



Exploring the emotional landscape: How graduate students' views on social networks influence their engagement in tech-enhanced learning environments

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Abstract

This research investigates how tertiary students' views on social networks for learning purposes relate to their emotional reactions and their level of academic involvement in technology-supported learning environments. A total of 890 Iranian EFL (English as a Foreign Language) students from five provinces (Esfahan, Tehran, Markazi, Shiraz, Khorasan Razavi, and Tabriz) were invited to participate, yielding 521 valid responses. Three instruments were employed: a Social Media Usage and Perceptions Questionnaire, an Academic Engagement Questionnaire, and a Learners' Emotion Questionnaire. The SEM analysis was performed using SPSS version 27 and AMOS version 24; incorporated various techniques, including correlation, regression, and factor analysis. The findings indicate a positive relationship between students' favorable perceptions of social networks and their positive emotions, which significantly contribute to higher academic engagement in tech-enhanced learning environments. Conversely, the study found that negative perceptions of social networks are associated with negative emotions, which diminish students' academic engagement. These results highlight the dual role of social networks in shaping both emotional experiences and learning outcomes in modern educational settings.

Keywords Social networks · Emotional challenges · Academic engagement · Technology-enhanced classrooms · Collaborative learning environment

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1 Introduction

The integration of social networks and digital platforms into education has become increasingly relevant, particularly for tertiary students, who often rely on these tools for academic and social engagement (Alraimi et al., 2015; Teng & Zhang, 2020). Social networks, such as Facebook, LinkedIn, and Twitter, offer students new avenues to collaborate with peers, connect with instructors, and access a wealth of academic resources (Alraimi et al., 2015). Beyond being just communication tools, these networks facilitate the formation of academic communities where ideas are shared, projects are discussed, and collaborative learning takes place. However, the extensive use of these platforms also evokes a range of emotional responses, influenced by the nature of interactions and content consumed (Benesch, 2018; Cao et al., 2023). While students frequently use social platforms to enhance their learning through collaborative discussions, resource sharing, and language practice, these activities differ significantly from formal academic research. Learning via social platforms is typically informal, self-directed, and interactive, allowing students to engage with content at their own pace. In contrast, academic research follows a structured approach, requiring systematic data collection, critical analysis, and adherence to rigorous methodologies. Additionally, research involves a greater cognitive load, higher levels of complexity, and extended time commitments, as scholars must engage in literature reviews, hypothesis testing, and data interpretation (Chen & Hsu, 2020).

Tertiary students' perceptions of social media play a key role in shaping their emotional well-being. On one hand, positive emotions such as joy, motivation, and a sense of connectedness can emerge from supportive interactions, peer recognition, and the collaborative learning environment that social networks foster (Cao et al., 2023; Chester et al., 2020). These positive emotions are often linked to greater academic engagement, improved learning outcomes, and enhanced satisfaction with the educational experience. On the other hand, social media can also elicit negative emotions such as stress, anxiety, or frustration. These negative emotions may arise from information overload, negative comparisons with peers, cyberbullying, or the pressure to maintain a certain academic persona. When students experience such negative emotions, their academic engagement may suffer, leading to diminished focus, lower productivity, and in some cases, disengagement from the learning process (Chen & Hsu, 2020; Kashada et al., 2018).

Moreover, technology-enhanced classrooms provide additional layers of complexity. Digital platforms, such as learning management systems (LMS), virtual meeting spaces, and collaborative tools, are designed to enhance the educational experience (Bozkurt & Keefer, 2018; Chen, 2010; Fischer-Suárez et al., 2022). However, students' engagement with these tools can vary greatly depending on their emotional states. Positive emotions can lead to increased involvement with these digital tools, fostering an environment where students are eager to participate, collaborate, and engage actively in their studies. Conversely, negative emotions can result in disengagement, as students may feel overwhelmed or alienated by the constant connectivity and digital demands placed on them (Gao et al., 2021; Gondwe, 2021).

The interplay between social networks, emotions, and academic engagement is crucial for understanding the dynamics of the modern educational environment.

Educators and institutions must consider how to create balanced, supportive environments that leverage the benefits of social media while mitigating its emotional challenges. Addressing this balance is essential to fostering a healthy, productive, and engaging academic atmosphere for tertiary students in technology-enhanced classrooms (Guérin & Fortier, 2013; Lai et al., 2024). In the contemporary landscape of education, technology has become an integral part of the learning process, offering diverse opportunities and challenges for both educators and students. With the prevalence of social networks shaping students' daily interactions and experiences, understanding the dynamics between EFL students' perceptions of these platforms, their emotional responses, and their academic engagement is crucial (Hamdaoui et al., 2018; Weise et al., 2022).

Emotional states play a significant role in shaping learning experiences and outcomes. Exploring how EFL students' interactions on social networks influence their emotional well-being can help identify potential stressors or motivators that impact their academic performance (Heidrich et al., 2018; Yuditseva, 2023). By recognizing the factors that contribute to positive and negative emotions, educators can work towards fostering a supportive and conducive learning atmosphere (Huang et al., 2020; Weise et al., 2022). Therefore, this study delves into the intricate relationship between EFL students' perceptions of social networks and the emotions—both positive and negative—that they experience in the digital realm. Additionally, it explores how these perceptions and emotional responses influence students' levels of academic engagement within technologically enriched learning environments. By examining these interconnected factors, educators and researchers can gain valuable insights into optimizing the use of technology in language education and enhancing student motivation and performance (Tadayonifar & Entezari, 2020). In the end, the results of this study could shape educational strategies and policies by providing direction on how to cultivate a nurturing and enriching learning setting for EFL students in the digital era. By focusing on these areas, the study aims to make a valuable impact on EFL education, delivering actionable insights that enable teachers to utilize technology and social networks to build dynamic, supportive, and efficient learning environments for their students (Hung, 2015; Zhang, 2024).

2 Review of the literature

2.1 General introduction to the review section

The integration of technology into education has significantly transformed the dynamics of learning environments, particularly in higher education (Imran et al., 2023). Technology-enhanced classrooms leverage digital tools and social networks to facilitate interaction, collaboration, and engagement, offering new opportunities for both students and instructors. Within these settings, the interplay of social networks, emotional experiences, and academic engagement has emerged as a critical area of inquiry, as it holds significant implications for understanding how students interact with learning environments and achieve academic success (Lai et al., 2024). Social networks, as virtual platforms, play a pivotal role in fostering communica-

tion, resource sharing, and collaborative learning among students (Shanshan & Wen-fei, 2022). Simultaneously, emotions—both positive and negative—are recognized as integral to the learning process, influencing motivation, engagement, and overall academic performance. Academic engagement, a multifaceted construct encompassing behavioral, emotional, and cognitive dimensions, is central to student success and reflects the extent of students' involvement and commitment to their learning tasks (Zhang, 2024). This review aims to explore the theoretical and empirical foundations underpinning the relationships among social networks, emotional states, and academic engagement (Zheng et al., 2023). By synthesizing relevant literature, it seeks to provide a comprehensive understanding of how these constructs interact within the context of technology-supported learning environments. Additionally, the review addresses the predictive role of social networks and emotions in shaping academic engagement, setting the stage for the study's investigation into graduate students' experiences in technology-enhanced classrooms (Wang et al., 2022).

Social Cognitive Theory (SCT) posits that learning occurs through social interactions, observation, and modeling. In the context of social networks, this theory emphasizes how EFL students' perceptions of online communities, connections, and interactions shape their learning experiences (Imran et al., 2023; Luszczynska & Schwarzer, 2015; Zhang et al., 2021). EFL students may observe and model behaviors within social networks, influencing their emotional responses and academic engagement (Al-Obaydi et al., 2023; Kashada et al., 2018). By examining how social interactions on digital platforms impact students' self-efficacy, motivation, and learning outcomes, SCT provides insights into the cognitive processes underlying these relationships. Emotions play a crucial role in shaping individuals' thoughts, behaviors, and interactions (Barrett et al., 2023; Kazemitabar et al., 2021). Emotion regulation theories offer a framework for understanding how EFL students perceive, interpret, and manage their emotional experiences in the context of social networks and technology-enhanced classrooms. By exploring how students regulate positive and negative emotions while navigating social networks, this framework sheds light on the strategies students employ to cope with academic challenges, social interactions, and digital distractions. Understanding emotion regulation mechanisms can inform interventions to support students' emotional well-being and academic performance (Kiuru et al., 2020; Zheng et al., 2023). Self-Determination Theory (SDT) focuses on intrinsic motivation, autonomy, and competence as drivers of behavior and engagement. In technology-enhanced classrooms, this theory elucidates how EFL students' perceptions of social networks impact their sense of autonomy, relatedness, and competence, influencing their academic engagement. By examining how social networks affect students' need satisfaction and motivational orientations, SDT offers insights into the factors that support or hinder students' active participation, persistence, and academic success. Understanding the motivational aspects of students' interactions with technology can inform strategies to enhance engagement and learning outcomes. The Technology Acceptance Model (TAM) centers on how users accept and adopt technology, influenced by their perceptions of its usefulness and ease of use (Lai et al., 2024; Verzeletti et al., 2016). In the context of technology-enhanced classrooms, this model elucidates how EFL students' perceptions of social networks as educational tools influence their engagement and utilization. By exploring students'

beliefs about the benefits and challenges of using social networks for academic purposes, TAM provides a framework for assessing the factors that mediate students' acceptance of digital platforms for learning (Lee, 2015; Sung, 2023). Understanding students' technology adoption behaviors can inform the design of user-friendly educational technologies and interventions (Littlejohn et al., 2016). This multi-faceted approach allows for a holistic exploration of the complex relationships and processes that shape students' learning experiences and outcomes in the digital age (Lee & Dražati, 2019; Soodmand Afshar & Jamshidi, 2022).

The literature shows that there are not many empirical studies focused specifically on this topic, though some related research provides useful insights into relevant areas. Barrett et al. (2023) investigates the influence of social networking sites on academic performance, focusing on how students' usage patterns on platforms like Facebook and Twitter relate to their grades, academic engagement, and overall learning experiences. The study reveals that while social media can serve as a valuable tool for collaboration and access to educational resources, it also poses significant risks of distraction, particularly when students engage in non-academic activities during study time. The research highlights the dual nature of social networks, showing that moderate and purposeful use can enhance communication and academic involvement, whereas excessive use for entertainment may lead to poorer academic outcomes. They suggest that the key to leveraging social media in education lies in teaching students effective time management and fostering a balanced approach to its use. Dai and Wang (2024) explored the impact of emotions like anxiety, boredom, and enjoyment on the engagement of Chinese EFL learners in technology-driven environments where English is used as the medium of instruction (EMI). The study utilized four validated questionnaires to evaluate emotions, engagement levels, and comfort with technology. Through structural equation modeling (SEM), the analysis demonstrated that technology integration and EMI played key roles in mediating the link between emotions and engagement. The results indicated that 69% of the variation in academic engagement was influenced by the interaction between learners' emotions and their views on technology and EMI. Positive emotions were found to boost engagement through these mediators, suggesting important implications for enhancing teaching strategies and curriculum development.

Yin et al. (2023) examined the effect of social network use on academic engagement in Chinese EFL learners. The study involved 591 participants from Guangdong Province, comprising both male and female students from different educational backgrounds. Through the use of questionnaires and statistical analysis, the study found a positive link between social network usage, age, and academic engagement, while gender and educational level showed no significant impact. Increased social network usage, particularly for entertainment, was associated with enhanced cognitive, emotional, and socio-behavioral engagement. Overall, social networks improve students' academic motivation, energy, and facilitate easy access to personalized learning resources. Qi (2024) examined the impact of positive and negative emotions, as well as social anxiety, on Chinese EFL learners within technology-enhanced learning settings. The study involved 878 participants who completed questionnaires on technology integration, emotion regulation, and social anxiety. Using structural equation modeling (SEM), the research revealed that positive emotions enhanced

learners' perceptions of the learning environment, while negative emotions negatively affected their ability to regulate emotions and their views on technology use. The results suggest that promoting positive emotions can help lower anxiety and enhance the use of technology in educational settings, highlighting the importance of emotions in learning.

Benesch (2018) delves into the emotional experiences of EFL students during language learning activities, providing a detailed exploration of how emotions shape students' behaviors and academic outcomes. The study highlights that anxiety, often caused by performance pressure or fear of judgment, can hinder students' participation and willingness to communicate in the target language. Conversely, motivation and enjoyment can enhance engagement, fostering a more positive and productive learning environment. Benesch also emphasizes the dynamic and fluid nature of emotions, demonstrating how emotional states can shift during different phases of learning, significantly influencing students' cognitive resources and language acquisition processes. The research underscores the importance of addressing these emotional factors in the classroom to create a supportive environment that facilitates not only academic achievement but also emotional well-being. By linking emotions directly to learning outcomes, Benesch's work contributes to a deeper understanding of how emotional regulation strategies can be implemented to enhance students' foreign language performance. Acosta-Gonzaga and Ramirez-Arellano (2021) examines the relationship between technology usage patterns and academic engagement among language learners. By analyzing how students' interactions with digital tools affect their participation, motivation, and performance, the research provides insights into effective strategies for integrating technology in language education. Berweger et al. (2022) explores students' perceptions of digital learning environments in EFL classes. By investigating how students navigate online resources, communicate through social networks, and engage with course material, the research highlights the significance of student perceptions in technology-enhanced language learning contexts. Zhang et al. (2021) examines the impact of social media platforms on student engagement and academic performance. By analyzing how students' interactions on social networks shape their learning experiences and outcomes, the research provides insights into the potential benefits and challenges of social media use in education.

While these empirical studies do not directly address the specific relationship outlined in the title, they offer valuable perspectives on related themes such as technology use, emotions, academic engagement, and student perceptions in educational contexts. Drawing insights from these studies can help inform the design and implementation of future research exploring the topic. Establishing causal relationships between EFL students' perceptions of social networks, their emotional experiences, and academic engagement can be challenging. Studies may show correlations without definitively proving causal pathways. This controversy raises questions about the direction of influence among these variables. In the absence of definitive proof of causality, understanding how social networks influence emotions and academic engagement becomes more challenging. Additionally, technology's role as an intermediary between social networks, emotions, and academic engagement may spark debates. Questions may arise regarding whether technology enhances or detracts from students' learning experiences. Debates over the influence of technology on

educational outcomes could shape interpretations of how students' interactions with social networks in technology-enhanced classrooms affect their emotional responses and engagement. By addressing these potential controversial issues, researchers can strive to enhance the validity, reliability, and ethical conduct of their research endeavors in this complex and evolving field.

3 Research questions

- RQ1. Is there any statistically significant relationship between tertiary students' perceptions of social networks, their positive and negative emotions, and their academic engagement in technology-enhanced classrooms?
- RQ2. How much do tertiary students' views of social networks, along with their positive and negative emotions, predict their level of academic involvement in technology-supported learning environments?

4 Method

4.1 Context

In this study, the universe includes EFL tertiary students enrolled in technology-enhanced classrooms across higher education institutions. The students included in the research were from the English as a Foreign Language department. This department was specifically chosen because EFL students frequently engage in technology-enhanced classrooms as part of their academic experience. The integration of digital tools, online platforms, and social networks is essential in language learning, as these technologies facilitate communication, collaboration, and exposure to authentic language resources. These classrooms are characterized by the integration of digital tools and platforms to facilitate learning and interaction, making them suitable environments for investigating the role of social networks, emotions, and academic engagement. The research focuses on tertiary students because they are likely to experience the interplay of social networks, emotional factors, and academic demands in these technologically enriched settings. This population provides insights into the dynamics of advanced learning environments, where social and emotional variables significantly influence engagement and outcomes. The study aims to ensure representativeness by including participants from diverse academic disciplines and institutions, thereby capturing a broad range of experiences and perceptions within the defined universe. This study employs a quantitative research design using a correlational methodology. The rationale for this choice is rooted in the research questions, which aim to examine relationships (RQ1) and predictive effects (RQ2) among variables. A convenience sampling method was employed to recruit participants from technology-enhanced classrooms at tertiary-level institutions. The sample size and statistical power were determined based on guidelines for correlational and regression analyses.

5 Participants

The online forms of the questionnaires were distributed to a total of 890 Iranian EFL students across five diverse provinces: Esfahan, Tehran, Markazi, Shiraz, Khorasan Razavi, and Tabriz. This geographic diversity is crucial as it provides a broader perspective on the educational experiences and challenges faced by EFL learners in various contexts within Iran. Out of the questionnaires sent, the researchers successfully collected 521 filled responses, indicating a response rate that reflects the engagement and willingness of participants to contribute to the study. The final sample comprised 521 participants, among whom there was a notable gender distribution: 170 participants identified as male, constituting 32.6% of the total, while 351 participants identified as female, making up 67.4%. This gender breakdown highlights a significant female representation in the study, which may influence the findings related to language learning and social dynamics within the classroom setting.

Regarding educational qualifications, most of the participants had a Master's degree (M.A.), with 414 individuals making up 79.5% of the total group. This indicates a well-educated group of respondents, likely bringing a wealth of knowledge and experience to the study. In contrast, 76 participants (14.6%) possessed a Bachelor's degree (B.A.), and a smaller group of 31 participants (6.0%) held a Ph.D (See Table 1). The prevalence of participants with advanced degrees suggests that the study may capture insights relevant to higher education contexts. To ensure ethical standards were upheld, participants' identities and personal information were treated with strict confidentiality throughout the research process. The questionnaires were administered online to enhance accessibility and convenience for participants, allowing them to complete the forms at their leisure. Before engaging with the questionnaire, each teacher was required to sign a consent form, which confirmed their understanding of the study's objectives and their agreement to participate. This action promoted openness and guaranteed that participants had a complete understanding of the research and their involvement in it.

5.1 Instruments

5.1.1 Social media usage and perceptions questionnaire

The survey created by Bashir and Gupta (2018) includes 25 items using a 5-point Likert scale, where responses range from one (Not true at all for me) to five (Totally true for me). It is designed to collect data on individuals' habits, experiences, and

Table 1 Frequency table

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	170	32.6%
	Female	351	67.4%
Educational Qualification	Bachelor's (B.A.)	76	14.6%
	Master's (M.A.)	414	79.5%
	Ph.D.	31	6.0%

attitudes towards social media. The questionnaire includes sections on demographic information, usage patterns, perceptions of social media, and specific experiences. After a thorough analysis of related variables and the presentation of comprehensive psychometric data, including test-retest reliability coefficient estimates, this instrument is deemed a reliable and valid resource for the present research. The questionnaire encompasses four areas of Social Network Usage: academic, socializing, entertainment, and information, with each area evaluated through five to seven questions. Academic subcategory focuses on how individuals use social media for educational purposes. It includes questions about using social media to access academic resources, participate in study groups, and communicate with classmates and teachers. Socialization examines how social media is used to interact with friends, family, and new acquaintances. It covers aspects like maintaining relationships, making new friends, and participating in social activities online. Entertainment subcategory looks at how social media is used for leisure and entertainment. It includes questions about watching videos, playing games, following celebrities, and engaging with entertainment content. Informative assesses how individuals use social media to gather information and stay updated on current events. It includes questions about following news outlets, joining interest groups, and seeking information on various topics. The reliability was validated by a pilot study involving 60 participants from the same group, resulting in a Cronbach Alpha reliability coefficient of 0.91 ($\alpha = 0.91$).

5.1.2 Academic engagement questionnaire

The Student Engagement Questionnaire, developed by Kember and Leung (2009), includes 35 items measured on a 5-point Likert scale, with responses ranging from one (Strongly disagree) to five (Strongly agree). It assesses three main areas of engagement: Socio-behavioral, Cognitive, and Emotional, with each area covered by 12 items. The scores reflect the participants' level of academic engagement, with higher scores indicating greater engagement. The questionnaire's validity was confirmed by three experts who reviewed the penultimate version. Earlier research confirmed the validity of the questionnaire using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), which yielded comprehensive psychometric data. It serves as a dependable and valid instrument for assessing social behavior, cognition, and emotional states. A pilot study with 60 participants from the same population confirmed its reliability, showing a Cronbach Alpha reliability index of 0.89 ($\alpha = 0.89$). Here are some examples of specific questions that might be included in each subcategory of the Student Engagement Questionnaire:

Socio-behavioral How often do you participate in group discussions during class?, Do you collaborate with classmates on assignments outside of class?, How frequently do you attend study groups or academic clubs?

Cognitive How often do you find yourself thinking about course material outside of class?, Do you apply concepts learned in class to real-world situations?, How frequently do you seek additional resources to understand course topics better?

Emotional How motivated do you feel to succeed in your academic courses?, Do you feel a sense of belonging in your academic community?, How often do you experience stress or anxiety related to your studies?

These questions help gauge different aspects of student engagement, providing a comprehensive understanding of their academic involvement.

5.1.3 Learners' emotion questionnaire

The Learners' Emotion Questionnaire, also known as the Perceived Achievement Emotions Questionnaire (PAEQ), is a comprehensive self-report tool specifically designed to measure students' emotions within academic settings (Bieleke et al., 2021). This tool is essential for understanding the emotional landscape of students as they engage in various learning and performance activities. The PAEQ is designed to evaluate various emotions that students may feel, such as enjoyment, pride, anger, anxiety, hopelessness, and boredom. These emotions are measured using 35 specific scales, each carefully developed to reflect the subtleties of these emotional experiences. The primary purpose of the PAEQ is to provide educators, researchers, and psychologists with deep insights into students' emotional experiences in educational contexts. By understanding these emotions, stakeholders can better address the emotional needs of students, potentially leading to improved academic outcomes and overall well-being. The PAEQ has been subjected to thorough testing to confirm its reliability and validity. Multiple studies have been conducted to validate its psychometric properties, confirming that the questionnaire accurately measures what it is intended to measure. Before its widespread use, the PAEQ was subjected to pilot testing. This phase was crucial to ensure that participants comprehended the items and the scale correctly. The pilot testing was successful, demonstrating the questionnaire's reliability with a high reliability index of 0.85. This index indicates a strong correlation and reliability in measuring the intended emotions, making the PAEQ a trusted tool in educational research and practice.

5.2 Procedure

A total of 890 Iranian EFL students were surveyed across various provinces in Iran over a one-week data collection period. From these participants, 521 valid responses were successfully collected, indicating a strong engagement with the research effort. The questionnaires were made accessible in both Persian and English to accommodate diverse linguistic backgrounds. To ensure the translations were precise and effectively conveyed the original meaning, a rigorous back-translation method was employed. This process involved translating the questionnaire from the source language into the target language, followed by a second translation back into the original language by a different translator. This dual-layered approach confirmed that the translated materials accurately reflected the initial content. Confidentiality was prioritized throughout the research process, safeguarding participants' identities and personal information. The questionnaires were distributed online to facilitate easy access and completion. Before participating, each teacher needed to sign a consent form

that outlined the study's goals and confirmed their voluntary participation. This consent process was essential for building trust and ensuring that participants were well-informed about the research's nature. After collecting the completed questionnaires, the data were systematically organized and prepared for analysis. Statistical analyses were performed using SPSS (version 27) and AMOS (version 24) software. SPSS was used for various statistical tests, while AMOS focused on structural equation modeling to explore relationships among complex variables. The analysis employed several methods, including correlation, regression analysis, and factor analysis, with results carefully examined to identify significant patterns and correlations among the variables.

6 Results

To evaluate the surveys' reliability and examine how tertiary students' views on social networks for learning purposes, their emotions (both positive and negative), and their academic engagement in tech-enabled classrooms are related, the researchers used Confirmatory Factor Analysis (CFA). CFA is a method for testing whether observed data fit the expected underlying constructs. The analysis validated the measurement models, confirming that the constructs were both distinct and interrelated. Convergent validity was confirmed through high factor loadings, indicating strong alignment of items with their respective constructs. CFA also helped uncover notable correlations between students' perceptions, emotions, and academic engagement, showcasing how these elements are connected. Detailed results, such as factor loadings, AVE values, and correlation coefficients, are presented in tables and figures, supporting the validity of the measured constructs.

Figure 1 represents a structural equation model (SEM) illustrating the relationships between positive emotions, negative emotions, perceived social network usage, and academic engagement. Positive Emotions have a strong positive influence on academic engagement. Negative Emotions detract significantly from academic engagement, while social network usage positively impacts both positive emotions and academic engagement and helps mitigate negative emotions. Social network usage plays a mediating role, influencing emotional experiences and, in turn, affecting students' academic involvement.

Table 2 presents the Goodness of Fit estimation, assessing how well a model fits the observed data using various fit indices. A CMIN/DF value of 2.671 falls within the "Acceptable" range (between 1 and 3). This suggests a reasonable fit between the model and the data. The RMSEA value is 0.078, which is close to 0.08, indicating an "Acceptable" fit. RMSEA values below 0.08 are considered acceptable. The GFI score is 0.958, which is within the "Excellent" range (> 0.95), indicating a very good fit. A CFI value of 0.951 is considered "Excellent" (> 0.95), showing strong model fit. The PNFI score of 0.649 is "Acceptable" (> 0.5). This indicates an appropriate balance between model fit and complexity. With a TLI score of 0.937, this falls in the "Acceptable" range (> 0.9), again suggesting a good model fit. Overall, the model's fit is acceptable to excellent across multiple indices.

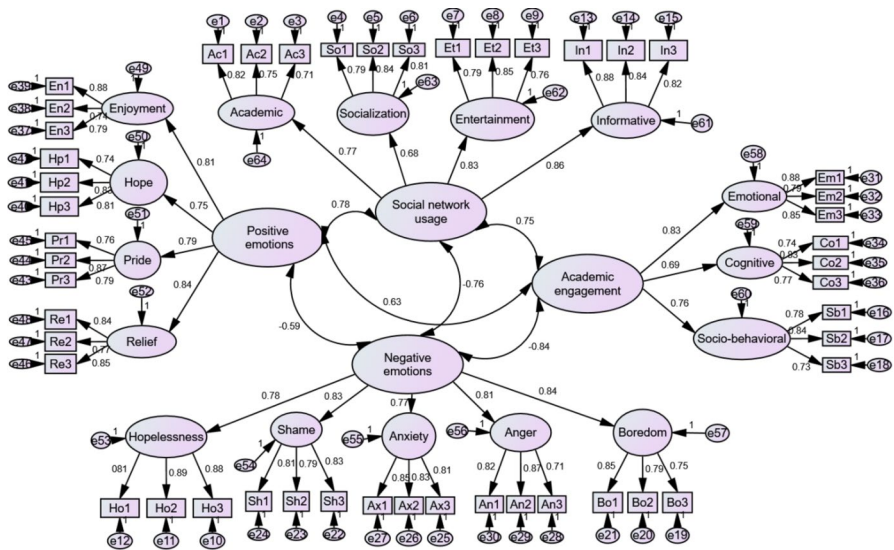


Fig. 1 The conclusively adjusted CFA model with standardized values

Table 2 The evaluation of fit quality

Criteria		Threshold			
		Terrible	Acceptable	Excellent	Evaluation
CMIN	6741.604				
DF	2524				
CMIN/DF	2.671	> 5	> 3	> 1	Acceptable
RMSEA	0.078		< 0.08	< 0.06	Acceptable
GFI	0.958	> 0.8	> 0.9	> 0.95	Acceptable
CFI	0.951	> 0.8	> 0.9	> 0.95	Acceptable
PNFI	0.649		> 0.5		Acceptable
TLI	0.937	> 0.8	> 0.9	> 0.95	Acceptable

Table 3 presents the reliability and validity metrics of four variables. CR values range from 0.84 to 0.91, indicating strong internal consistency for all variables (values > 0.7 are considered reliable). AVE values are all above 0.85, showing that a substantial portion of variance in the items is captured by the latent constructs (AVE > 0.5 suggests good convergent validity). MaxR(H) values are slightly lower than CR, indicating a reliable estimation of true scores for each construct.

Table 4 shows the standardized regression weights between various variables. A strong positive association between social networks and positive emotions (0.784, $P = 0.002$), suggesting that higher social network involvement leads to more positive emotions. A significant negative relationship between positive and negative emotions (-0.591 , $P = 0.001$), indicating that as positive emotions increase, negative emotions decrease. There is a strong negative relationship between negative emotions and social networks (-0.762 , $P = 0.002$), meaning more social network activity is associated with fewer negative emotions. A positive association between engagement and social networks (0.753, $P = 0.001$), showing that more engagement correlates with

Table 3 Reliability and validity of the variables

	CR	AVE	MSV	MaxR(H)	Social networks for learning purposes	Positive emotions	Negative emotions	Engagement
Social networks for learning purposes	0.91	0.91	0.847	0.874	0.954			
Positive emotions	0.86	0.88	0.764	0.854	0.782***	0.941		
Negative emotions	0.84	0.87	0.814	0.861	−0.697***	−0.764***	0.934	
Engagement	0.89	0.85	0.845	0.857	0.573***	0.637***	−0.512***	0.925

*** It is significant at 0.000 level

Table 4 Standardized regression weights of the variables

			Standardized Regression Weights	S.E.	C.R.	P
Social networks	<--->	Positive emotions	0.784	0.152	0.345	0.002
Positive emotions	<--->	Negative emotions	−0.591	−0.241	−0.651	0.001
Negative emotions	<--->	Social networks	−0.762	−0.151	−0.542	0.002
Engagement	<--->	Social networks	0.753	0.325	0.534	0.001
Engagement	<--->	Positive emotions	0.631	0.189	0.348	0.001
Engagement	<--->	Negative emotions	−0.843	−0.264	−0.471	0.002

S.E. Standard Error; C.R. Critical Ratio; P Probability Value

greater involvement in social networks. A moderate positive relationship between engagement and positive emotions (0.631, $P = 0.001$), indicating that higher engagement increases positive emotions. A strong negative association between engagement and negative emotions (−0.843, $P = 0.002$), suggesting that higher engagement reduces negative emotions. All relationships are statistically significant at the 0.001 or 0.002 levels, indicating strong and reliable associations among the variables. Positive emotions are enhanced by social networks and engagement, while negative emotions are inversely related to both engagement and positive emotions.

Figure 2 provides a detailed structural equation model that maps out the relationships between various psychological and behavioral factors influencing Academic Engagement. Notably, Positive Emotions, such as enjoyment, pride, and hope, play a pivotal role, with a strong positive association with Academic Engagement (0.81). This indicates that students who frequently experience these positive emotions are more likely to exhibit higher levels of engagement in academic activities. Enjoyment, for instance, is a feeling of happiness or pleasure derived from participating in tasks or learning activities, which directly contributes to a student's desire to engage more deeply in their education. Likewise, pride, which refers to a sense of satisfaction with one's achievements, motivates students to stay committed and proactive in their studies. In contrast, Negative Emotions, such as hopelessness, shame, and anxiety, show a substantial negative correlation with Academic Engagement (−0.79). These emotions can demotivate students, creating barriers to effective learning and

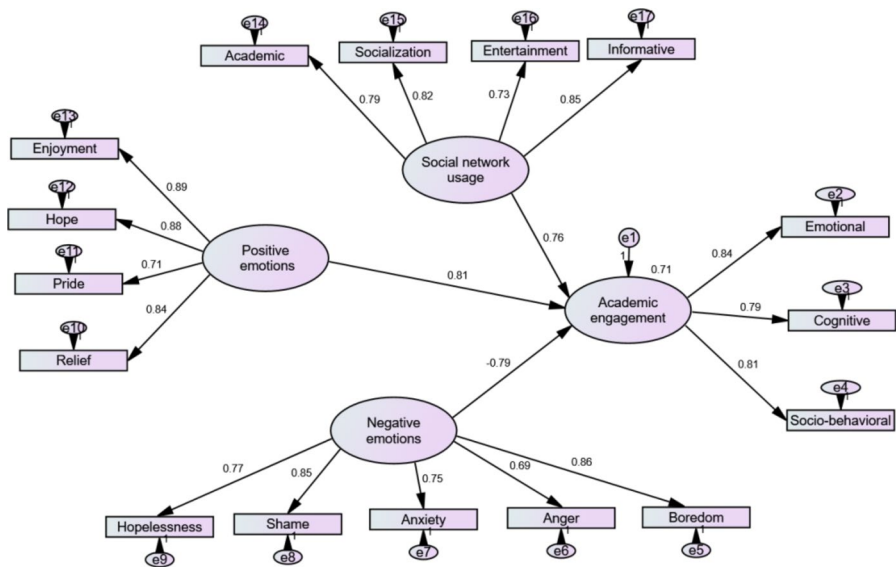


Fig. 2 The final measurement model

Table 5 Structural model assessment

Parameter	Estimate	Lower	Upper	<i>P</i>
Academic engagement	0.711	0.214	0.427	0.001

reducing their willingness to engage in academic tasks. Moreover, Social Network Usage (categorized as academic, socialization, and entertainment) also demonstrates a significant positive correlation with Academic Engagement (0.76). This suggests that social networks, when used for both academic and social purposes, can foster a supportive environment that enhances students' academic involvement. By participating in academic discussions or socializing with peers online, students may feel more connected and motivated to participate actively in their studies.

Table 5 presents the Structural Model Assessment, focusing on Academic Engagement. The estimate of 0.711 indicates a strong positive relationship for Academic Engagement in the structural model. The confidence interval (0.214 to 0.427) does not cross zero, suggesting that the effect is statistically significant. Additionally, the *P*-value of 0.001 further supports that this relationship is highly significant, as it is well below the typical alpha threshold of 0.05, meaning there is a less than 0.1% chance that this result is due to random variation. In the structural model, Academic Engagement has a significant positive estimate of 0.711 (CI [0.214, 0.427], *p* = 0.001), indicating a strong and reliable association within the model.

The findings also suggest that a significant portion, approximately 71%, of the variations observed in students' academic engagement can be attributed to the combined influence of their perceived social networks usage, positive emotions, and negative emotions. This means that the model successfully explains a large part of the changes in how engaged students feel academically. Specifically, social networks

usage alone accounts for about 58% of the changes in academic engagement. This suggests that the way students perceive and use social networks can greatly shape their academic experiences, either by providing social support or, alternatively, by causing distractions. In addition to social media's impact, positive emotions are shown to uniquely predict around 66% of the changes in academic engagement. This indicates that when students experience positive emotions, such as motivation, joy, or satisfaction, their academic involvement tends to increase significantly. Positive emotions foster greater participation and interaction in academic settings. On the other hand, negative emotions also have a distinct impact, uniquely predicting about 62% of the changes in academic engagement. This highlights that negative emotions, such as stress, anxiety, or frustration, tend to decrease students' academic involvement, which could lead to disengagement or poorer performance. Therefore, addressing both the emotional well-being of students and their social media usage patterns could be crucial in enhancing their overall academic engagement and success.

7 Discussion

The results of the study provide valuable insights into the complex relationship between the variables. The favorable connection found between students' views on social networks for learning purposes and their academic involvement highlights the possible advantages of utilizing digital platforms for educational aims. These findings suggest that when tertiary students view social networks as valuable tools for learning and communication, they are more likely to actively engage with academic content, collaborate with peers, and participate in meaningful interactions within the technology-enhanced learning environment. By perceiving social networks as supportive resources for academic pursuits, tertiary students may feel more empowered to explore content, seek assistance, and share knowledge with their peers, ultimately enhancing their levels of academic engagement and participation in the digital classroom.

Furthermore, the identification of a negative relationship between tertiary students' perceptions of social networks and their negative emotions highlights the nuanced interplay between technology use, emotions, and academic outcomes. When students hold positive perceptions of social networks as educational tools, they may experience fewer negative emotions such as anxiety, frustration, or disengagement while interacting with digital platforms in academic contexts. This negative relationship suggests that viewing social networks as conducive to learning and collaboration may mitigate adverse emotional responses that could hinder students' academic performance and well-being. The findings regarding the negative relationship between tertiary students' perceptions of social networks and their negative emotions, as well as their academic engagement, underscore the importance of fostering a positive digital learning environment where social networks are perceived as channels for constructive interactions and knowledge sharing. By creating supportive structures that encourage the strategic use of social networks for academic purposes, educators and institutions can help students harness the benefits of technology while minimizing the potential drawbacks associated with negative emotions and disengagement.

The findings of this study make a significant contribution to the field by providing empirical evidence on the complex interplay between students' perceptions of social network usage, their emotional experiences, and their academic engagement in technology-enhanced classrooms. The model explains approximately 71% of the variance in academic engagement, highlighting the combined influence of these factors. This level of explanatory power underscores the importance of integrating social, emotional, and technological dimensions when examining student engagement in modern learning environments. A key contribution is the identification of social network usage as a dominant predictor, accounting for 58% of the variance in academic engagement. This finding underscores the dual role of social networks in academic settings, serving as tools for social support and collaboration while also potentially acting as sources of distraction. This insight is critical for educators and policymakers aiming to optimize the use of digital platforms in education.

Additionally, the study highlights the unique predictive roles of positive and negative emotions. Positive emotions, which predict 66% of the changes in academic engagement, are shown to significantly enhance students' motivation, participation, and interaction. Conversely, negative emotions, predicting 62% of the variance, reveal the detrimental impact of stress, anxiety, and frustration on academic involvement. These findings emphasize the need for fostering a supportive emotional climate in classrooms to maximize engagement and performance. By integrating insights into the influence of emotional and technological factors on academic engagement, this study provides a comprehensive framework for designing interventions that address both emotional well-being and digital literacy. These contributions extend the understanding of academic engagement in technology-supported learning environments and offer actionable implications for enhancing student outcomes in higher education.

Consistent with the present study, earlier research has also shown a positive correlation between students' views on social networks and their academic engagement (Dai & Wang, 2024; Li et al., 2020; Littlejohn et al., 2016). This pattern indicates that seeing social networks as useful educational tools is often linked to increased academic engagement among various student groups. Additionally, the current study's findings regarding the negative relationship between perceptions of social networks, negative emotions, and academic engagement are in line with prior research. Evidence suggests that when students consider social networks beneficial for their learning, they are less prone to negative emotions that could hinder their academic involvement and success (Shanshan & Wenfei, 2022; Wang et al., 2022; Zhang et al., 2021).

While the current study specifically focuses on tertiary students, previous research may have examined broader student populations (Mihai et al., 2022; Subramaniam et al., 2022; Verzeletti et al., 2016). Differences in academic levels and experiences could influence how perceptions of social networks impact emotions and academic engagement, highlighting the need for targeted interventions and tailored support for tertiary students (Tadayonifar & Entezari, 2020). Previous studies may have been conducted in different educational contexts or cultural settings, leading to variations in the observed relationships (Teng & Zhang, 2020; Zhang, 2024). Factors such as institutional support, technological infrastructure, and socio-cultural norms could influence the dynamics between social networks, emotions, and academic engage-

ment among tertiary students (Lyashevsky et al., 2020; Sung, 2023). These comparative insights inform ongoing discussions on the implications of technology use for learning outcomes and student well-being, guiding future investigations and educational practices aimed at enhancing the digital learning experiences of tertiary students.

The study focuses on specific educational settings or populations, such as tertiary students in particular regions, making the findings less applicable to broader or different populations. The reliance on self-reported perceptions of social networks may introduce bias. Students' responses could be influenced by their mood or desire to present themselves in a certain way, affecting the accuracy of the data. Because the study employs a cross-sectional design, it might not reflect changes over time. This constraint hinders the ability to determine causal relationships among perceptions of social networks, emotions, and academic engagement.

8 Conclusion

The study established a significant positive correlation between tertiary students' views on social networks and their positive emotions and academic engagement in technology-driven classrooms. This indicates that students who see social networks as helpful or supportive tend to experience greater emotional well-being, including heightened happiness, sense of connection, and motivation. These positive emotions translate into higher levels of participation and investment in academic activities within tech-enhanced environments, where collaboration and interaction are often mediated through digital platforms. Social networks may help students build a sense of community, share resources, and offer emotional support, thereby fostering a more engaging and enriching academic experience. Conversely, the study also demonstrated that negative perceptions of social networks can lead to detrimental effects on students' academic engagement. Students who view social networks negatively may associate these platforms with stress, anxiety, or social pressure, which in turn results in negative emotional experiences. Such negative emotions—like frustration or distraction—undermine their ability to focus on academic tasks, reducing their engagement and overall performance in technology-enhanced learning environments. The study highlights the dual impact of social networks, which can either enhance or hinder academic engagement depending on how students perceive and emotionally respond to them.

These results have significant implications for educational practice and policy. Educators and instructional designers can leverage the positive relationship between tertiary students' perceptions of social networks and their academic engagement to design innovative learning experiences that integrate technology effectively. By promoting a positive perception of social networks as learning tools and providing guidance on their productive use, educators can enhance student motivation, collaboration, and academic success in technology-enhanced classrooms. Additionally, efforts to address factors contributing to negative emotions associated with social network use can support students in managing their digital interactions and emotional responses, fostering a more conducive learning environment for tertiary students in

the digital age. The findings have some theoretical implications. Positive perceptions of social networks can foster an emotionally supportive environment that enhances academic engagement. When students perceive social media as a platform where they can connect and collaborate positively, they are more likely to feel emotionally supported, which in turn can boost their motivation and involvement in academic tasks. This suggests that integrating social network platforms into educational strategies could improve student engagement and outcomes. By providing a space for peer-to-peer interaction, feedback, and collaborative learning, social networks can encourage students to participate more actively in the learning process, making educational experiences more dynamic and engaging. The study underscores the importance of addressing students' emotional responses to social networks. Positive emotions such as excitement, satisfaction, and belonging linked to social networks can be leveraged to enhance learning experiences. Teachers and educational designers could create online environments that maximize these emotions, helping students stay connected and motivated. However, strategies to mitigate negative emotions, such as anxiety, frustration, or feelings of isolation, are equally crucial to prevent disengagement. Addressing these negative emotions through proper guidance, digital literacy training, and supportive interactions can minimize the risks of social network-induced stress or disengagement. Finally, the findings highlight the need for technology-enhanced classrooms to consider the emotional impacts of social network usage. With the growing integration of digital platforms in education, it is essential to design learning environments that promote positive emotional experiences and foster a sense of connection. This can inform educators and administrators in creating structured, supportive, and emotionally intelligent online spaces that encourage not only academic engagement but also emotional well-being. In this way, social networks can become powerful tools for promoting both academic success and emotional development in technology-mediated education.

As practical implications educational institutions can enhance academic engagement by integrating social network platforms that promote positive interactions. This can be achieved by selecting platforms with features that encourage collaboration, support, and positive feedback among students. Schools and universities should implement strategies to monitor students' emotional responses to social network usage. This can help in identifying negative emotional impacts early and providing timely interventions, such as counseling or workshops on positive social media use. Technology-enhanced classrooms should be designed to incorporate social network tools that foster positive emotions. This could involve creating group activities, discussion forums, and peer support systems within these platforms to boost engagement. Providing training sessions and resources for both students and educators on how to effectively use social networks for academic purposes can mitigate negative emotions and enhance engagement. This can include best practices for maintaining a positive online presence and handling negative interactions. Institutions can develop policies that encourage the positive use of social networks while addressing potential negative impacts. Policies could include guidelines on appropriate online behavior, support resources, and mechanisms for reporting and addressing negative experiences.

Future studies could focus on several key areas to deepen understanding and expand upon these findings. Researchers can conduct long-term studies to observe changes in the relationship between the variables over time. This could help in understanding the long-term effects and sustainability of these relationships. They can design and implement interventions aimed at enhancing positive emotions and mitigating negative emotions through social network use. Evaluate the effectiveness of these interventions on academic engagement in technology-enhanced classrooms. They also can examine how cultural differences influence the relationship between social networks, emotions, and academic engagement. This can provide insights into how cultural contexts modify these dynamics. Finally, they can study the effectiveness of different emotional regulation strategies in helping students manage the negative emotions associated with social network use in technology-enhanced classrooms.

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Data availability The data will be available on a reasonable request.

Declarations

Conflict of interest Morteza Mellati and Mohammadreza Valizadeh have no conflict of interest to declare.

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