



Mediating and moderating role of emotional intelligence between mobile phone use and affective commitment among undergraduate students in academic institutes

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Abstract

With the widespread adoption of mobile phone use (PMU) among undergraduate (UG) students in Kathmandu's academic institutions, this research aims to investigate how emotional intelligence (EI) functions as both a mediator and a moderator in the MPU-Affective Commitment (AC) relationship among undergraduate students in selected academic institutions in Kathmandu. A quantitative cross-sectional survey questionnaire, comprising 30 statements, was completed by 423 undergraduate (UG) students from selected academic institutions in Kathmandu. Responses were recorded on a 5-point Likert-type scale. The relationships were examined using partial least squares structural equation modeling. The study revealed relationships between MPU, EI, and AC. EI exhibited both mediating and moderating effects on the relationship between MPU and AC. However, the mediation observed is partial. Additionally, EI played a moderating role, influencing the strength and direction of the MPU-AC relationship. Based on these findings, it is evident that emotional intelligence (EI) plays a multifaceted role in the relationship between mobile phone use (MPU) and affective commitment (AC) in academic pursuits. EI serves as both a mediator and a moderator, highlighting the complexity of these interactions. These insights hold significant implications for educational institutions seeking to leverage the positive aspects of mobile technology while nurturing EI to enhance students' AC. This insight can inform educators and policymakers on strategies to optimize the positive effects of mobile technology on student commitment while addressing potential challenges.

Keywords Affective commitment (AC) · Emotional intelligence (EI) · Mobile phone use (MPU) · Academic institutes

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Introduction

The extensive adoption of Mobile Phone Use (MPU) has garnered growing attention in all areas, including academics, due to its profound impact on student life. Periods of student development involve physical, emotional, and social energy; if not coordinated correctly, it may negatively impact physical, emotional, and social well-being, and academic performance (Ali et al., 2019; Bazaluk et al., 2022; Rodríguez et al., 2020). Through this concentration, this study aims to examine the intricate dynamics of how mindful MPU influences affective commitment (AC) among students in academic institutes, with a definite emphasis on the mediating and moderating role of EI.

Mobile phones have evolved from simple communication devices to essential tools for learning, communication, entertainment, and social interaction (Yeh et al., 2020). Their prevalent presence in both academic and personal scopes stimulate a critical investigation of their effect on students' emotional, psychological, and social well-being (Kuznekoff & Titsworth, 2013; Sarhandi et al., 2017; Smale et al., 2021). Incorporating mobile technology into educational settings has reshaped the learning setting, offering extraordinary prospects for access to information and alliance while presenting challenges such as attention, distraction, and dependency (Keengwe & Bhargava, 2014; Liu et al., 2022).

AC states to the emotional attachment, identification, and participation of students' development towards their educational institutes (Cownie, 2019; Meyer et al., 1993; Shayery et al., 2022). It incorporates feelings of devotion, dedication, determination, and engagement to academic goals and institutional values. This emotional bond plays a decisive role in shaping students' enthusiasm, persistence, and overall gratification with their educational involvement (Chamizo-Nieto et al., 2021; Pekrun et al., 2002).

The role of EI is key in how students understand, manage, and utilize emotions in academics (Mayer & Salovey, 1990; Schutte et al., 1998). EI belongings students' ability to navigate interpersonal relationships, cope and communicate with academic stressors, and maintain motivation towards their educational purposes. Students through higher EI are often better prepared to accomplish the challenges of educational life, cultivating resilience and adaptive strategies for success (Golemen, 1995; Lyons & DeLange, 2016; Yeh et al., 2020). While much research has been directed at the impact of MPU on academic presentation and social behaviors (Calderón-Garrido et al., 2022; Edeh et al., 2024; Herut et al., 2024; Khan et al., 2023b), there remains an important break in understanding the specific mechanisms through which EI influences AC within an academic context (Bam, 2023; Cownie, 2019).

The study examines the mediating and moderating role of EI between mobile phone use (MPU) and affective commitment (AC) among undergraduate students. The rationale and significance behind the study lie in addressing the rising prevalence of MPU and its dual impact on academic engagement. While excessive MPU may impair emotional well-being and commitment, mindful use can enhance EI, promoting better academic performance. By understanding this relationship, educational institutions can implement strategies to foster mindful MPU and EI development, improving students' engagement and commitment. The results provides the hypothesis that EI plays a crucial role in moderating MPU's effects.

Theoretical perspective

MPU and AC

Theoretical perspective

The theoretical perspective of MPU among students encompasses various activities, including communication, information seeking, and entertainment. While mobile phones are beneficial for connectivity and information, their excessive use can lead to addiction, distraction, and concentrated face-to-face interactions (Calderón-Garrido et al., 2022).

AC refers to the emotional attachment, identification, and participation of a distinct person who has with a group, or activity. This type of commitment is important in an educational context because it reflects how emotionally connected students feel to their institutions and their willingness to engage in academic activities. Meyer et al. (1993) defined AC as one of the three types of organizational commitment, emphasizing the emotional aspect.

Empirical research studies

The increasing prevalence of MPU among students has sparked concerns about its potential impact on AC, such as academic engagement and commitment, with numerous empirical studies shedding light on the theoretical perspective. This body of study delivers a robust indication of the relationship between mindful MPU and its impact on AC (Wang et al., 2022). Nowadays, the extensive use of mobile phones is observed both inside and outside the classroom. Integrating smartphones into classroom teaching and learning can offer various strengths and limitations to learners, fostering dynamic work, motivation, and engagement (Bourekadi et al., 2020). A systematic evaluation by Calderón-Garrido et al. (2022), analyzing 60 articles from 2011 to 2020, found that integrating mobile phones in classrooms

demonstrated benefits for education, with the utilization of mindfulness and self-regulation skills (Calderón-Garrido et al., 2022). On the other hand, a study by Ifeanyi and Chukwuere (2018) suggested that excessive use of mobile phones can negatively impact the willingness to learn, motivation, and commitment among South African undergraduate students. Additionally, a study by Kuznekoff and Titsworth (2013) demonstrated that a lack of mindfulness and self-regulation in MPU can negatively impact learning commitment, willingness, and motivation. All evidence suggests that mindfulness MPU is beneficial for the student's emotional engagement.

So, grounded on the earlier indication signifying a relation between mindfulness MPU and AC, the hypothesis is projected;

H1: Mindfulness MPU has a significant influence on AC.

The hypothesis that mindfulness MPU significantly impacts AC among students is justified based on the theoretical framework and previous research (Calderón-Garrido et al., 2022; Kuznekoff & Titsworth, 2013). The relationship is grounded in the AC (Cownie, 2019; Meyer et al., 1993) imposed by mindful MPU, which engages students emotionally and influences their willingness to engage in academic activities (Calderón-Garrido et al., 2022; Kuznekoff & Titsworth, 2013).

Mindfulness MPU and EI

Theoretical perspective

EI encompasses the assistance that enables persons to comprehend and accomplish situations effectively (Mayer & Salovey, 1990). However, young people, fueled by their boundless energy and curiosity, often seek to explore new ideas and assert their individuality. Yet, in today's digital age, the prevalence of devices like smartphones offerings a significant challenge. Students are increasingly drawn to using these devices for both academic and other purposes, sometimes without realizing when it becomes habitual behavior. Consequently, they may find themselves constantly connected to social media platforms, even during class time or outside of school hours. This dependency on technology can weaken students' self-control, limit their face-to-face interactions, and make them vulnerable to online harassment and cyberbullying. Ultimately, it poses a threat to crucial components of EI, such as empathy and effective communication.

Review of literature

MPU and EI have gained attention, with studies exploring both positive and negative influences. Excessive MPU during classroom activities can lead to distractions and reduced focus, potentially affecting EI assistance. Aimed at illustration, Rodríguez et al. (2020) highlighted that excessive MPU is associated with anxiety and extrinsic motivation. Likewise, another study by Smale et al. (2021) highlighted that improper MPU in school can negatively impact behavior, learning, and well-being. Similarly, a study by Tanil and Yong (2020) with 119 undergraduates found that the presence of smartphones negatively impacted memory. However, some research has suggested that the mindfulness usage of cellphones can significantly enhance student emotions, performances, and empathy. For example, Sarhandi et al. (2017) demonstrated that proper utilization of mobile phones, such as self-regulation and awareness, can cultivate good communication and social interaction. Overall, empirical findings suggest a complex relationship with both positive and negative implications.

Hypothesis development

Based on the research evidence demonstrating a relationship between mindfulness MPU and EI, a hypothesis is proposed:

(H2) Mindfulness use of mobile phones significantly impacts EI.

The hypothesis that mindfulness MPU significantly impacts EIs among students is justifiable based on theoretical frameworks, and previous evidence suggests that mindfulness MPU can impact EI. This study does not suggest only positive significance; if there is no mindful utilization of mobile phones, it can impact EI, such as understanding emotions, controlling emotions, behaviors, and empathy. Based on this information, we aim to delve into examining the mindfulness MPU and its significant impact on EI.

EI and AC

Theoretical perspective

EI and AC are vital concepts in organizational behavior and psychology, particularly in educational settings. EI, popularized by Goleman (1995), includes the skills to notice, comprehend, manage, and usage feelings effectively (Meyer et al., 1993). It encompasses four components: self-understanding, self-regulation, social skills, and social

relationships. These assistances allow persons to handle relationships carefully and empathetically (Goleman, 1995).

Affective commitment refers to the emotional part, identification, and participation a distinct has with an organization (Meyer et al., 1993). For students, AC means their emotional attachment to their educational institution, significantly influencing their engagement and performance (Mayer & Salovey, 1990).

The theoretical suggestion between EI and AC proposes that EI individuals form positive relationships and create supportive academic environments. This nurtures a stronger emotional attachment and sense of belonging to their institution, enhancing their AC.

Literature review

EI and affective commitment in educational contexts are crucial. Numerous researchers have conducted studies in educational settings (Meyer et al., 1993; Rivers et al., 2012). For illustration, research by Ranasinghe et al. (2017) suggests that scholars with high EI have better academic performances and fewer stress points. Rivers et al. (2012) highlighted EI's role in social effectiveness and navigating academic life's emotional complexities.

Affective commitment is vital in educational settings (Bam, 2023). Meyer et al. (1993) defined AC in their three-element prototypical of organizational commitment. In education, affective commitment is linked to positive outcomes like higher student engagement, better academic performance, and lower dropout rates (Bam, 2023; Meyer et al., 1993). Students with a strong emotional attachment to their institutions are more likely to succeed academically and socially.

One research done by Puyod et al. (2021) initiated that EI positively influences self-efficacy and academic engagement in a study of 395 students in Thailand. An article by Martín et al. (2021) showed a significant connection between vigor, dedication, and absorption with the EI factor of self-esteem. All studies indicated that emotionally intelligent students foster a supportive academic environment, enhancing their emotional attachment to the institutions.

Hypothesis development

Based on the theoretical perspective and empirical studies, the subsequent hypothesis is planned:

Hypothesis (H3): There is a significant relationship between students' EI and their affective commitment to their educational institutions. Students with higher EI manage academic stress better and build positive

relationships, fostering a stronger emotional attachment to their institution.

This hypothesis aims to provide a framework for examining the impact of EI on AC among students, enhancing the understanding of how EI competencies influence educational outcomes.

EI has a significant mediating result between MPU and AC

Theoretical perspectives

MPU and its impact on academic settings MPU has become ubiquitous, particularly among students in academic institutions. Studies demonstrate that MU for academic purposes can take together encouraging and undesirable consequences on attention, concentration, presentation, and overall well-being. For instance, while MU can facilitate access to educational resources and enhance learning experiences, it can also lead to distractions and reduced focus if not managed mindfully.

AC in academic environments AC denotes the expressive part, identification, and connection a distinct person has with their group. In educational settings, AC is crucial as it fosters a sense of being in the right place, engagement, and a positive emotional connection to the institution. Meyer et al.'s (1993) three-domain classical commitment highlights the importance of AC in promoting sustained involvement and dedication.

EI and mindfulness EI encompasses skills like self- and social awareness and management (Goleman, 1995). These skills are essential for navigating the challenges associated with MU, particularly regarding mindfulness. Mindfulness includes the existence of current and completely involved with the present task, reducing distractions, and enhancing emotional regulation.

Empirical research studies

Impact of EI on mindfulness MPU and AC Wang et al. (2022) exposed a significant connection between mindfulness, technological use, and student commitment. Mindfulness can mitigate the negative impacts of MPU by fostering a sense of purpose and focus. Tang and He (2023) demonstrated that self-regulation skills could address issues related to MPU, such as attention and distraction, thereby improving emotional regulation and reducing negative emotions. Bergdahl et al. (2020) found that awareness, self-regulation, and empathy skills cultivated mindfulness in classroom settings,

enhancing AC towards educational institutions. Iqbal et al. (2021) explored the role of EI in promoting mindful MU in academic environments, which positively influences AC. Trigueros et al. (2019), a research involving 615 students, results indicated strong connections between EI, positive emotions, self-regulation, resilience, AC, and engagement in physical activities.

Hypothesis development

Based on the theoretical framework of EI (Goleman, 1995) and AC (Meyer et al., 1993), as well as empirical evidence, the ensuing hypothesis is planned;

Hypothesis (H4): EI has a significant mediating effect on the relationship between Mindful MPU and AC in academic settings. I enhance mindfulness skills for MPU, which are crucial for managing commitment effectively. Mindful MPU reduces distractions and enhances engagement and focus in academic tasks. Increased engagement and positive emotions fostered by EI lead to higher AC towards the educational institution. The proposed research purpose is to observe the mediating role of EI between MU and AC. By understanding how EI can enhance mindful MPU and, in turn, strengthen AC, educational institutions can develop strategies to promote mindful MPU habits and foster stronger emotional connections among students. This research has significant implications for improving student engagement, performance, and overall well-being in academic settings.

EI plays an important moderating/interaction role in the connection between mindful MPU and AC

Theoretical perspective

Mindfulness MPU in Education: Mindfulness, defined as the consciousness that rises through paying consideration to determination in the current instant and nonjudgmentally, has been increasingly integrated into educational settings to improve students' psychological and academic outcomes (Kabat-Zinn, 2003). Mobile applications designed to promote mindfulness can help manage stress, increase concentration, and enhance emotional regulation (Lyons & DeLange, 2016).

AC in educational contexts

AC refers to the expressive part, identification, and contribution that an individual has to a body (Meyer et al., 1993). In educational settings, AC can be viewed as students' emotional attachment to their educational institution, which can

influence their engagement, satisfaction, and overall academic success.

EI as a moderator/interaction

EI includes the skill to observe, comprehend, accomplish, and control emotions in oneself and others (Mayer & Salovey, 1990). EI is posited to enhance the positive effect of mindfulness by improving emotional regulation and interpersonal relationships, which in turn may strengthen students' AC to their educational institution.

Empirical studies

Mobile phones present challenges to students, but mindfulness can cultivate the skillful use of mobile phones, fostering awareness of the moment without judgment. Research by Alomari (2023) revealed that mindfulness MPU skills are effective tools for promoting mindfulness among students. Research has confirmed that EI is positively interrelated with AC. For instance, Carmeli (2003) found that employees with higher EI exhibited stronger emotional attachment to their organization. In educational settings, students with developed EI are possible to have better interpersonal relations with peers and faculty, leading to higher AC.

Mindfulness mobile phone skills have been shown to be effective tools for promoting mindfulness among students. A study by Howells et al. (2016) revealed that using mindfulness mobile phone apps significantly reduced stress and anxiety levels among university students, which could contribute to increase AC by generating a more positive and caring education. Shapiro et al. (2008) argued that mindfulness exercises reduced pressure and improved mental health among university students. These improvements in psychological well-being can lead to higher levels of AC as students feel more connected and committed to their educational institution.

Hypothesis development

Given the theoretical perspectives and empirical evidence, the subsequent hypothesis is proposed:

H5: EI has a significant moderating/interaction role in the relation between mindfulness MPU and AC among students in educational settings. The rationale behind this hypothesis is that EI is an outstanding skill that helps students understand values, habits, and the impact on their emotions. EI helps students understand the effective use of mobile phones. In addition to fostering pleasant feelings and self-confidence in the classroom, thoughtful MPU fosters beneficial emotional relationships. Thus,

EI has the power to influence whether students are reactive or mindful in their MPU in the classroom and how it impacts AC in educational settings. Researchers propose this hypothesis to explore the interaction or moderating effect between effective MPU and AC. If this is shown to be significant, it could be a way to overcome mobile distractions and classroom disruptions, increasing trust and improving emotions in educational settings, thereby enhancing the bond between teachers, students, and other stakeholders.

There is further evidence supporting this rationale. Mindfulness MPU promotes students' psychological well-being, enhancing their emotional attachment to their educational institution. For illustration, a study by Yeh et al. (2020) stated that beliefs towards mindful use of mobile devices significantly influence creativity self-efficacy. Another study by Hameli and Ordun (2022) indicated that a higher level of EI is definitely correlated to self-efficacy, which in turn is definitely correlated to institute commitment. This moderation or interaction role of EI is significant, indicating that EI can enhance the effectiveness of mindfulness practice through mobile phones by improving students' emotional and interpersonal competencies, thereby amplifying the positive effect of mindfulness MPU on AC. In conclusion, the hypothesis that EI significantly moderates/interacts with the relationship between MPU and AC among students in educational settings is grounded in robust theoretical frameworks and supported by empirical research.

Conceptual framework

This conceptual framework (Figs. 1, 2, 3) and the converging hypothesis offer a planned basis for inspecting the multi-layered relationship between mindful MPU, EI, and AC among students. The study aims to empirically examine these hypotheses to increase a profound understanding of the interaction among these variables.

Research methodology

This study employed a quantitative cross-sectional approach to discover mobile phone usage patterns among undergraduate students from selected academic institutions in Kathmandu, Nepal. Data collection was conducted between June and August 2023 using convenience sampling techniques to identify participants.

Selection criteria

Participants were required to be actively enrolled undergraduate students from institutions offering a range of programs, from certificate courses to master's degrees, in Kathmandu. To be qualified for the research, participants had to:

Use mobile phones for 6 h or more daily, as this level of screen time is highly measured based on earlier studies (Daniyal et al., 2022).

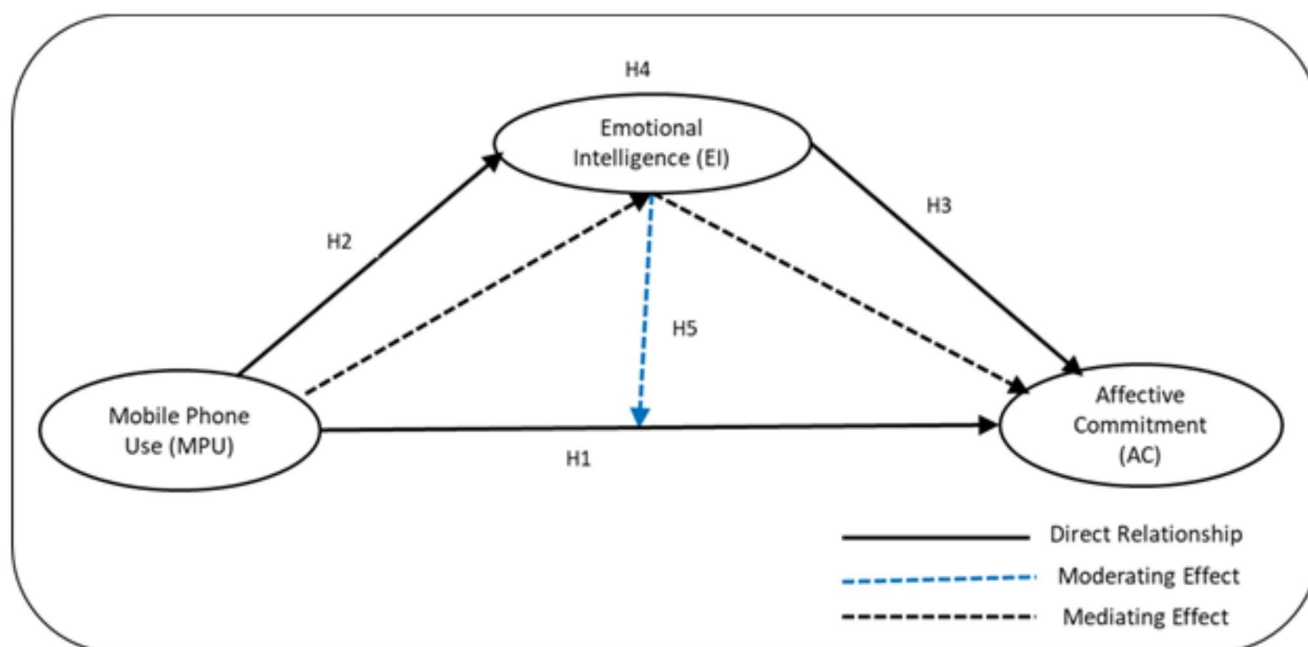


Fig. 1 The Mediating and Moderating Role of EI between MPU and AC. H1: Mindful MPU has a significant influence on AC. H2: Mindful MPU has a substantial impact on EI. H3: EI has a substantial impact on

AC, H4: EI has a significant mediating effect between mindful MPU and AC. H5: EI has a substantial moderating role in between mindful MPU and AC

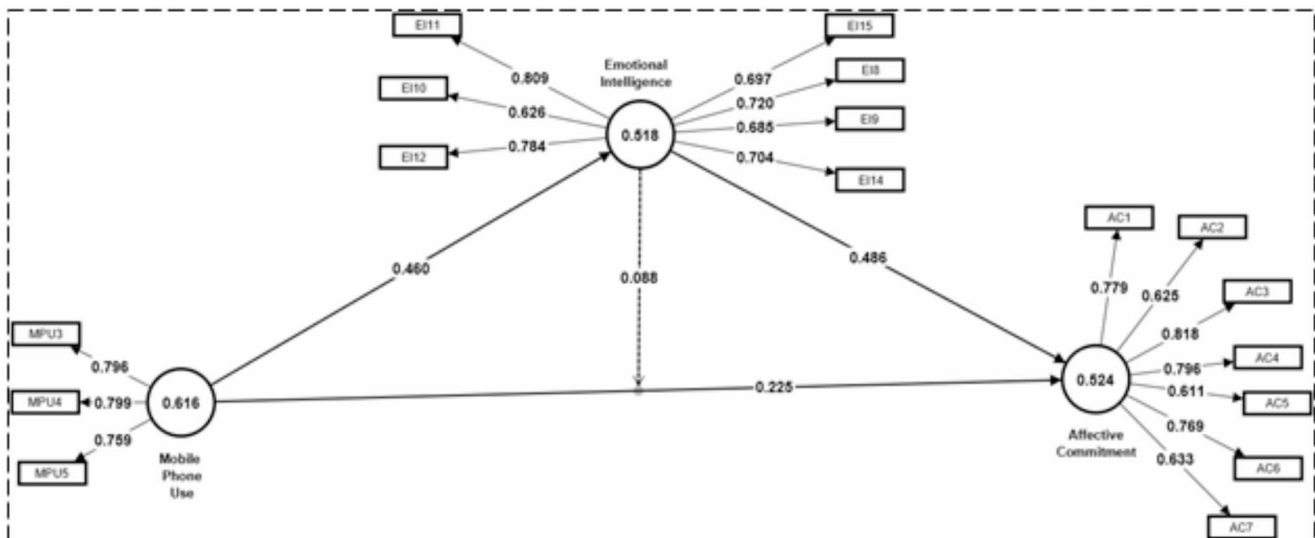


Fig. 2 Measurement model with outer loadings and AVE values from PLS-Algorithm

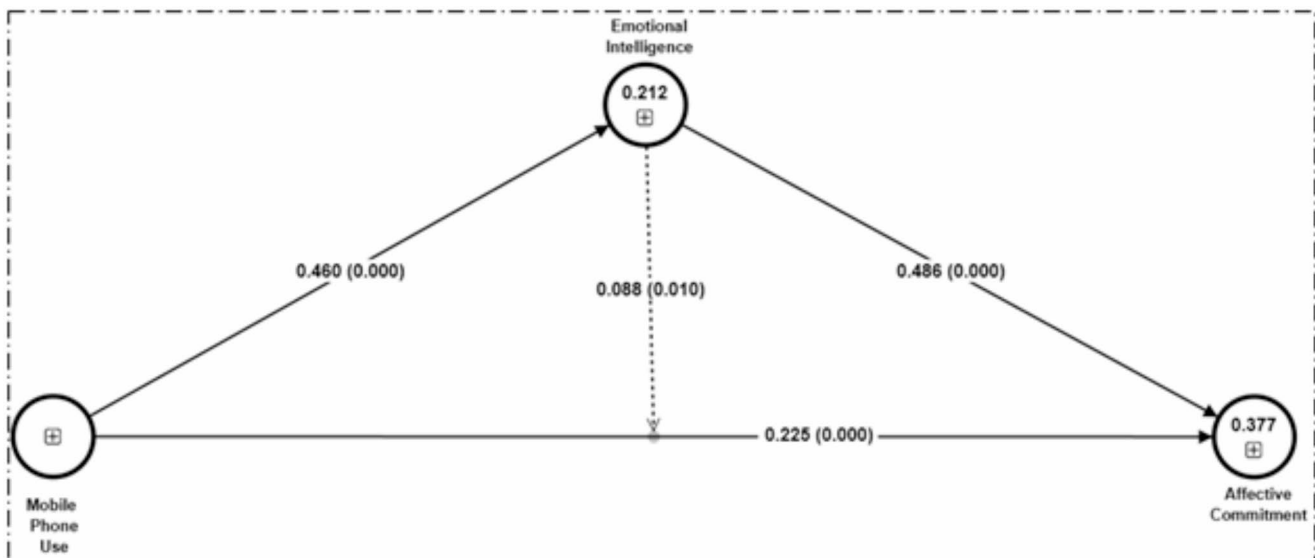


Fig. 3 Structural Model with path coefficient (beta) and p-values from bootstrapping test

Engage extensively with social media platforms, including but not limited to Viber, Instagram, WhatsApp, email, and so on.

Study area

The study was conducted in selected educational institutions across Kathmandu. Due to **privacy concerns** expressed by the institutions, their names were kept confidential. These institutions offer a variety of academic programs ranging from certificate to master's degree levels.

Sampling and sample size

Since the total student population in these institutions was not disclosed, Cochran's formula for unknown populations was applied to calculate the sample size. The estimated sample size for this study was approximately 423 participants.

Research instruments and variables

In the study "Examining the Moderating Role of Emotional Intelligence on the Relationship between Mobile Phone Use and Affective Commitment," variables were measured using items such as mobile phone use, emotional intelligence

(self-report scales), and affective commitment (emotional attachment and loyalty to an organization or group).

The questionnaires were completed online. Section A of the study included socio-demographic variables such as age, gender, and educational discipline.

Section B focused on mobile phone use with a 5-item questionnaire, utilizing a 5-point Likert scale to examine mindful mobile phone use, drawing on instruments used by previous researchers (Baer et al., 2004; Yeh et al., 2020).

The third section included a 15-item emotional intelligence questionnaire, utilized by previous researchers, employing a 5-point Likert scale (Salovey et al., 2004; Schutte et al., 1998; Van Deursen et al., 2015).

Additionally, section D affective commitment instruments were utilized from previous research studies (Cownie, 2019; Masouleh & Allahyari, 2017; Meyer et al., 1993), consisting of 10 items with a 5-point Likert scale in this study.

Before conducting the study, we obtained ethical clearance from the Institutional Review Board (IRB) at Yeti Health Science Academy, which is affiliated with the Nepal Health Research Council (NHRC). In accordance with the norms of this institution, the research was conducted.

Validity and reliability of the study

The questionnaire in Sections B, C, and D, assessing MPU, EI, and AC, was evaluated by three experts and included in the appendix (Appendix 2, Table 6) after the references. They were instructed to rate the relevance of the questions based on the study's objectives, using response options ranging from "not relevant" to "very relevant." The assessment results were used to calculate the Content Validity Index (CVI) for relevance. The findings indicated that the questions were deemed relevant for inclusion in the final study, demonstrating content validity.

Ethical considerations were addressed by obtaining ethical approval from the relevant institution's ethics committee (Yeti Health Science Academy) and ensuring confidentiality and data protection measures to safeguard participants' information. Data analysis for the study will involve descriptive statistics, correlation analysis to explore relationships, mediation analysis to examine the role of EI as a mediator, and moderation analysis to assess its moderating effect between MPU and AC. Depending on the specific research questions and the nature of the data, the researcher may consider additional statistical techniques, such as structural equation modeling (SEM), to gain a more comprehensive understanding of the mediation and moderating effects in the study. This study aimed to investigate the Mediating and Moderating role of EI between MPU and AC, contributing to the understanding of these factors in the academic context.

Results

Demographic profile of the respondents

After addressing outliers and missing data, our final sample size comprised 367 participants, resulting in a response rate of 53.13%, which was well-suited for testing our hypotheses. Among the participants, 5.45% were male, while 94.55% were female. The majority of participants, accounting for 56.67%, fell within the age range of 21 to 31 years. The next largest group, at 30.24%, consisted of participants aged less than 20 years. Those aged over 40 years constituted 8.99%, and the smallest group fell within the 31 to 40-year age bracket, representing 4.087% of the total. Regarding academic backgrounds, the largest proportion of participants (50.681%) held a Bachelor of Science in Nursing (B.Sc. Nursing) degree, followed by 26.703% with a Bachelor of Pharmacy (B. Pharm) degree. Additionally, 11.989% had a Bachelor of Public Health (BPH) degree; the smallest group, comprising 10.627%, held a Post-Basic Bachelor of Nursing Science (PBNS) degree.

Pre-test and Pilot-test

Before commencing the main study, we administered a preliminary test involving 30 participants who shared their input on enhancing the questionnaires to reduce the likelihood of confusion. In response to their recommendations, we implemented minor adjustments to the questionnaires. For the pilot study, we gathered data from 20 samples and computed Cronbach's alpha to evaluate internal consistency. All constructs exhibited a reliability exceeding 0.70, which aligns with the criterion established by Sekaran (2003).

Common Method Bias (CMB)

To evaluate the potential for common method bias (CMB), we conducted an analysis using the heterotrait-monotrait (HTMT) ratio and inner variance inflation factor (VIF) values. Following the guidelines outlined by Nitzl et al. (2016), a correlation value exceeding $r > .90$ suggests the presence of CMB among key constructs. However, in our investigation, all correlation values between the constructs were below 0.90 (as indicated in the HTMT table). The highest correlation observed was 0.645, affirming the absence of CMB. Furthermore, we assessed the inner VIF values, where a VIF exceeding 3.30 could indicate potential contamination of the model due to CMB, in line with the recommendations of Adedeji et al. (2020) and Kock (2015). In our study, the highest VIF value recorded was 1.302 (as illustrated in the structural model assessment table), which falls below the

Table 1 Means, SD, correlations, and reliabilities of the study variables

Variables	Gender	Age	A_area	MPU	EI	AC	Mean	SD
Gender	1						1.946	0.227
Age	−0.052	1					1.918	0.836
A_area	−0.075	0.097	1				2.147	1.295
MPU	0.050	0.113*	−0.048	1			3.609	0.691
EI	−0.045	0.074	−0.033	0.381**	1		3.716	0.669
AC	−0.031	0.190**	−0.059	0.441**	0.546**	1	3.341	0.691

$n=384$, * $p<.05$, ** $p<.01$ (2-tailed)

Table 2 Constructs validity and reliability

Constructs	Items	FL	CA	CR	AVE
AC	AC1	0.779	0.845	0.858	0.524
	AC2	0.625			
	AC3	0.818			
	AC4	0.796			
	AC5	0.611			
	AC6	0.769			
	AC7	0.633			
EI	EI10	0.626	0.844	0.849	0.518
	EI11	0.809			
	EI12	0.784			
	EI14	0.704			
	EI15	0.697			
	EI8	0.720			
	EI9	0.685			
MPU	MPU3	0.796	0.689	0.688	0.616
	MPU4	0.799			
	MPU5	0.759			

CR Composite Reliability, AVE Average Variance Extracted, CA Cronbach's Alpha

threshold value of 3.30. This provides further confirmation that our study was not affected by common method bias.

In Table 1, you will find descriptive statistics and the correlations among the constructs. These data reveal significant correlations between all variables and AC. The construct labelled EI had the highest average value, standing at a mean of 3.716, while the construct identified as AC had the lowest mean value, registering at 3.341.

The use of Partial Least Squares Structural Equation Modelling (PLS-SEM) through Smart-PLS 4.0 is a well-established and widely accepted approach for investigating path models based on composites, primarily aimed at theory testing. This method offers notable advantages when dealing with a large number of indicators and data that do not follow a normal distribution, aligning with the recommendations provided by Hair et al. (2021) and Kock (2015). To prepare the initial data, we utilized SPSS (version 23.0) to perform essential data treatments, including checks for common method bias and assessments of linearity. Subsequently, for hypothesis testing and the execution of the PLS-SEM analysis, we employed Smart-PLS software version 4.0.

Evaluation of measurement model (outer model)

To rigorously evaluate the internal consistency and reliability of our variables, we adopted a comprehensive approach, aligning with the guidelines advocated by Hair et al. (2021). Our analysis involved both Cronbach's Alpha (CA) and Composite Reliability (CR). The findings, as depicted in Table 2, unequivocally demonstrate robust internal consistency, with all variables registering values well above the 0.7 threshold for both Cronbach's Alpha and CR. To further substantiate the convergent validity of our measures, we diligently adhered to the criteria set forth by Hulland (1999) and Hair et al. (2021). These criteria stipulate that each item should exhibit a factor loading (FL) exceeding 0.60, and the average variance extracted (AVE) should surpass 0.50. Notably, in our model, we made the decision to remove MPU1, MPU2, EI1, EI2, EI3, EI4, EI5, EI6, EI7, EI13, AC8, AC9, and AC10 due to their factor loadings falling below the 0.40 threshold, thereby failing to contribute to the achievement of an AVE of 0.50 for their respective constructs. Encouragingly, the data presented in Table 2 underscores the strength of our remaining items. These items not only exceeded the recommended FL threshold, with factor loadings consistently surpassing 0.60, but they also comfortably surpassed the AVE threshold, consistently yielding values above 0.50. This unequivocally establishes a high level of convergent validity, firmly aligning with the guidelines outlined by Hair et al. (2021).

To establish the discriminant validity of our measures, we employed two robust techniques: the Fornell-Larcker criterion and the heterotrait-monotrait ratio (HTMT). Following the Fornell-Larcker criterion, we scrutinized the diagonal values (represented by the square root of AVE) in relation to the correlation values below them. The findings, as presented in Table 3, clearly demonstrate that the diagonal values consistently surpass the correlation values underneath, thus affirming the presence of commendable discriminant validity (Fornell & Larcker, 1981). Additionally, we fortified our discriminant validity assessment by employing the HTMT ratio, which entails a comparison between the correlations among distinct constructs and the correlations among items within a given construct. As per the standard,

Table 3 Discriminant validity- Fornell larcker

Constructs	HTMT			Fornell Larcker		
	AC	EI	MPU	AC	EI	MPU
AC				0.724		
EI	0.645			0.568	0.720	
MPU	0.576	0.593		0.439	0.460	0.785

Table 4 Assessment of the structural model & hypotheses testing result

R-Square	Endogenous Variables		R Square		R Square Adjusted		0.26: Substantial, 0.13: Moderate, 0.02: Weak	
	AC		0.377		0.372			
	EI		0.212		0.210			
Effect Size (F-Square)	Exogenous Variables		AC		EI		0.35: Substantial, 0.15: Medium effect, 0.02: Weak effect	
	EI		0.292					
	MPU		0.064		0.269			
Collinearity (Inner VIF)	Exogenous Variables		AC		EI		VIF <= 5.0	
	EI		1.302					
	MPU		1.269		1.000			
Model Fit	Criteria		Saturated model		Estimated model		Threshold	
	SRMR		0.041		0.042		SRMR <0.08	
	Chi-square		946.602		951.985			
	NFI		0.878		0.879		NFI >0.9	
Hypotheses	OS/Beta	SD	Bias Corrected		T	P	Decision	Mediation
			CI/LL	CI/UL				
H1: MPU -> AC	0.225	0.057	0.114	0.336	3.956	0.000	Supported	
H2: MPU -> EI	0.460	0.052	0.345	0.550	8.930	0.000	Supported	
H3: EI -> AC	0.486	0.048	0.380	0.571	10.175	0.000	Supported	
H4: MPU -> EI -> AC	0.224	0.034	0.157	0.289	6.572	0.000	Supported	Partial
H5: EI x MPU -> AC	0.088	0.034	0.021	0.153	2.592	0.010	Supported	

a ratio below 0.9 is deemed acceptable (Henseler et al., 2015). We observed that the correlation values among the latent variables consistently remain below the 0.9 threshold, as recommended by Henseler et al. (2015), and evaluated through the HTMT ratio of correlations. Consequently, we confidently assert that our measurement constructs distinctly and adequately exhibit discriminant validity.

The off-diagonal values are the correlations between latent variables, and the diagonal is the square root of AVE.

Assessment of the structural (inner) model

After thoroughly scrutinizing the measurement model, we turned our attention to the assessment of collinearity within the structural model. This encompassed a comprehensive analysis of critical indicators, including the inner Variance Inflation Factor (VIF), coefficient of determination (R^2) values, and effect size (f^2). As meticulously presented in Table 4, our findings reveal that all prescribed thresholds for R^2 , f^2 , and inner VIF were met, attesting to the absence of problematic collinearity issues. Having duly addressed and accounted for collinearity, we then proceeded with the rigorous evaluation of the hypotheses as outlined below.

In order to evaluate the degree to which the measurement model accounts for the collected data, we employed standard indices of model fit, such as the standard root mean square residual (SRMR) and the normed fit index (NFI). The SRMR value obtained was 0.046, which falls below the threshold of 0.08, suggesting that the model fits well. Furthermore, the NFI value of 0.878 is very close to the desired threshold of >0.9. These model fit indices provide evidence that the observed data aligns well with the proposed model, indicating a strong fit.

Hypotheses testing results

The outcomes pertaining to our proposed hypotheses are meticulously outlined in Table 4. Our first hypothesis (H1) postulated a direct association between MPU and AC. The results conspicuously affirm this hypothesis, with a statistically significant relationship established. The p-value of 0.000, falling well below the 0.05 threshold, combined with a substantial t-value of 3.956 (exceeding the critical 1.96 threshold), provides unequivocal evidence of a significant effect. Thus, we confidently conclude that MPU exerts a significantly positive influence ($\beta=0.225$) on AC. Similarly,

our second hypothesis (H2) postulated a positive relationship between MPU and EI. The empirical findings resoundingly support this hypothesis, with a significant p -value of 0.000 (below 0.05) and a substantial t -value of 8.930 (surpassing 1.96). The corresponding β -value of 0.460 further attests to this positive effect. Furthermore, our third hypothesis (H3) posited a direct connection between EI and AC. The obtained results robustly validate this hypothesis, with a statistically significant relationship indicated by a p -value of 0.000 (less than 0.05) and a noteworthy t -value of 10.176 (exceeding 1.96). Hence, we confidently conclude that MPU exerts a meaningful positive impact ($\beta=0.486$) on AC.

Our fourth hypothesis (H4) posited that EI would serve as a mediator in the relationship between MPU and AC. The results distinctly demonstrate a significant mediating role played by EI. This is corroborated by a p -value of 0.000, which is below the 0.05 threshold, and the presence of positive values for both the lower limit (LL) and upper limit (UL) of the mediation effect (0.0157 and 0.289, respectively). These findings unequivocally affirm the existence of a meaningful positive mediation effect. Notably, the mediation observed here is partial, as the direct relationship between MPU and AC also remains statistically significant.

Table 4 also provides a comprehensive overview of the results regarding the moderating effects of EI. Our fifth hypothesis (H5) postulated the presence of a moderating effect of EI on the relationship between MPU and AC. The empirical findings unequivocally validate this hypothesis, with a significant moderating role attributed to EI. This is underscored by a p -value of 0.010 (below the 0.05 threshold) and a substantial t -value of 2.592 (surpassing the critical 1.96 threshold). Moreover, the moderation effect is positive, as reflected by the β -value of 0.088. This indicates

that in the presence of EI, the relationship between MPU and AC exhibits enhanced strength.

To provide a more vivid depiction of how EI interacts with the relationship between MPU and AC, we've included Fig. 4. This visual representation illustrates that the impact of MPU on AC is more pronounced when EI levels are high and attenuate when EI levels are low. To delve deeper into this dynamic, we conducted path analyses separately for both high (i.e., 1 standard deviation above the mean) and low (i.e., 1 standard deviation below the mean) levels of EI. The simple paths for MPU at both ends of the EI spectrum are delineated in Fig. 4. These path analyses serve to elucidate how the MPU-AC relationship varies depending on the level of EI. The outcomes from these analyses reveal that when EI is high, the MPU-AC relationship is notably stronger, as evident from the larger beta coefficient. Conversely, when EI is low, the MPU-AC relationship appears weaker, signified by the smaller beta coefficient. In summary, these findings underscore the pivotal role of EI in molding the association between MPU and AC.

Discussion

The increasing prevalence of MPU among students has raised concerns about its potential impact on academic commitment (AC), including academic engagement and overall commitment. Numerous empirical studies have explored this issue, offering valuable insights. For instance, Liu et al. (2022) and Wang et al. (2022) provide robust evidence linking mindful MPU with positive AC, suggesting that MPU can enhance academic engagement and commitment. These findings indicate that when students use their mobile

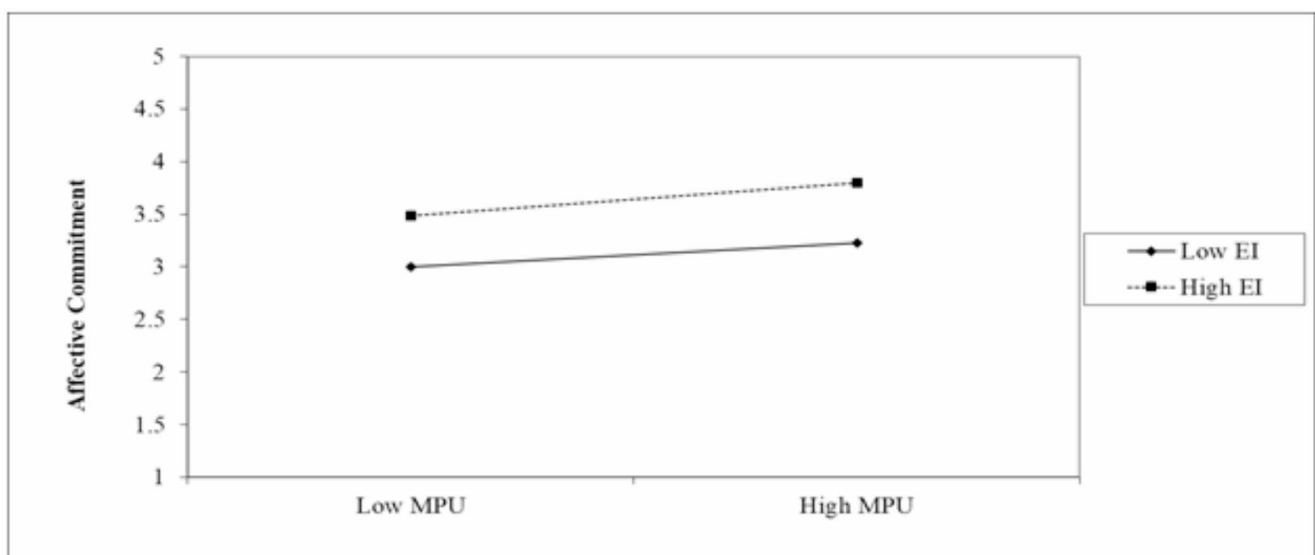


Fig. 4 Interactive Effect of EI in between MPU and AC

phones mindfully, it can positively affect their academic performance and engagement. Moreover, Nikolopoulou et al. (2021) highlight the dual nature of MPU in educational settings, noting that while smartphones can foster dynamic work, motivation, and engagement, their integration into classroom teaching must be managed carefully to avoid potential drawbacks. Calderón-Garrido et al. (2022) support this view in their systematic review, which found that mobile phone integration in the classroom, when combined with mindfulness and self-regulation skills, benefits educational commitment. However, contrasting findings by Hartley et al. (2020) and Smale et al. (2021) suggest that excessive MPU, particularly without mindfulness and self-regulation, can negatively impact students' willingness to learn, motivation, and commitment. These studies underscore the importance of mindful and regulated use of mobile phones to harness their benefits without succumbing to their potential distractions. The outcome of our current study aligns with these findings, confirming the hypothesis (H1) that MPU positively influences AC. These results underscore the importance of promoting mindful MPU among students to enhance their academic engagement.

The results of this research align with previous research, reinforcing the complex correlation between MPU and EI. Consistent with Khan et al. (2023a), our results indicate that excessive MPU is linked to increased anxiety and extrinsic motivation, suggesting that inappropriate mobile use can impair emotional well-being. Similarly, Shakoor et al. (2021) highlighted negative impacts on behavior and learning, verifying our observation that high MPU during classroom activities can disrupt focus and reduce EI skills. Moreover, the study by Tanil and Yong (2020) found that the presence of smartphones negatively affected memory, which aligns with our findings on the detrimental effects of MPU on cognitive functions related to EI. On the other hand, our results also support the notion that mindful MPU can enhance EI, resounding Sarhandi et al. (2017) who demonstrated that mindful MPU improves communication and social interaction. Thus, our study substantiates the hypothesis (H2), indicating a positive relationship between MPU and EI, emphasizing the significance of mindful mobile use.

The present study covers the present body of data by specifically examining the relationship between EI and AC, as proposed in Hypothesis 3 (H3). These results build upon previous research demonstrating the influence of EI across various domains of competence. Prior evidence has consistently revealed that EI positively impacts presentation, interpersonal relationships, and overall well-being (Martín et al., 2021; Puyod et al., 2021; Zhoc et al., 2020). In this regard, a study by Bayu et al. (2023) found a relationship between EI and AC, supporting our current study's hypothesis. Similarly, Puyod et al. (2021) highlighted that the individual

abilities of students affect their emotional engagement, with EI emerging as a key predictor of AC, aligning with H3. Furthermore, Martín et al. (2021) demonstrated a helpful connection between EI and youth commitment, recommending EI interventions to promote self-esteem and engagement in adolescents, consistent with our findings. Moreover, Zhoc et al. (2020) provided an observed indication of the encouraging result of EI on students' best operation in advanced education contexts. These previous studies collectively suggest that EI can be a predictor of increasing students' commitment and well-being. Current research confirmed a substantial positive influence of EI on AC, with a substantial β coefficient of 0.486. This suggests that enhancing EI can improve AC and professional outcomes, particularly in educational and organizational contexts. Future research should explore the mechanisms and integration of EI development in curricula and training programs.

The current results (H4) of this study underscore the significant mediating part of EI between MPU and AC in classroom settings. The mediation effect is statistically significant, indicating that EI positively influences the relationship between MPU and AC. However, the mediation is partial, as the direct relation between MPU and AC remains substantial, suggesting that while EI plays a crucial role, other factors also contribute to this relationship. Existing literature supports the mediating (relationship) role of EI. Wang et al. (2022) highlighted that excessive MPU during class negatively impacts AC, decreasing participation and academic performance. In contrast, Herut et al. (2024) found that students with higher EI exhibit better self-regulation, and awareness of other skills and management significantly influencing academic results by reducing distractions and enhancing engagement. Bergdahl et al. (2020) demonstrated that students with strong digital skills, including device management, showed increased participation and learning outcomes. Similarly, Iqbal et al. (2021) linked higher relational engagement to improved cognitive outcomes, emphasizing EI's importance in fostering AC. These findings suggest that EI enhances students' ability to regulate emotions and maintain focus, thus effectively mediating the relationship between MPU and AC.

Our fifth hypothesis (H5) proposed that EI moderates/interaction between MPU and AC. The findings confirmed this hypothesis, showing that persons with developed EI are improved at managing the distractions and stress associated with MPU, thereby maintaining their AC. This aligns with Goleman (1995), who emphasized EI's role in managing relationships, and Salovey et al. (2004), who highlighted its importance in emotional regulation. Petrides and Furnham (2003) also revealed that high EI persons exhibit better emotional regulation and reactivity, which helps them sustain their commitment despite high MPU. These studies

collectively underscore EI's critical function in mitigating MPU's potential negative effects on AC.

The findings of this study reflect both consistencies and differences when compared to previous research. Like the studies by Calderón-Garrido et al. (2022) and Liu et al. (2022), we argue that mindful mobile phone use (MPU) enhances academic commitment (AC) and engagement. However, excessive MPU, similar to findings from Hartley et al. (2020) and Smale et al. (2021), negatively affects EI and focus. Cultural differences may explain why MPU impacts AC differently across studies, as varying norms around technology use could shape its effects on behavior and commitment. A unique aspect of our findings is the mediating role of EI between MPU and AC, suggesting that high EI helps mitigate the distractions of MPU, leading to better academic outcomes. This highlights the need for EI-focused interventions in educational settings to balance.

Implications of the study

The increasing prevalence of MPU among students has raised concerns about its potential impact on academic commitment (AC), including academic engagement and overall commitment. Our study underscores the importance of promoting mindful MPU among students to enhance their academic engagement. The findings indicate that when students use their mobile phones mindfully, it can positively affect their academic performance and engagement. This suggests that educational institutions should consider integrating guidelines for mindful MPU into their policies and curriculums to maximize its benefits while mitigating potential distractions.

Moreover, the study highlights the complex relationship between MPU and EI (EI). Excessive MPU is linked to increased anxiety and extrinsic motivation, impairing emotional well-being and reducing focus. Conversely, mindful MPU can enhance EI, improving communication and social interaction skills. These results emphasize the significance of fostering EI in students through targeted interventions and programs, as higher EI can help students manage their MPU more effectively, leading to better academic outcomes.

Additionally, the study confirms the positive impact of EI on AC, suggesting that enhancing EI can improve students' emotional attachment to their educational institutions. This has practical implications for educators and policymakers, who should focus on developing EI programs that can be integrated into the curriculum to boost students' academic engagement and commitment.

The mediating role of EI between MPU and AC further indicates that EI not only directly influences AC but also enhances the positive effects of MPU on AC. This

highlights the need for comprehensive educational strategies that include both EI development and mindful MPU observation. Upcoming studies should discover the mechanisms and integration of EI development in curricula and training programs to maximize students' academic engagement and overall well-being.

Limitations

This study has several limitations that permit consideration. First, the cross-sectional design restricts causal inferences between mindful mobile phone use (MPU), emotional intelligence (EI), and academic commitment (AC). Future longitudinal studies could provide insights into these relationships over time. Additionally, the reliance on self-reported data may introduce bias, as participants might not accurately reflect their MPU or EI levels. The sample was limited to undergraduate students selected from institutions in Kathmandu, which may affect the generalizability of the findings to other educational contexts. Finally, potential confounding variables, such as socioeconomic status and prior academic performance, were not accounted for, which could influence the results.

Conclusion

The study conducted a quantitative cross-sectional investigation to discover the relations between MPU, EI, and AC among students in the selected institutes in Kathmandu. Data collection spanned from June to August 2023, involving 423 participants from selected institutes who actively use mobile phones and engage with social media platforms. The study employed a structured online questionnaire covering socio-demographic variables, MPU, EI, and AC, validated through expert evaluation for content validity. Results highlighted the dual nature of MPU, where mindful use positively influenced AC, whereas excessive and unregulated use detracted from it. EI emerged as a significant mediator and moderator in this relationship, enhancing the positive impact of mindful MPU on AC. Students with higher EI demonstrated better management of MPU-related distractions, maintaining higher levels of academic commitment. The implications underscored the need for educational institutions to integrate guidelines for mindful MPU into their policies and curricula to optimize academic engagement while minimizing distractions. Furthermore, fostering EI through targeted interventions could enhance students' ability to regulate MPU effectively, thereby improving academic outcomes and emotional well-being. Educators and policymakers are encouraged to develop and implement EI

programs within educational settings to cultivate students' emotional attachment to their academic institutions. Future research directions should explore further mechanisms and integration strategies for EI and MPU in educational contexts, aiming to enhance students' overall academic

engagement and well-being. This research contributes valued perceptions to understanding the complex dynamics between MPU, EI, and AC, emphasizing their interconnected roles in shaping students' academic experiences and commitments.

Appendix 1

Table 5 Survey items

Items	Sources	Factor Loading	Cronbach Alpha
MPU1: Using mobile devices is an efficient way to learn creativity.	(Baer et al., 2004);	0.902	0.90
MPU2: Using mobile devices can effectively improve my creativity.	Yeh et al., 2020)	0.843	
MPU3: It is easy to bring about creative ideas through mobile devices.		0.677	
MPU4: Mobile devices help me produce many creative ideas quickly.		0.480	
MPU5: Mobile devices help enhance my multi-perspective thinking.		0.817	
EI1: I know when to speak about my personal problems to others.	(Salovey et al., 2004;		0.918
EI2: When I am faced with obstacles, I remember times I faced similar obstacles and overcame them.	Schutte et al., 1998; Van		
EI3: I expect that I will do well on most things I try.	Deursen et al., 2015).		
EI4: When my mood changes, I see new possibilities.			
EI5: Emotions are one of the things that make my life worth living.			
EI6: I expect good things to happen.			
EI7: I like to share my emotions with others.			
EI8: When I experience a positive emotion, I know how to make it last.			
EI9: I seek out activities that make me happy.			
EI10: I am aware of the non-verbal messages I send to others.			
EI11: When I am in a positive mood, solving problems is easy for me.			
EI12: I have a lot of energy when I feel happy.			
EI13: When I am in a positive mood, I am able to come up with new ideas.			
EI14: I help other people feel better when they are down.			
EI15: I can tell how people are feeling by listening to the tone of their voice.			
AC1: I feel a strong sense of identification with my institutes.	(Cownie, 2019)	0.996	0.918
AC2: I am proud that at this institutes.		0.953	
AC3: I feel a strong sense of belonging to this institutes.		0.924	
AC4: The institute inspires me to be a good student.		0.796	
AC5: I genuinely enjoy my relationship with my tutors.		0.606	
AC6: The image I have of my tutors is very positive.		0.898	
AC7: Studying with my tutors is enjoyable.		0.822	
AC8: I care about the future of my tutors.		0.789	
AC9: My institute and its students need each other equally.		0.877	
AC10: Students are equally as proud to study at this institutes as the institutes is as proud to have me as a student here.		0.720	

Definitions

Mobile Phone Use (MPU) Efficiency refers to effectively utilizing mobile devices to enhance creativity, idea generation, and multi-perspective thinking

Affective commitment (AC) is students' positive attachment to their institution, driven by feelings of belonging, pride, and identification, fostering care and a desire to maintain the relationship

Emotional intelligence (EI) enhances affective commitment through social media by fostering connection, empathy, and positive relationships

Appendix 2

Table 6 Content validity

Section B, C, & D: Mobile Phone Use (MPU), 15 items on Emotional Intelligence (EI), and Affective Commitment (AC) with 10 items.	Expert1	Expert 2	Expert 3	CVI
	Very relevant	Relevant	Relevant	5/5 = 100%
	Very Relevant	Very Relevant	Very relevant	5/5 = 100%
				Accepted
				Total CVI = 100%
				Accepted

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Data availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethical approval This research does not involve any human subjects and animal testing and, therefore, does not require an ethical statement number.

Informed consent All subjects and their parents/legal guardians provided appropriate informed assent and consent for this study. All methods were performed in accordance with the relevant guidelines and regulations.

Competing interests The authors declare no competing interests.

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