review.

This review aimed to provide a holistic examination of the positive and negative effects of social networks on student engagement and to identify the factors that moderate these effects.

2. Evidence Acquisition

A narrative review provides a broad overview of key concepts, evidence sources, and research patterns in a complex field. It can clarify the extent, scope, and nature of existing research; summarize findings; identify knowledge gaps; and inform whether a systematic review is warranted. Unlike a systematic review, a narrative review does not formally assess the quality of the included studies. Given the scope of the topic, this approach was selected to examine both the positive and negative effects of social networks on student engagement. The review followed the framework proposed by Arksey and O'Malley (21) and comprised five stages.

2.1. Identifying the Research Question

The review question was: "What is known from the existing literature about the impact of social networks on student engagement in universities?" The term impact encompassed both positive and negative outcomes for student participation.

2.2. Identifying Relevant Studies

The authors searched scientific databases and manually identified texts, relevant reports, and reference lists of selected studies. Because of time constraints, only studies published from 2010 through 2025 were considered. Only English-language articles and reports were included because translation resources were unavailable. The search strategy was developed by reviewing publications on social networks and student engagement and identifying relevant

keywords, synonyms, and variants. The search terms included "network," "virtual networks," "virtual," "Telegram," "Instagram," "Twitter," "Facebook," "WhatsApp," and "YouTube," combined with "students," "university," or "higher education," and with "engagement," "activity," "involvement," or "collaboration."

2.3. Selecting Appropriate Studies

Two reviewers screened English-language publications addressing the influence of social networks on student engagement. Screening was conducted by title, abstract, and full text. Duplicate and irrelevant records were removed. When relevance could not be determined from the abstract, the full text was assessed. Disagreements were resolved through discussion or consultation with a third reviewer. EndNote X5 was used to organize records, screen titles and abstracts, and identify duplicates.

2.3.1. Inclusion and Exclusion Criteria

Eligible publications were original studies related to social networks and student engagement, available in full text, and published in English. Publications on unrelated topics, review articles, letters to the editor, and studies with very small samples were excluded.

2.4. Data Charting

Two independent reviewers used a standardized data-extraction form developed in Excel 2016. Disagreements were discussed with a third reviewer until consensus was reached. Extracted variables included the authors, publication year, study objective, and type of effect.

2.5. Summarization and Reporting

The evidence was organized thematically to integrate findings across the included literature. The objective was to provide a comprehensive account of the evidence rather than to assess study quality or determine the generalizability of individual studies. Two researchers independently coded the data through familiarization with the article texts; identification and extraction of key themes; categorization of articles under the themes; examination of each study's findings; and verification of the extracted content within each domain. The resulting themes are presented in Table 1-3.

3. Results

The review identified both positive and negative effects of social networks on student engagement.

Table 1. Positive Effects of Social Networks on Student Engagement

Positive Impact, Themes and Subthemes	Statement
Facilitation of academic and educational communication	
Used as a study group	Students use Telegram or WhatsApp groups for class discussions and resource sharing.
Used as specialized research platforms	Platforms such as ResearchGate and LinkedIn have increased participation in academic research.
Used as educational resources	Students use YouTube channels to understand complex course concepts.
Used for online classes	The use of Zoom and Microsoft Teams has improved student interaction.
Enhancement of cultural and social participation	
Event promotion	Students first learn about university events through Instagram or Twitter.
Virtual associations	The formation of Facebook groups has increased membership in academic associations.
Cultural activities	Social networks facilitate interaction among international students.
Strengthening of civic and voluntary engagement	
Student campaigns	Environmental initiatives on Twitter have increased participation rates.
Crowdfunding	The use of GoFundMe in student projects has been successful.

Positive effects included the facilitation of academic and educational communication, enhanced cultural and social participation, and stronger civic and voluntary engagement (Table 1).

Negative effects included reduced academic concentration and attendance, social media addiction, lower grade point averages, reduced physical participation, social isolation, misinformation, distrust, depression, and social comparison (Table 2).

Individual characteristics and university policies were identified as factors that may modify the relationship between social networks and student engagement (Table 3).

4. Conclusions

4.1. Positive Effects on Academic and Educational Engagement

Social networks can facilitate academic and educational communication. Studies have emphasized the potential of social media to enhance learning and increase students' interest and enthusiasm (17, 22, 23). Students report that social media enables rapid collaboration and interaction, facilitates the exchange of knowledge and skills with classmates, and provides opportunities for immediate feedback on academic and research activities. These platforms can therefore extend learning beyond the classroom and increase student participation and engagement (24-31).

4.2. Positive Effects on Cultural, Social, and Civic Engagement

Social networks can increase cultural and social participation by helping students learn about university

programs, participate in activities, and engage in international interactions (32-35). They can also support civic and voluntary participation and student-led campaigns. This finding is consistent with studies emphasizing the role of digital media in social mobilization (36-39).

4.3. Negative Effects

Adverse academic and educational effects include reduced concentration and attendance, social media addiction, and lower grade point averages (40-44). Cultural effects include a preference for virtual interaction and increased social isolation (45, 46). In civic and voluntary domains, adverse effects include rumor dissemination, distrust, depression, and social comparison (47-50).

4.4. Moderating Factors

The effects of social networks are moderated by individual characteristics, including introversion, extraversion, and gender, as well as by university policies, including access restrictions and the encouragement of positive educational use (51-54).

4.5. Limitations

This review used a defined set of specialized keywords. Although the authors searched multiple databases and used diverse relevant terms, some eligible studies may have been missed.

4.6. Implications and Final Conclusions

Social networks function as a double-edged sword in university settings. They can strengthen academic, cultural, and civic engagement while also threatening

Table 2. Negative Effects of Social Networks on Student Engagement

Negative Impact, Themes and Subthemes	Statement
Academic and educational dimension	
Reduced concentration	Constantly checking social media during study time reduces students' productivity.
Decreased attendance or participation	Attendance at university libraries has decreased because of access to digital resources.
Social media addiction	Instagram use has reduced students' study time.
Grade point average decline	The use of various social networks has led to lower examination scores.
Cultural dimension	
Virtual interaction	Physical attendance at university events has decreased because of a preference for online interactions.
Increased isolation	Feelings of loneliness among students have increased despite virtual connections.
Civic and voluntary dimension	
Rumor dissemination	Misinformation on social networks has contributed to student tensions.
Distrust	The dissemination of false information has reduced trust in university institutions.
Depression and social comparison	Comparisons with influencers have reduced satisfaction with the university environment.

Table 3. Factors Influencing the Relationship Between Social Networks and Student Engagement

Factors Influencing and Themes	Statement
1. Individual characteristics	
Introversion or extraversion	Extroverted students use social media more frequently for participation.
Gender	Women use social media more frequently than men to coordinate group activities.
2. University policies	
Access restrictions	Universities that have restricted access to Facebook during class hours have reported improved physical attendance.
Encouragement of positive use	Offering academic credit for scientific activities on LinkedIn has been effective.

concentration, mental health, physical participation, and institutional trust. Their ultimate effects depend substantially on individual student characteristics and institutional policies. Extroverted students and women may use these platforms more positively, whereas targeted access restrictions and the encouragement of educational use may mitigate adverse effects.

Universities should adopt a proactive and balanced approach that leverages the positive potential of social networks while reducing misuse through media literacy education, ethical guidelines, and dedicated institutional platforms. Integrating social networks into broader university development strategies may help institutions maximize benefits while limiting harms.

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References

1. Kalavani K, Azami-Aghdash S, Zare Z, Shami E, Heydari M. Challenges and Strategies for Educating Medical Students During the COVID-19

- Pandemic: A Systematic Review. *Gazi Medical Journal*. 2025;**36**(2):226-235. <https://doi.org/10.12996/gmj.2024.3797>.
2. Haghdoust AA, Dehnavieh R, kalavani K. The impact of COVID-19 on global health and the strategies to control it: The futures Wheel Model. *Payesh (Health Monitor)*. 2021;**20**(5):629-31. <https://doi.org/10.52547/payesh.20.5.629>.
 3. Kalavani K, Dehnavieh R, Emadi S. Post-Covid-19 higher education scenarios and future strategic orientations of education. *Journal of Medical Education and Development*. 2021. <https://doi.org/10.18502/jmed.v16i2.7147>.
 4. Fazil AW, Hakimi M, Akrami K, Akrami M, Akrami F. Exploring the role of social media in bridging gaps and facilitating global communication. *Studies in Media, Journalism and Communications*. 2024;**2**(1):13-21. <https://doi.org/10.32996/smjc.2024.2.1.2>.
 5. Acharya K. Social media management system project report. *Authorea Preprints*. 2024. <https://doi.org/10.22541/au.172252491.11210579/v1>.
 6. Muliadi M, Muhammadijah M, Amin KF, Kaharuddin K, Junaidi J, Pratiwi BI, et al. The information sharing among students on social media: the role of social capital and trust. *VINE Journal of Information and Knowledge Management Systems*. 2024;**54**(4):823-40. <https://doi.org/10.1108/VJIKMS-12-2021-0285>.
 7. Surbaugh HM. The More Things Change: Tracking Social Media Platform Shifts in Academic Libraries (2019 - 2025). *Journal of Web Librarianship*. 2025;**19**(2):125-144. <https://doi.org/10.1080/19322909.2025.2502930>.
 8. Cuong TV, Khai NT, Oo TZ, Józsa K. The Impact of Social Media Use Motives on Students' GPA: The Mediating Role of Daily Time Usage. *Education Sciences*. 2025;**15**(3):317. <https://doi.org/10.3390/educsci15030317>.
 9. Smith WJ. *Understanding how professional development for college faculty on adult learning theories can improve online instruction and course design: A Delphi study [dissertation]*. Regent University; 2023.
 10. Lam AHC, Ho KKW, Chiu DKW. Instagram for student learning and library promotions: a quantitative study using the SE Instructional Model. *Aslib Journal of Information Management*. 2023;**75**(1):112-30. <https://doi.org/10.1108/AJIM-12-2021-0389>.
 11. Yahyaie S, Garkaz O, Paryab S, Mahdavi S, Ramezani S, Pourheidari M. Investigating the Relationship Between Excessive Use of Mobile Phones and Social Loneliness in the Student Community. *J Arch Mil Med*. 2025;**13**(1). e159796. <https://doi.org/10.5812/jamm-159796>.
 12. Rushing M. *Behind the filter: Instagram's influence among Generation Z first-generation college-bound students in their college choice [thesis]*. University of North Carolina at Chapel Hill; 2024. <https://doi.org/10.17615/mjkc-g738>.
 13. Mihailidis P. The civic-social media disconnect: exploring perceptions of social media for engagement in the daily life of college students. *Information, Communication & Society*. 2014;**17**(9):1059-71. <https://doi.org/10.1080/1369118X.2013.877054>.
 14. Kenna JL, Hensley MA. Utilizing social media to promote civic engagement in the social studies classroom. *The Social Studies*. 2019;**110**(2):86-94. <https://doi.org/10.1080/00377996.2018.1524360>.
 15. Dragseth MR. Building student engagement through social media. *Journal of Political Science Education*. 2020;**16**(2):243-56. <https://doi.org/10.1080/15512169.2018.1550421>.
 16. Ebrahimi Tavani M, Poursaki T, Gharibi F. The Necessity of Promoting Technology Commercialization in Iran's Universities of Medical Sciences: A Policy Brief. *koomesh*. 2024;**26**(1). e153982. <https://doi.org/10.69107/koomesh-153982>.
 17. Graham M. Social media as a tool for increased student participation and engagement outside the classroom in higher education. *Journal of Perspectives in Applied Academic Practice*. 2014;**2**(3):16. <https://doi.org/10.14297/jpaap.v2i3.113>.
 18. Attia N, Baig I, Marzouk YI, Khan A. The potential effect of technology and distractions on undergraduate students' concentration. *Pakistan journal of medical sciences*. 2017;**33**(4):860. [PubMed ID: 29067054]. [PubMed Central ID: PMC5648953]. <https://doi.org/10.12669/pjms.334.12560>.
 19. Dontre AJ. The influence of technology on academic distraction: A review. *Human Behavior and Emerging Technologies*. 2021;**3**(3):379-90. <https://doi.org/10.1002/hbe2.229>.
 20. Vale J, Oliver M, Clemmer RMC. The influence of attendance, communication, and distractions on the student learning experience using blended synchronous learning. *The Canadian Journal for the Scholarship of Teaching and Learning*. 2020;**11**(2). <https://doi.org/10.5206/cjsotl-rcacea.2020.2.1105>.
 21. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International journal of social research methodology*. 2005;**8**(1):19-32. <https://doi.org/10.1080/1364557032000119616>.
 22. Scott OKM, Stanway AR. Tweeting the lecture: How social media can increase student engagement in higher education. *Sport Management Education Journal*. 2015;**9**(2):91-101. <https://doi.org/10.1123/SMEJ.2014-0038>.
 23. Welch BK, Bonnan-White J. Twittering to increase student engagement in the university classroom. *Knowledge management & e-learning*. 2012;**4**(3):325-345. <https://doi.org/10.34105/j.kmel.2012.04.026>.
 24. Price AM, Devis K, LeMoine G, Crouch S, South N, Hossain R. First year nursing students use of social media within education: Results of a survey. *Nurse education today*. 2018;**61**:70-6. [PubMed ID: 29179050]. <https://doi.org/10.1016/j.nedt.2017.10.013>.
 25. Johnston AN, Barton MJ, Williams-Pritchard GA, Todorovic M. Youtube for millennial nursing students; using internet technology to support student engagement with bioscience. *Nurse education in practice*. 2018;**31**:151-5. [PubMed ID: 29906632]. <https://doi.org/10.1016/j.nepr.2018.06.002>.
 26. Jackson J, Gettings S, Metcalfe A. "The power of Twitter": Using social media at a conference with nursing students. *Nurse Educ Today*. 2018;**68**:188-191. [PubMed ID: 29945099]. <https://doi.org/10.1016/j.nedt.2018.06.017>.
 27. Lahti M, Haapaniemi-Kahala H, Salminen L. Use of social media by nurse educator students: an exploratory survey. *The open nursing journal*. 2017;**11**(1):26-33. [PubMed ID: 28400892]. [PubMed Central ID: PMC5362977]. <https://doi.org/10.2174/1874434601711010026>.
 28. Duke VJA, Anstey A, Carter S, Gosse N, Hutchens KM, Marsh JA. Social media in nurse education: Utilization and E-professionalism. *Nurse education today*. 2017;**57**:8-13. [PubMed ID: 28683342]. <https://doi.org/10.1016/j.nedt.2017.06.009>.
 29. Jones R, Kelsey J, Nelmes P, Chinn N, Chinn T, Proctor-Childs T. Introducing Twitter as an assessed component of the undergraduate nursing curriculum: case study. *Journal of advanced nursing*. 2016;**72**(7):1638-53. [PubMed ID: 26861572]. <https://doi.org/10.1111/jan.12935>.
 30. Tower M, Blacklock E, Watson B, Heffernan C, Tronoff G. Using social media as a strategy to address 'sophomore slump' in second year nursing students: a qualitative study. *Nurse education today*. 2015;**35**(11):1130-4. [PubMed ID: 26220639]. <https://doi.org/10.1016/j.nedt.2015.06.011>.
 31. McKay M, Sanko JS, Shekhter I, Birnbach DJ. Twitter as a tool to enhance student engagement during an interprofessional patient safety course. *Journal of Interprofessional Care*. 2014;**28**(6):565-7. [PubMed ID: 24779404]. <https://doi.org/10.3109/13561820.2014.912618>.
 32. Resch K, Amorim JP. Facilitating intercultural encounters with international students: A contribution to inclusion and social network formation. *Social Inclusion*. 2021;**9**(3):58-68. <https://doi.org/10.17645/si.v9i3.4084>.

33. Yu B, Leung YW. Establishing ties or strengthening friendships? Students' use of online social networks in intercultural friendship development. *Information Technology & People*. 2024;**37**(2):815-34. <https://doi.org/10.1108/ITP-01-2022-0035>.
34. Guo W. Navigating cultural integration: the role of social media among Chinese students in the UK. *Journal of the Knowledge Economy*. 2025;**16**(1):2751-82. <https://doi.org/10.1007/s13132-024-02111-8>.
35. Abbas N, Whitfield J, Atwell E, Bowman H, Pickard T, Walker A. Online chat and chatbots to enhance mature student engagement in higher education. *International Journal of Lifelong Education*. 2022;**41**(3):308-26. <https://doi.org/10.1080/02601370.2022.2066213>.
36. Heidari E, Salimi G, Mehrvarz M. The influence of online social networks and online social capital on constructing a new graduate students' professional identity. *Interactive Learning Environments*. 2023;**31**(1):214-31. <https://doi.org/10.1080/10494820.2020.1769682>.
37. Foos F, Kostadinov L, Marinov N, Schimmelfennig F. Does social media promote civic activism? A field experiment with a civic campaign. *Political Science Research and Methods*. 2021;**9**(3):500-18. <https://doi.org/10.1017/psrm.2020.13>.
38. Iefimova GV, Pashchenko KO. The Role of Social Media in Promoting Volunteer Initiatives and Shaping Communities. *Problemy Ekonomiky*. 2025;**1**(63):350-356. <https://doi.org/10.32983/2222-0712-2025-1-350-356>.
39. Anthony Angwaomaodoko E. Exploring Civic Engagement through Student-Led Initiatives. *International Research in Education*. 2024;**12**(2):10. <https://doi.org/10.5296/ire.v12i2.21934>.
40. Ning W, Inan FA. Impact of social media addiction on college students' academic performance: an interdisciplinary perspective. *Journal of Research on Technology in Education*. 2024;**56**(5):616-31. <https://doi.org/10.1080/15391523.2023.2196456>.
41. Nurudeen M, Abdul-Samad S, Owusu-Oware E, Koi-Akrofi GY, Tanye HA. Measuring the effect of social media on student academic performance using a social media influence factor model. *Education and Information Technologies*. 2023;**28**(1):1165-88. <https://doi.org/10.1007/s10639-022-11196-0>.
42. Abrar S. Social media addiction, learning strategies and academic performance among matriculation students. *Pak J Soc Sci Rev*. 2025;**4**(3):310-327.
43. Alhrahshah R, Al Majali S. Relationship between social networking addiction and academic performance in students of university. *International Journal of Instruction*. 2023;**16**(2):783-802. <https://doi.org/10.29333/iji.2023.16241a>.
44. Ghaderi D. The Relationship Between Screen Time, Social Network Usage, and Physical Activity with Depression in Students at Qazvin University. *Asian J Sports Med*. 2024;**15**(2). e147095. <https://doi.org/10.5812/asjsm-147095>.
45. Butnaru GI, Haller AP, Dragolea LL, Anichiti A, Tacu Hârşan GD. Students' wellbeing during transition from onsite to online education: Are there risks arising from social isolation? International journal of environmental research and public health. *International Journal of Environmental Research and Public Health*. 2021;**18**(18):9665. [PubMed ID: 34574589]. [PubMed Central ID: PMC8467860]. <https://doi.org/10.3390/ijerph18189665>.
46. Smith D, Leonis T, Anandavalli S. Belonging and loneliness in cyberspace: Impacts of social media on adolescents' well-being. *Australian Journal of Psychology*. 2021;**73**(1):12-23. <https://doi.org/10.1080/00049530.2021.1898914>.
47. Jiang B, Wang D. Perception of misinformation on social media among Chinese college students. *Frontiers in Psychology*. 2024;**15**. 1416792. [PubMed ID: 39027055]. [PubMed Central ID: PMC11256398]. <https://doi.org/10.3389/fpsyg.2024.1416792>.
48. Abimbade O. From creators to critical thinkers: How middle schoolers learn to spot and stop false information through media production. *Journal of Digital Learning in Teacher Education*. 2025;**41**(2-3):146-161. <https://doi.org/10.1080/21532974.2025.2522067>.
49. Owolabi EO, Boakye MDS, Omololu SO, Smalls BL, Shaibi GQ. Technology-Based Interventions to Promote Diabetes Self-Management Behaviors for Persons Newly Diagnosed with Type 2 Diabetes: A Scoping Review. *Curr Diab Rep*. 2024;**24**(12):257-272. [PubMed ID: 39352613]. <https://doi.org/10.1007/s11892-024-01553-3>.
50. Sultan AAM, Ismail E, Saad MSM, Husain AH, Daud MZ, Alswat HM. Impact of social media on higher education: Academic performance, leadership and co-curricular activity engagement. *Multidisciplinary Reviews*. 2025;**8**(5):2025142. <https://doi.org/10.31893/multirev.2025142>.
51. Wang Y, Yu R, Wu X, Chen Z, Huang Y. The impact of personality type on online learning performance among high school students. *Educ Inf Technol*. 2025;**30**(7):8733-8764. <https://doi.org/10.1007/s10639-024-13161-5>.
52. Ray A, Oulamine A, Lim B. Assessment of the impact of extraversion on depression, distraction and knowledge absorption capacity in online learning education. *International Journal of Educational Management*. 2025;**39**(1):198-218. <https://doi.org/10.1108/IJEM-06-2024-0328>.
53. Sinha E. The role of human behaviour in activist content sharing on social media. *Online Information Review*. 2024;**48**(6):1216-32. <https://doi.org/10.1108/OIR-07-2022-0374>.
54. Yu Z. The effects of gender, educational level, and personality on online learning outcomes during the COVID-19 pandemic. *International Journal of Educational Technology in Higher Education*. 2021;**18**(1). 14. [PubMed ID: 34778520]. [PubMed Central ID: PMC8016506]. <https://doi.org/10.1186/s41239-021-00252-3>.