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Exploring EFL students' digital well-being through scenario-based assessment: A vignette study in Vietnamese universities

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Abstract

This mixed-methods study investigates Vietnamese EFL university students' digital well-being and emotion regulation in technology-mediated learning environments. Through quantitative surveys (N=342) and qualitative interviews (n=40), the research examined students' emotional experiences across different educational technology scenarios and their regulation strategies for maintaining digital well-being. Findings revealed complex patterns of co-existing anxiety and enjoyment, with significant variations across synchronous and asynchronous activities. Technical proficiency emerged as a key predictor of positive emotional experiences, while gender differences indicated higher anxiety levels among female students. The study identified three main categories of emotion regulation strategies: proactive preparation, real-time adjustment, and post-session reflection, with strategy effectiveness significantly predicting digital well-being outcomes. Results demonstrate the critical role of institutional support systems and peer networks in successful emotion regulation. This research contributes to digital well-being theory by illuminating the intricate relationship between emotional experiences, technical competence, and cultural factors in online language learning contexts.

Keywords: Digital well-being, EFL students, Scenario-based assessment, Vignette study, Vietnamese universities

Introduction

Digital transformation has fundamentally reshaped educational landscapes globally, particularly in language education where technology mediates knowledge creation, sharing, and access (Şişianu & Puşcaşu, 2024). The COVID-19 pandemic has accelerated this transformation, necessitating rapid adaptations in teaching and learning models (García-Morales et al., 2021) and raising critical questions about student well-being in digital



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learning environments. While digital technologies enable ubiquitous learning across various platforms (Blundell et al., 2020), this shift has introduced significant challenges for language learners.

Research has consistently demonstrated that learners experience heightened levels of achievement-related emotions such as anxiety, isolation, and disconnectedness in virtual classrooms compared to traditional settings (Dewaele et al., 2024; MacIntyre et al., 2020). These negative achievement emotions stem from multiple factors, including technical difficulties, reduced immediate feedback, and limited spontaneous peer interaction (Guo et al., 2023). Such emotions directly impact learning outcomes and, combined with the psychological impact of prolonged screen time and physical inactivity in online learning environments, have raised serious concerns about students' overall well-being (Pan et al., 2023).

Digital well-being, conceptualized as individuals' subjective well-being in technology-saturated environments (Büchi, 2021), has consequently emerged as a critical consideration in contemporary education. Research indicates that higher education practices and digital environments significantly impact students' mental health, with university students showing consistently poorer well-being than their age-matched peers (Hill et al., 2020). This phenomenon warrants particular attention in language learning contexts, where emotional factors play a crucial role in learning outcomes.

In Vietnam, digital transformation in education has gained momentum through comprehensive policies strengthening digital education for 2022-2025 (Quy et al., 2023). However, significant challenges persist in higher education, where limited IT infrastructure and inadequate digital access affect approximately 80% of students from rural provinces (Tri et al., 2021). The situation is particularly complex in English language education, where despite its priority status and 90% of university students choosing English studies (Nguyen, 2016), technological integration faces substantial obstacles. Infrastructure limitations, combined with large class sizes and grammar-based assessment systems, create significant challenges for implementing digital-age teaching methodologies (Mai & Thao, 2022).

Institutional support for technology integration in EFL teaching, while driven by top-down policies, has shown limited effectiveness. Despite substantial budget allocation through the National Foreign Languages Project 2020 for technological infrastructure and teacher training (Gruba & Nguyen, 2019), implementation faces multiple challenges, including unclear technology requirements and insufficient stakeholder communication (Nguyen, 2019). The focus remains primarily on teachers' classroom technology use, often overlooking students' technology adoption needs beyond the classroom (Hoi, 2020).

Current research examining digital transformation in education has largely focused on technical implementation aspects or general learning outcomes, neglecting the crucial

intersection of achievement emotions, digital well-being, and language learning effectiveness. This gap is particularly significant given Vietnam's unique educational context and the increasing emphasis on digital transformation in higher education. Understanding how EFL students experience and regulate these achievement emotions in technology-enhanced learning environments is essential for developing effective support systems and policies.

This study addresses these gaps through three significant contributions: theoretically extending understanding of digital well-being and its relationship with achievement emotions in language learning contexts; methodologically employing innovative scenario-based assessment to measure achievement emotions; and practically informing institutional policies for enhancing students' digital well-being through effective regulation of achievement emotions. Specifically, this study explores two research questions:

- (1) What achievement emotions do Vietnamese EFL university students report when encountering different educational technology scenarios in their language learning?
- (2) How do Vietnamese EFL university students regulate their achievement emotions to maintain digital well-being during online language learning activities?

Literature review

Theoretical framework

This study is grounded in three interconnected theoretical perspectives: digital well-being theory, emotion regulation framework, and achievement emotions in online learning. Digital well-being theory, as conceptualized by Büchi (2021), provides the foundational understanding of how individuals' subjective well-being is shaped in technology-saturated environments. The theory posits that digital well-being emerges from the dynamic interaction between digital practices, their associated benefits and drawbacks, and overall well-being outcomes. This theoretical lens is particularly relevant for examining EFL students' experiences, as their language learning increasingly occurs within digital spaces where technology-mediated interactions are prevalent.

The emotion regulation framework complements this understanding by illuminating the processes through which individuals manage their emotional experiences. Gross's (2015) process model of emotion regulation delineates five strategic approaches: situation selection, situation modification, attentional deployment, cognitive change, and response modulation. These strategies broadly fall into two categories: cognitive reappraisal and expressive suppression (Gross & John, 2003). For EFL students navigating digital learning environments, the ability to employ these regulatory strategies effectively becomes crucial for maintaining optimal learning conditions and digital well-being.

Achievement emotions theory, particularly the Control-Value Theory (CVT) proposed by Pekrun (2006), further enriches this theoretical foundation by specifically addressing achievement-related emotions in educational contexts. CVT explains how students' achievement emotions are shaped by their appraisals of control and value in achievement situations. In online language learning environments, these achievement emotions can range from enjoyment and pride to anxiety and boredom, significantly impacting students' engagement and performance (Dai & Wang, 2024).

The integration of these theoretical perspectives provides a comprehensive framework for understanding EFL students' emotional experiences and regulatory behaviors in digital learning environments. Digital well-being theory explains the broader context of technology-mediated learning experiences, while the emotion regulation framework illuminates the specific strategies students employ to manage their emotional responses. Achievement emotions theory then provides the educational context-specific lens through which to examine these emotional experiences and regulatory behaviors.

This theoretical integration suggests that EFL students' digital well-being is not merely a product of technology use, but rather emerges from the complex interplay between their digital practices, emotion regulation strategies, and achievement emotions. When students encounter challenging situations in online language learning, their ability to regulate emotions effectively (through strategies like cognitive reappraisal) influences their achievement emotions, which in turn affects their overall digital well-being. This theoretical synthesis aligns with Vanden Abeele's (2020) conceptualization of digital well-being as a dynamic construct requiring active management of digital experiences.

For Vietnamese EFL university students specifically, this integrated theoretical framework provides a structured approach to examining how they experience and regulate emotions in technology-mediated language learning contexts. It acknowledges both the universal aspects of digital well-being and emotion regulation while remaining sensitive to the specific challenges and opportunities presented in online language learning environments. This theoretical foundation thus guides the investigation of students' emotional experiences and regulatory strategies within their unique educational and cultural context.

Digital well-being

Digital well-being has emerged as a critical area of research attention as digital technologies become increasingly integrated into educational contexts, particularly in language learning environments. While early conceptualizations focused narrowly on user satisfaction with technology, contemporary frameworks emphasize examining how digital media practices impact overall quality of life and human welfare (Büchi, 2021). This broader framing acknowledges that digital well-being cannot be separated from general

human well-being, given the increasingly porous boundaries between physical and digital experiences in modern education (Prinsloo et al., 2024).

Recent studies have expanded our understanding of digital well-being across diverse educational contexts. For instance, research has explored impacts on youth (Moss et al., 2023), international students (Gennari et al., 2023), and learners with disabilities (Gale & Devine, 2023). These studies highlight how digital experiences and their effects on well-being can vary significantly based on individual circumstances, vulnerabilities, and social contexts. Duradoni et al. (2020) specifically examined digital well-being among historically marginalized groups, finding that existing technological inequities and biases can amplify negative impacts on well-being for certain populations.

In the context of language education, digital well-being research has primarily focused on two major streams: digital monitoring/surveillance of students and concerns about technology addiction/overuse (Roffarello & De Russis, 2023). The monitoring aspect examines how tracking of student engagement and behavior through learning analytics may impact psychological well-being. However, this approach has been criticized for potentially increasing student anxiety and stress levels. Meanwhile, research on technology use patterns investigates how excessive screen time and unhealthy digital habits may affect student wellness and learning outcomes. Importantly, Roffarello and De Russis (2023) argue for considering a “new kind of psychological digital well-being” that better accounts for the complex interactions between technology use patterns, individual differences, and social factors in educational settings.

While these studies have advanced our understanding of digital well-being, several critical gaps remain in the literature. First, most research has focused on Western contexts, with limited investigation of digital well-being in Asian educational settings, particularly in EFL environments. Second, there is insufficient attention to how students actively regulate their achievement emotions with educational technology. Third, the role of cultural and contextual factors in shaping digital well-being experiences remains underexplored. These gaps highlight the need for more nuanced investigations of digital well-being in diverse educational contexts.

Emotion regulation in online learning

Online learning environments present unique challenges for language learners' achievement emotions due to the reduced availability of non-verbal cues and face-to-face interactions that typically facilitate emotional expression and regulation (Stolba et al., 2024). While research on emotion regulation in traditional classroom settings is extensive, studies examining emotion regulation specifically in online language learning contexts remain limited, highlighting a significant research gap.

Recent scholarship has identified distinct categories of emotion regulation strategies that learners employ in online collaborative settings: peer regulation and group regulation (Zhang et al., 2022). Peer regulation involves individual learners' attempts to influence others' emotional states or their receptiveness to being influenced by peers, while group regulation reflects the collective efforts of all group members to maintain a positive emotional climate during online interactions. However, the effectiveness of these strategies in promoting digital well-being remains understudied, particularly in the context of language learning.

Studies have revealed that effective emotion regulation in online learning involves both cognitive reappraisal and expressive suppression strategies (Zhao et al., 2021). Cognitive reappraisal, which involves reinterpreting emotion-eliciting situations, has been found to positively influence learners' perceived control and enjoyment of online learning activities. Conversely, expressive suppression - the inhibition of emotional expressions - has been associated with increased anxiety and decreased engagement in online learning contexts. This dichotomy suggests the need for a more nuanced understanding of how different emotion regulation strategies contribute to digital well-being.

In the specific context of language learning, emotion regulation strategies play a particularly critical role in managing the unique challenges of online language acquisition. Bielak and Mystkowska-Wiertelak (2020) identified that language learners employ various strategies such as cognitive change, situation modification, attention deployment, and response change to up-regulate positive emotions and down-regulate negative ones during online learning. These strategies are especially important for maintaining digital well-being and supporting productive language learning experiences in technology-mediated environments. However, the effectiveness of these strategies may vary across different cultural contexts and learning platforms, suggesting the need for more context-specific research.

Recent studies have also highlighted the interconnected nature of emotion regulation and academic achievement in online learning environments. Zhang et al. (2022) found that successful emotion regulation strategies were positively correlated with academic performance and engagement in online collaborative writing tasks. Nevertheless, there remains a critical need for research examining how different emotion regulation strategies specifically contribute to digital well-being in online language learning contexts, particularly from diverse cultural perspectives.

Achievement emotions in digital well-being

Achievement emotions significantly influence students' digital well-being in technology-enhanced language learning environments. As the primary emotional experiences in educational contexts, these emotions are directly tied to achievement activities or outcomes

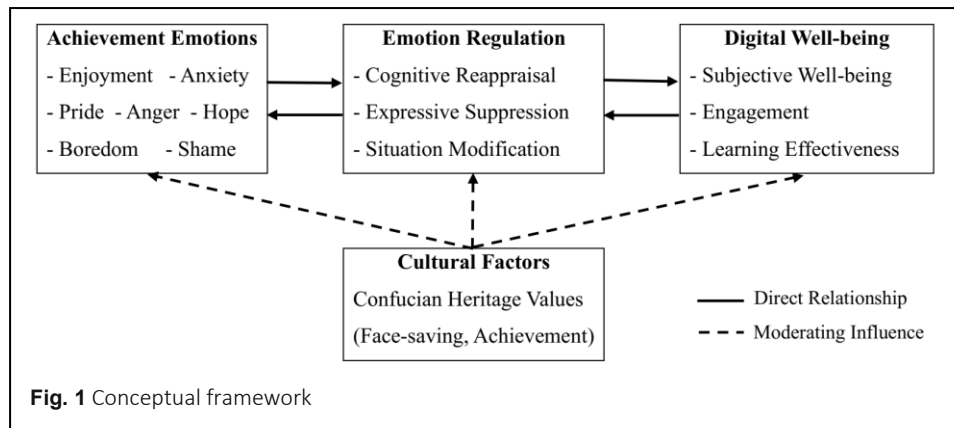
(Ibrahim & Hashemifardnia, 2024) and interact with students' overall digital experiences to shape their well-being in online learning contexts. Recent research demonstrates that achievement emotions influence not only academic performance but also students' ability to maintain healthy digital learning practices (Yang et al., 2021).

In technology-mediated language learning, achievement emotions manifest through a three-dimensional taxonomy: valence (positive/negative), activation (activating/deactivating), and object focus (activity/outcome) (Pekrun et al., 2022). Studies show that positive activating emotions (enjoyment, hope, pride) enhance digital well-being by promoting adaptive technology use and effective online learning strategies (Kohnke & Fong, 2023). Conversely, negative emotions (anxiety, boredom) often lead to maladaptive digital behaviors and decreased well-being (Kang & Wu, 2022).

The relationship between achievement emotions and digital well-being becomes particularly complex in online EFL contexts. Wang et al. (2023) found that technological self-efficacy mediates the relationship between achievement emotions and digital well-being. Students with higher technological self-efficacy typically experience more positive achievement emotions and better digital well-being outcomes. Bekker et al. (2023) further demonstrated that negative achievement emotions, particularly boredom, can lead to problematic digital behaviors and decreased well-being in online learning environments.

Cultural factors significantly influence the interaction between achievement emotions and digital well-being. In East Asian contexts, where Confucian heritage culture emphasizes academic achievement, students often experience higher levels of anxiety and lower levels of enjoyment in digital learning environments (Yang et al., 2021). Dinh and Nguyen (2020) found that Vietnamese students' digital well-being is particularly affected by achievement-related anxiety, influenced by cultural expectations and face-saving concerns in online learning contexts. In Confucian heritage cultures, 'face-saving' refers to maintaining one's social dignity and reputation through meeting expected standards of performance, with academic failures potentially causing significant social embarrassment not only for the individual but also for their family. This cultural value intensifies achievement anxiety in public digital learning environments where mistakes are visible to peers and instructors.

Recent studies highlight the bidirectional relationship between achievement emotions and digital well-being. While positive achievement emotions contribute to better digital well-being, improved digital well-being also facilitates more positive emotional experiences in online learning (Huang et al., 2024). This reciprocal relationship suggests the need for integrated approaches to supporting both achievement emotions and digital well-being in technology-enhanced language learning environments. This integration of achievement emotions, emotion regulation, and digital well-being forms the theoretical core of this study, as illustrated in Figure 1, which depicts the complex interrelationships



between these constructs in technology-mediated language learning environments and guides our investigation of Vietnamese EFL students' experiences.

Research methods

Research design

This study employed a sequential explanatory mixed-methods design to investigate Vietnamese EFL university students' emotional experiences and digital well-being regulation in technology-mediated learning environments. This design was selected because understanding emotional experiences in digital learning requires both systematic measurement of regulation patterns and in-depth exploration of individual experiences (Creswell & Creswell, 2022). The sequential nature allowed quantitative findings to inform the development of qualitative instruments, ensuring targeted exploration of emerging patterns and unexpected findings (Ivankova et al., 2006). As Schoonenboom and Johnson (2017) argue, this design enables triangulation of data sources, enhancing the validity and comprehensiveness of findings about students' digital well-being regulation strategies.

Context and participants

The study was conducted at three public universities in Vietnam offering undergraduate English language programs, selected based on their substantial educational technology implementation in EFL instruction. Using stratified random sampling to ensure proportional representation across academic years and proficiency levels (Cohen et al., 2018), 342 undergraduate EFL students were recruited. The sample comprised 68% female and 32% male students (age: $M=20.3$, $SD=1.4$), distributed across four academic years (1st year: 26%, 2nd year: 28%, 3rd year: 24%, 4th year: 22%) and three proficiency levels based on CEFR standards (B1: 35%, B2: 45%, C1: 20%). This sampling strategy, as

recommended by Dörnyei and Dewaele (2022), ensured representation of distinct student subgroups while maintaining randomization within each stratum. All participants were enrolled in courses with significant digital learning components and met the inclusion criteria of being (1) full-time undergraduate English language majors, (2) having completed at least one semester of technology-enhanced language learning, and (3) having consistent access to digital learning devices and internet connectivity.

Instruments

This study utilized both quantitative and qualitative instruments to comprehensively investigate Vietnamese EFL university students' emotional experiences and digital well-being regulation. The Vietnamese version of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) was adapted to measure participants' usage of cognitive reappraisal and expressive suppression in digital learning environments. The 7-point Likert-type questionnaire maintained high internal consistency (.79 for cognitive reappraisal, .73 for expressive suppression) and test-retest reliability ($r=.69$) through adaptation (John & Gross, 2004). Items were modified to focus on digital learning contexts while preserving construct measurement integrity.

The Academic Emotions Questionnaire-Digital Learning Environment (AEQ-DLE) was developed based on Davari et al.'s (2020) Academic Emotions Questionnaire-Foreign Language Classroom to examine academic achievement emotions within digital learning contexts. The questionnaire measures eight distinct emotions: enjoyment ($r=.85$), hope ($r=.75$), pride ($r=.81$), anger ($r=.89$), anxiety ($r=.80$), shame ($r=.82$), hopelessness ($r=.80$), and boredom ($r=.82$). Following Pekrun et al.'s (2017) guidelines for context-specific adaptation, items were modified to reflect technology-mediated learning experiences while maintaining construct validity.

For qualitative data collection, Technology-Enhanced Learning Vignettes (TELV) were developed following Bielak and Mystkowska-Wiertelak's (2020) methodology. The instrument presents scenario-based prompts depicting common digital learning situations, accompanied by semi-structured interview protocols developed using Galletta's (2017) guidelines. The interview protocol explored participants' general digital learning experiences, emotional responses to specific scenarios, and emotion regulation strategies.

All instruments underwent rigorous validation procedures, including forward and backward translation between English and Vietnamese following Brislin's (1970) protocol. Content validity was established through expert review ($n=5$) from fields of educational psychology, TESOL, and educational technology. Quantitative instruments were validated through confirmatory factor analysis (ERQ: CFI=.92, RMSEA=.06; AEQ-DLE: CFI=.90, RMSEA=.07). Both instruments demonstrated good internal consistency reliability with Cronbach's alpha values ranging from .78 to .85 for the ERQ subscales (cognitive

reappraisal: $\alpha=.82$; expressive suppression: $\alpha=.79$) and from .76 to .89 for the AEQ-DLE subscales (enjoyment: $\alpha=.85$; anxiety: $\alpha=.88$; hope: $\alpha=.79$; pride: $\alpha=.81$; anger: $\alpha=.87$; shame: $\alpha=.83$; helplessness: $\alpha=.80$; boredom: $\alpha=.82$). These values exceed the recommended threshold of .70 (Nunnally & Bernstein, 1994), indicating reliable measurement. The CFA fit indices also demonstrate good model fit according to established criteria (Hu & Bentler, 1999), with values close to or exceeding the recommended thresholds ($CFI \geq .90$, $RMSEA \leq .08$), confirming the structural validity of both instruments in the Vietnamese context. The qualitative protocols underwent peer debriefing and member checking to ensure trustworthiness (Lincoln & Guba, 1985). A comprehensive pilot study with 30 students verified instrument clarity, cultural appropriateness, and response patterns.

Data collection

Data collection spanned from March to May 2024. Quantitative data collection preceded qualitative data gathering, aligning with the sequential explanatory design. The ERQ and AEQ-DLE were administered online through a secure survey platform to 342 participants, with each receiving a unique identifier to maintain anonymity while enabling data matching across phases.

Following Morse's (2000) guidelines for mixed-methods research, 40 participants were selected for the qualitative phase using maximum variation sampling. This sample size was determined by theoretical saturation in similar studies (Guest et al., 2006), representation of diverse emotion regulation patterns from quantitative findings, and feasibility of in-depth analysis. Selection criteria ensured representation across emotion regulation profiles (high/low reappraisal, high/low suppression) and achievement emotion patterns identified in the quantitative phase. These participants engaged in individual vignette-based interviews conducted via video conferencing, lasting 45-60 minutes each. Interviews were audio-recorded with consent and transcribed verbatim in Vietnamese. Following Merriam and Tisdell's (2015) recommendations for cross-language research, transcripts underwent professional translation to English with back-translation verification.

Data analysis

The analysis followed a sequential integration approach (Creswell & Clark, 2017). Quantitative data analysis employed SPSS 28.0, beginning with preliminary analyses including data screening, normality testing using Shapiro-Wilk test, and outlier detection through Mahalanobis distance. Descriptive statistics characterized emotion regulation patterns and academic emotions. Confirmatory factor analysis using maximum likelihood estimation verified instrument structure, with acceptable fit criteria of $CFI > .90$, $RMSEA < .08$, and $SRMR < .06$. Hierarchical regression models examined relationships

between emotion regulation strategies and academic emotions, controlling for demographic variables, with effect sizes calculated using Cohen's f^2 . Mediation analyses using Hayes' PROCESS macro (Model 4) examined indirect effects of emotion regulation on digital well-being through achievement emotions.

Qualitative data underwent thematic analysis following Braun and Clarke's (2022) framework. After data familiarization through repeated transcript reading, initial coding was conducted using NVivo 12, followed by theme development through constant comparison. Two researchers independently coded 20% of transcripts, achieving an initial inter-coder agreement of 85% (Cohen's $\kappa = .83$). Discrepancies were resolved through discussion with a third researcher. Theme refinement occurred through peer debriefing, followed by theme definition and naming. The analysis generated thematic maps integrated with quantitative findings using joint displays (Guetterman et al., 2015).

Results

Emotional experiences in educational technology scenarios

Analysis of both quantitative and qualitative data revealed complex patterns of achievement emotions among Vietnamese EFL university students when engaging with educational technology. The Academic Emotions Questionnaire-Digital Learning Environment (AEQ-DLE) data (N=342) indicated anxiety and enjoyment as predominant achievement emotions (see Table 1). This quantitative finding was enriched by interview data (n=40), where students frequently described the simultaneous presence of these contrasting emotions. As one third-year student explained: "I feel anxious about technical issues, but I also enjoy the flexibility of online learning. It's like two emotions constantly competing" (P17).

Principal component analysis revealed two distinct achievement emotion clusters: positive activating emotions (enjoyment, hope, pride) accounting for 42.3% of variance, and negative deactivating emotions (anxiety, helplessness, boredom) explaining 35.7%

Table 1 Descriptive statistics and gender differences in emotional experiences

Emotion Type	Overall (N=342)		Female (n=233)		Male (n=109)		Gender Difference	
	M	SD	M	SD	M	SD	t	p
Anxiety	3.82	0.89	3.98	0.91	3.45	0.87	3.78	.001
Enjoyment	3.65	0.92	3.58	0.89	3.79	0.94	-2.15	.032
Hope	3.45	0.85	3.42	0.83	3.51	0.88	-0.95	.341
Pride	3.38	0.91	3.35	0.90	3.44	0.93	-0.87	.384
Anger	3.30	0.93	3.38	0.95	3.14	0.90	2.23	.026
Shame	3.28	0.94	3.45	0.96	2.95	0.89	4.53	.001
Helplessness	3.25	0.95	3.41	0.97	2.92	0.88	4.12	.001
Boredom	3.12	0.88	3.15	0.89	3.06	0.86	0.89	.374

Note. Emotions measured on 5-point Likert scale (1 = Never, 5 = Always)

Table 2 Emotional responses across different digital learning scenarios

Learning Scenario	Anxiety		Enjoyment		Hope		Pride	
	M	SD	M	SD	M	SD	M	SD
Synchronous Discussion	4.12	0.95	3.45	0.92	3.32	0.88	3.28	0.91
Asynchronous Forums	3.35	0.87	3.89	0.88	3.65	0.84	3.58	0.89
Digital Content Creation	3.48	0.92	3.92	0.85	3.71	0.86	3.78	0.88
Online Assessment	4.25	0.97	3.25	0.91	3.18	0.89	3.42	0.92
Collaborative Projects	3.65	0.93	3.82	0.87	3.58	0.85	3.68	0.90

Note. Emotions measured on 5-point Likert scale (1 = Never, 5 = Always)

of variance. Thematic analysis of interview data supported this clustering, with students consistently describing their achievement emotions in terms of these two broad categories. A fourth-year student reflected: “Positive emotions usually come with being active and engaged, while negative feelings make me want to withdraw from online activities” (P28).

Different technological scenarios elicited varying emotional responses (see Table 2). Synchronous activities generated higher anxiety levels ($M=4.12$, $SD=0.95$), particularly among first-year students ($\beta=.284$, $p<.01$). Interview data revealed that this anxiety often stemmed from technical uncertainties: “During live sessions, I’m constantly worried about my internet connection or microphone failing” (P12). Conversely, asynchronous activities produced more positive emotions ($M=3.89$, $SD=0.88$), with students appreciating the reduced time pressure: “I feel more confident when I can take time to craft my responses in the forum” (P33).

Technical proficiency emerged as a significant predictor of achievement emotions ($R^2=.235$, $p<.001$), with higher proficiency associated with more positive achievement emotions ($\beta=.312$, $p<.001$). This quantitative finding was supported by interview data showing how students’ emotional responses evolved with increasing digital literacy. A second-year student noted: “As I became more comfortable with the technology, my anxiety decreased and I started enjoying online activities more” (P07).

Gender differences in emotional patterns were notable, with female students reporting higher anxiety levels ($M=3.98$, $SD=0.91$) compared to male students ($M=3.45$, $SD=0.87$), $t(340)=3.78$, $p<.001$, $d=0.42$. Qualitative data suggested this difference might relate to sociocultural factors, as female participants more frequently expressed concerns about “losing face” during technical difficulties.

Performance anxiety emerged as a persistent theme across both datasets, with 72% of surveyed students reporting moderate to high anxiety during online assessments. Interview participants frequently described this as “double anxiety” - combining traditional test stress with technical concerns. However, students with higher technological self-efficacy (top quartile) showed significantly lower assessment anxiety ($M=3.12$, $SD=0.83$) compared to those in the bottom quartile ($M=4.35$, $SD=0.94$), $t(168)=5.67$, $p<.001$, $d=0.88$. As one

high-efficacy student explained: “I know I can handle any technical issues that arise, so I can focus on the actual test content” (P15).

Emotion regulation and digital well-being

The analysis of emotion regulation strategies revealed distinct patterns in how students managed their achievement emotions during digital learning. Quantitative data from the Emotion Regulation Questionnaire showed cognitive reappraisal as the predominant strategy (M=3.85, SD=0.82), followed by expressive suppression (M=3.42, SD=0.89). Table 3 presents the distribution and effectiveness of regulation strategies across different academic years.

Hierarchical regression analysis revealed that strategy effectiveness significantly predicted digital well-being scores ($R^2=.312$, $p<.001$). Students who reported higher effectiveness in cognitive reappraisal demonstrated better digital well-being outcomes ($\beta=.385$, $p<.001$). Interview data provided context for this relationship: “I learned to reframe technical problems as learning opportunities rather than failures. This mindset shift really helped me stay positive during online classes” (P22).

The qualitative analysis identified three main categories of regulation strategies: proactive preparation, real-time adjustment, and post-session reflection. Proactive strategies included technical preparation and emotional readiness: “I always test my equipment 30 minutes before class to avoid anxiety during the session” (P09). Real-time adjustments involved immediate responses to emotional triggers: “When I feel overwhelmed during group discussions, I briefly turn off my camera to compose myself” (P25).

Digital well-being maintenance patterns showed significant variation across academic years ($F(3,338)=12.45$, $p<.001$, $\eta^2=.142$). Fourth-year students reported more sophisticated regulation strategies (M=4.15, SD=0.76) compared to first-year students (M=3.45, SD=0.88), $t(168)=5.12$, $p<.001$, $d=0.85$. This development was reflected in interview data:

Table 3 Emotion regulation strategies and effectiveness ratings by academic year

Strategy Type	First Year		Second Year		Third Year		Fourth Year	
	Usage ¹	Eff ²	Usage	Eff	Usage	Eff	Usage	Eff
Cognitive Reappraisal	3.45 (0.88)	3.12 (0.92)	3.78 (0.85)	3.58 (0.87)	4.02 (0.79)	3.85 (0.82)	4.15 (0.76)	4.05 (0.78)
Expressive Suppression	3.82 (0.92)	2.95 (0.95)	3.55 (0.88)	3.15 (0.90)	3.25 (0.85)	3.28 (0.86)	3.05 (0.82)	3.35 (0.84)
Situation Modification	3.15 (0.95)	3.45 (0.88)	3.48 (0.87)	3.65 (0.85)	3.75 (0.82)	3.88 (0.80)	3.92 (0.79)	4.12 (0.76)
Attention Deployment	3.28 (0.91)	3.35 (0.89)	3.52 (0.86)	3.62 (0.84)	3.68 (0.83)	3.78 (0.81)	3.85 (0.80)	3.95 (0.77)

Note. ¹Usage frequency measured on 5-point scale (1=Never, 5=Always), M(SD) ²Effectiveness rating on 5-point scale (1=Not effective, 5=Very effective), M(SD)

“Over the years, I’ve built a toolkit of strategies. Now I know exactly what works for different situations” (P37).

Support system utilization emerged as a critical factor in successful regulation. Students who regularly accessed institutional technical support reported higher digital well-being scores ($M=3.92$, $SD=0.81$) compared to those who rarely sought help ($M=3.28$, $SD=0.92$), $t(340)=4.85$, $p<.001$, $d=0.74$. Peer support networks also played a crucial role, with 68% of participants identifying peer assistance as essential for emotional regulation during online learning.

Path analysis revealed that the relationship between achievement emotion regulation strategies and digital well-being was partially mediated by perceived technological self-efficacy (indirect effect=.245, 95% CI [.182, .308]). Students who effectively regulated their emotions showed increased confidence in handling technical challenges, which in turn enhanced their digital well-being. As one participant noted: “Managing my frustration with technology helped me become more confident. Now I feel much more capable in the online environment” (P13).

Discussion

Emotional experiences in educational technology scenarios

The findings reveal significant patterns in Vietnamese EFL students’ achievement emotions that both align with and challenge existing theoretical frameworks. The co-existence of high anxiety ($M=3.82$, $SD=0.89$) and enjoyment ($M=3.65$, $SD=0.92$) as predominant emotions extends beyond the traditional binary view of emotions in digital learning (Dewaele et al., 2024). This duality suggests a more complex emotional landscape, particularly evident in the distinct clustering of positive activating emotions (42.3% variance) and negative deactivating emotions (35.7% variance), which refines our understanding of Pekrun et al.’s (2022) Control-Value Theory in digital language learning contexts.

The marked disparity in achievement emotional responses between synchronous (anxiety $M=4.12$, $SD=0.95$) and asynchronous activities (enjoyment $M=3.89$, $SD=0.88$) challenges prevailing assumptions about real-time interaction benefits in language learning. This finding critically questions Stolba et al.’s (2024) emphasis on synchronous communication primacy, suggesting instead that temporal flexibility might be more conducive to positive emotional experiences in technology-mediated learning. The gender gap in anxiety levels (female $M=3.98$, male $M=3.45$, $p<.001$, $d=0.42$) further problematizes current digital learning approaches, indicating potentially systemic issues in how educational technology environments address gender-specific needs.

Perhaps most revealing is the relationship between technical proficiency and achievement emotion outcomes ($R^2=.235$, $p<.001$), which suggests a more nuanced interpretation of Büchi's (2021) digital well-being theory. While technical competence significantly predicts positive emotions ($\beta=.312$, $p<.001$), the persistence of high assessment anxiety (72% reporting moderate to high levels) indicates that technical skills alone may be insufficient for emotional regulation. This finding particularly challenges Yang et al.'s (2021) conclusions about achievement emotions in East Asian contexts by highlighting how technological factors interact with cultural pressures in Vietnamese EFL settings.

The substantial difference in assessment anxiety between high and low technological self-efficacy groups ($M=3.12$ vs. $M=4.35$, $p<.001$, $d=0.88$) presents a critical consideration for digital assessment design. However, this relationship may be more complex than previously theorized, given the qualitative evidence of "double anxiety" - a phenomenon not adequately addressed in current digital well-being frameworks.

Emotion regulation and digital well-being

The findings on achievement emotion regulation strategies and their relationship to digital well-being reveal several critical patterns that both support and challenge existing theoretical frameworks. The predominance of cognitive reappraisal ($M=3.85$, $SD=0.82$) over expressive suppression ($M=3.42$, $SD=0.89$) aligns with Gross's (2015) process model but demonstrates unique applications in digital learning contexts. However, the significant progression in strategy sophistication across academic years ($F(3,338)=12.45$, $p<.001$, $\eta^2=.142$) suggests that emotion regulation in digital environments may be a developmental process rather than a static skill set, challenging current conceptualizations of digital well-being competences.

The strong predictive relationship between strategy effectiveness and digital well-being outcomes ($R^2=.312$, $p<.001$) extends beyond Zhang et al.'s (2022) findings on emotion regulation in online learning. Particularly noteworthy is the substantial difference in regulation capability between fourth-year ($M=4.15$, $SD=0.76$) and first-year students ($M=3.45$, $SD=0.88$), suggesting that effective regulation strategies develop through prolonged exposure to digital learning environments. This developmental trajectory challenges assumptions about immediate adaptability to online learning and raises questions about current onboarding practices for digital learning platforms.

The emergence of three distinct regulatory categories - proactive preparation, real-time adjustment, and post-session reflection - provides a more nuanced framework than Zhao et al.'s (2021) binary model of cognitive reappraisal and expressive suppression. This tripartite structure suggests that effective digital well-being maintenance requires a more comprehensive approach than previously theorized. The significant impact of support

system utilization on digital well-being scores ($M=3.92$ vs $M=3.28$, $p<.001$, $d=0.74$) further challenges individualistic approaches to emotion regulation in digital learning.

Perhaps most significant is the mediating role of technological self-efficacy in the relationship between regulation strategies and digital well-being (indirect effect=.245, 95% CI [.182, .308]). This finding extends Büchi's (2021) digital well-being theory by demonstrating how technical confidence acts as a crucial intermediary in emotional regulation effectiveness. However, the high reliance on peer support networks (68% of participants) suggests that successful regulation in digital learning environments may be more socially dependent than current theories acknowledge, particularly within Vietnamese cultural contexts where collective learning approaches are culturally embedded.

Implications for digital language learning

The findings have significant implications for enhancing digital language learning environments. Pedagogically, institutions should implement a balanced approach between synchronous and asynchronous activities, with careful consideration of students' emotional readiness for real-time interactions. Course designs should incorporate progressive technical skill development alongside language learning objectives, allowing students to build confidence gradually in digital environments.

Institutional support systems require restructuring to provide comprehensive technical and emotional assistance. Universities should establish dedicated digital learning support centers offering both preventive and remedial services. These centers should coordinate with language departments to develop contextualized support materials and intervention strategies aligned with specific course requirements and student needs.

Professional development programs need to equip language instructors with skills for recognizing and addressing emotional challenges in digital environments. Training should focus on facilitating effective online interactions, managing virtual classroom dynamics, and implementing emotionally-aware assessment practices. Instructors need guidance on integrating technical support within their pedagogical approaches while maintaining focus on language learning outcomes.

Student support services should prioritize peer mentoring systems and emotional regulation workshops. Universities should establish structured orientation programs for new students, focusing on both technical skills and emotional preparation for digital learning. Regular counseling services specifically addressing digital learning challenges should be available, with particular attention to gender-specific needs and cultural factors affecting online participation.

Theoretical and practical contributions

This study enhances digital well-being theory by demonstrating the intricate relationship between achievement emotions and regulation strategies within language learning contexts. The findings expand current theoretical frameworks by revealing how digital well-being emerges through the complex interaction of technical competence, emotional regulation, and cultural factors in technology-mediated language learning. The integration of achievement emotions theory with digital well-being concepts provides a novel theoretical lens for understanding the emotional dynamics of online language acquisition.

For practice, the research identifies critical intervention points in online language teaching where emotional support can enhance learning outcomes. The findings highlight the importance of culturally-sensitive approaches to digital language instruction, particularly in Confucian heritage contexts where face-saving concerns significantly influence online participation. The study's scenario-based assessment methodology offers practitioners a concrete tool for evaluating and addressing students' emotional experiences in digital learning environments, contributing to more effective instructional design and support systems.

Conclusion

This study provides compelling evidence for the complex relationship between emotional experiences, regulation strategies, and digital well-being in language learning environments. Through rigorous mixed-methods investigation of Vietnamese EFL university students' experiences, the research demonstrates how technical proficiency, cultural factors, and institutional support collectively shape students' emotional well-being in digital learning contexts. The findings challenge simplistic approaches to digital transformation in language education by revealing the intricate interplay between technical competence and emotional regulation.

The research makes substantial theoretical contributions by expanding digital well-being frameworks to encompass the unique challenges of language learning environments. By integrating achievement emotions theory with digital well-being concepts, the study establishes a more comprehensive theoretical foundation for understanding emotional experiences in technology-mediated language education. This theoretical advancement particularly illuminates how cultural factors, such as face-saving concerns in Confucian heritage contexts, influence students' emotional regulation strategies.

For practitioners and institutions, this research provides evidence-based insights for developing emotionally supportive digital learning environments. The scenario-based assessment methodology offers a practical framework for evaluating and addressing emotional challenges in digital language learning. These findings emphasize that

successful digital transformation in language education requires careful attention to students' emotional well-being alongside technological infrastructure development.

This investigation demonstrates that enhancing digital well-being in language learning requires a holistic approach that integrates emotional support with technical skill development. The findings underscore the necessity for institutions to develop comprehensive support systems that address both the technical and emotional dimensions of digital learning, particularly in contexts where cultural factors significantly influence online participation and learning experiences.

Abbreviations

AEQ-DLE: Academic Emotions Questionnaire-Digital Learning Environment; CEFR: Common European Framework of Reference for Languages; CVT: Control-Value Theory; EFL: English as a Foreign Language; ERQ: Emotion Regulation Questionnaire; IT: Information Technology; SRMR: Standardized Root Mean Square Residual; TELV: Technology-Enhanced Learning Vignettes; TESOL: Teaching English to Speakers of Other Languages.

Author's contributions

The author designed the study, collected and analyzed the data, wrote the manuscript, and approved the final version for submission.

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