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Loneliness and Social Connection in Online Higher Education: A Mixed-Methods Study of University Students' Experiences

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Abstract: The rapid expansion of online higher education has transformed not only instructional practices but also students' social and emotional learning experiences. This study explores university students' experiences of loneliness and social connection in online higher education contexts through a convergent mixed-methods design grounded in Social Presence Theory. Quantitative and qualitative data were collected concurrently from university students who had experienced online learning for at least one academic semester. The quantitative phase involved an online survey administered to 102 students, while the qualitative phase consisted of semi-structured interviews with 12 purposively selected participants. Quantitative data were analyzed using descriptive statistics, whereas qualitative data were analyzed through thematic analysis. The findings revealed that students experienced moderately high levels of loneliness alongside moderate levels of social connection, peer interaction, instructor interaction, and sense of belonging in online learning environments. Qualitative findings further demonstrated that students frequently perceived online learning as emotionally distant and socially limited due to reduced interpersonal interaction, limited visibility, and minimal emotional engagement. However, meaningful social connection remained possible through collaborative activities, instructor responsiveness, and active participation. The integration of findings suggests that loneliness and social connection coexist dynamically within digitally mediated educational environments. The study highlights the importance of social presence, interpersonal responsiveness, and interaction quality in fostering emotionally supportive online higher education experiences.

Keywords: belonging, loneliness, online higher education, social connection, social presence theory

INTRODUCTION

The rapid expansion of online higher education has transformed not only instructional delivery but also the social and emotional dimensions of students' learning experiences. While digital learning environments provide flexibility, accessibility, and technological innovation (Karhapää et al., 2024), they also reshape how students interact, communicate, and develop interpersonal relationships within academic communities (Dalsgaard &

Ryberg, 2023). In recent years, universities worldwide have increasingly adopted online and hybrid learning systems, accelerating a broader shift toward digitally mediated education (Mexhuani, 2025). Although these developments offer significant educational opportunities, concerns have emerged regarding students' feelings of isolation, disconnection, and emotional well-being in online learning contexts.

Social connection has long been recognized as a crucial element of meaningful learning experiences in higher education. Interaction with peers and instructors contributes to students' sense of belonging, academic motivation, emotional support, and overall engagement (Dulfer et al., 2025). In traditional face-to-face learning environments, social presence is often facilitated through spontaneous conversations, collaborative activities, classroom discussions, and informal interpersonal interactions (Minosky et al., 2024). However, online learning environments may reduce opportunities for these forms of connection, potentially contributing to experiences of loneliness and emotional detachment among students (Liu & Lin, 2024; Wheele et al., 2025). The absence of physical interaction, limited social cues, and the transactional nature of some digital learning platforms can create challenges for sustaining interpersonal relationships in virtual educational spaces.

Loneliness in higher education has increasingly become a critical concern, particularly in digitally mediated learning contexts. Existing studies have associated loneliness with decreased academic engagement, reduced motivation, emotional exhaustion, and lower psychological well-being among university students (Aslan et al., 2025; Hendrick et al., 2023). In online education, however, loneliness should not be understood simply as physical isolation. Students may remain continuously connected through digital technologies while still experiencing a perceived lack of meaningful social interaction, emotional closeness, and interpersonal engagement within academic communities (Hendrick et al., 2023). This apparent paradox reflects the distinction between technological connectivity and perceived social presence. Although online learning platforms enable communication, they do not necessarily foster the sense of being socially and emotionally present with others. Consequently, loneliness and social connection may emerge simultaneously, as students participate in online classes, discussions, and collaborative activities while still feeling emotionally distant or disconnected from peers and instructors. At the same time, online learning environments can also cultivate meaningful social connection through responsive communication, collaborative learning, and supportive virtual communities (Wheele et al., 2026). These contrasting experiences suggest that loneliness and social connection are not mutually exclusive but rather coexist dynamically, shaped by the quality of interpersonal interaction and students' perceptions of social presence within digitally mediated learning environments.

Previous research on online learning has primarily focused on technological effectiveness (Chaudhary et al., 2025), academic performance (García-Machado et al., 2024), student satisfaction (Octoyuda et al., 2025), and instructional strategies (Rakha, 2025). Although growing attention has been directed toward student well-being and emotional experiences (Liu & Lin, 2024; Malighetti et al., 2023), research examining loneliness and social

connection in online higher education remains limited in several important respects. Conceptually, existing studies have tended to investigate loneliness, social presence, or connectedness as separate constructs, providing limited understanding of how loneliness and social connection may coexist within the same online learning experience. Methodologically, much of the literature relies predominantly on quantitative survey-based approaches that measure levels of loneliness or social presence (Özdoğan et al., 2025), offering valuable evidence of prevalence but providing limited insight into how students interpret and negotiate these experiences in their everyday learning. Conversely, qualitative studies have generated rich accounts of students' emotional experiences but often lack the broader empirical patterns needed to contextualize those narratives across larger student populations. Consequently, there remains a need for research that integrates quantitative and qualitative evidence to explain not only the prevalence of loneliness and social connection but also how and why these seemingly contradictory experiences emerge simultaneously within online higher education contexts.

Given these limitations, there is a need for research that integrates quantitative and qualitative evidence to develop a more comprehensive understanding of loneliness and social connection in online higher education. While previous studies have predominantly examined either measurable patterns or students' lived experiences, less attention has been paid to explaining how loneliness and social connection can coexist within the same online learning environment. Addressing this gap, the present study adopts a convergent mixed-methods design to investigate both the prevalence of these experiences and the meanings students attribute to them. Grounded in Social Presence Theory, the study moves beyond documenting levels of loneliness or connectedness by examining how students negotiate emotional isolation and interpersonal connection within digitally mediated learning spaces. In doing so, the study contributes a more integrated understanding of online learning by demonstrating that loneliness and social connection are not mutually exclusive but dynamically coexist, shaped by the quality of social presence, interaction, and communication. Accordingly, this study addresses the following research questions:

1. How do university students describe and interpret their experiences of loneliness and social connection in online learning environments?
2. What patterns of loneliness and social connection emerge among university students in online higher education contexts?

This study is significant for several reasons. First, it contributes to the growing body of literature on the social and emotional dimensions of online higher education, particularly within discussions of student well-being and digital learning experiences. Second, the study provides insights into how students negotiate feelings of connection and isolation in increasingly technology-mediated educational environments. Third, the findings may inform educators, institutions, and policymakers in designing more socially supportive and emotionally responsive online learning practices. Finally, by employing a convergent mixed-methods approach, the study offers a more holistic understanding of loneliness and social connection, bridging statistical patterns with students' lived experiences in

contemporary higher education contexts.

CONCEPTUAL FRAMEWORK OF THE STUDY AND LITERATURE REVIEW

Conceptual Framework of the Study

This study is grounded in Social Presence Theory, originally developed by Short et al. (1976). The theory explains how communication media differ in their ability to convey interpersonal presence, emotional closeness, and social interaction during mediated communication. According to the theory, face-to-face interaction is considered the richest form of communication because it allows individuals to exchange verbal and non-verbal cues such as facial expressions, gestures, eye contact, tone of voice, and immediate feedback simultaneously. In contrast, mediated communication environments may reduce these social cues, potentially making interaction feel less personal, less emotionally engaging, and more psychologically distant. Consequently, individuals' perceptions of social presence influence how they experience communication, emotional connection, and interpersonal relationships in technologically mediated environments.

Within online higher education contexts, Social Presence Theory provides a relevant framework for understanding students' experiences of loneliness and social connection. Online learning environments rely heavily on digital communication platforms such as video conferencing applications, learning management systems, discussion forums, and messaging tools (Baimakhan et al., 2024). Although these technologies facilitate accessibility and educational continuity, they may also reshape students' experiences of interaction and belonging within academic communities (DiGiacomo et al., 2023; Wong, 2024). The theory suggests that low levels of perceived social presence may contribute to feelings of loneliness, isolation, invisibility, and emotional disconnection among students due to limited interpersonal interaction, reduced spontaneity, and the absence of physical proximity. At the same time, online learning environments may still foster meaningful social connection when communication technologies successfully support interaction, responsiveness, collaboration, and emotional engagement among students and instructors.

In this study, Social Presence Theory (Short et al., 1976) serves as the primary analytical lens for examining how university students experience loneliness and social connection in online higher education contexts. The theory guides the interpretation of both quantitative and qualitative findings by explaining how digitally mediated interaction shapes students' perceptions of interpersonal connection, emotional participation, and belonging in online learning environments. Drawing upon the theoretical assumptions of social presence, the quantitative component of the study examines several dimensions related to students' online learning experiences, including loneliness in online learning, perceived social connection, peer interaction, instructor interaction, and sense of belonging. These dimensions reflect how students perceive emotional closeness, interpersonal engagement, and social participation within digitally mediated educational settings. Meanwhile, the qualitative component explores how students interpret and

negotiate their lived experiences of connection, isolation, interaction, and emotional engagement in online learning spaces. Through this framework, the study seeks to contribute to broader discussions concerning the human and emotional dimensions of contemporary online higher education.

Previous Studies

Previous studies on online higher education have extensively examined issues related to student engagement (Vermeulen & Volman, 2024), academic performance (García-Machado et al., 2024), learning satisfaction (Octoyuda et al., 2025), and technological effectiveness (Chaudhary et al., 2025). With the rapid expansion of digitally mediated learning environments, increasing scholarly attention has also been directed toward students' emotional well-being and social experiences in online education (Liu & Lin, 2024; Malighetti et al., 2023). Several studies have reported that online learning environments may contribute to feelings of isolation, emotional detachment, and reduced interpersonal interaction among students (Kitano & Lane, 2025; Oyarzun et al., 2025). Researchers have argued that limited face-to-face communication, decreased spontaneous interaction, and restricted non-verbal communication may negatively influence students' sense of belonging and social connectedness in virtual learning spaces (Buckley et al., 2023; Korthals Altes et al., 2023). At the same time, other studies suggest that online learning environments may still foster meaningful interaction through collaborative activities, peer communication, and supportive online communities (Ransanz Reyes et al., 2025; Weng et al., 2024), indicating that students' experiences of loneliness and connection are often complex and varied.

Existing research has also explored the relationship between social presence and students' learning experiences in online education (Gao et al., 2024; Liang & Ren, 2025). Studies grounded in Social Presence Theory generally demonstrate that higher levels of perceived social presence are associated with stronger engagement, participation, satisfaction, and emotional connection among students (Weidlich et al., 2023; Zhong et al., 2022). Communication immediacy, instructor responsiveness, peer interaction, and collaborative learning activities have been identified as important factors influencing students' perceptions of connectedness in online learning environments. Nevertheless, much of the existing literature relies predominantly on quantitative survey-based approaches that focus on measuring levels of social presence, loneliness, or student satisfaction (Armah et al., 2023; Panjehfouladgaran et al., 2025). While such studies provide valuable statistical insights, they may not fully capture how students personally interpret and negotiate their experiences of loneliness, isolation, and social interaction within digitally mediated educational settings. Conversely, qualitative studies often provide rich descriptions of students' emotional experiences but may lack broader understanding regarding the patterns and prevalence of loneliness and social connection across larger student populations.

Although previous studies have contributed significantly to discussions of online learning and student well-being, several gaps remain. First, research specifically examining

loneliness and social connection simultaneously within online higher education contexts remains relatively limited. Second, existing studies often emphasize either the psychological consequences of online learning or the technological dimensions of digital education without sufficiently integrating both perspectives. Third, there remains a lack of mixed-methods research that combines quantitative patterns with qualitative interpretations of students' lived experiences in online learning environments. Addressing these gaps, the present study employs a convergent mixed-methods design to explore both the patterns and experiences of loneliness and social connection among university students in online higher education contexts. By integrating quantitative and qualitative findings, this study seeks to provide a more comprehensive understanding of the emotional and interpersonal dimensions of digitally mediated learning environments.

METHODS

Research Design

This study employed a convergent mixed-methods design to explore university students' experiences of loneliness and social connection in online higher education contexts. A convergent mixed-methods approach involves the concurrent collection and analysis of both quantitative and qualitative data, followed by the integration of findings to develop a more comprehensive understanding of the research problem (Moseholm & Feters, 2017). This design was considered appropriate because the study sought not only to identify broader patterns of loneliness and social connection among university students but also to understand how students personally describe and interpret these experiences within online learning environments.

In the quantitative phase, survey data were collected to examine patterns related to students' experiences of loneliness and social connection in online higher education contexts. The quantitative component enabled the researcher to identify general tendencies, frequencies, and distributions associated with students' perceptions of interaction, belonging, and emotional connection in digitally mediated learning environments (Duran et al., 2020). Meanwhile, the qualitative phase focused on exploring students' lived experiences, interpretations, and emotional perspectives regarding loneliness and social connection in online learning. Qualitative data were obtained to provide deeper insights into how students negotiate interpersonal interaction, emotional engagement, and feelings of isolation within virtual educational spaces (Barrett & Twycross, 2018).

Both quantitative and qualitative data were collected during a similar timeframe and analyzed separately using appropriate analytical procedures. The findings from the two datasets were subsequently integrated during the interpretation stage to compare, complement, and deepen understanding of the phenomenon under investigation (Creswell & Creswell, 2023). Through this convergent mixed-methods design, the study aimed to provide a holistic understanding of loneliness and social connection by combining measurable patterns with students' subjective experiences in online higher education contexts.

Participants

The participants of this study were university students enrolled in online higher education courses. The study involved participants who had experienced online learning environments for at least one academic semester, ensuring that they possessed sufficient experience with digitally mediated learning contexts. Students from various academic disciplines and year levels were invited to participate in order to obtain diverse perspectives regarding loneliness and social connection in online higher education settings.

For the quantitative phase, participants were selected using convenience sampling through online survey distribution (Lim, 2025). A total of 102 students participated in the survey component of the study. The quantitative participants provided data regarding their experiences of loneliness, social connection, interaction, and engagement in online learning environments. The survey allowed the researcher to identify broader patterns and tendencies related to students' emotional and interpersonal experiences in digitally mediated educational contexts.

For the qualitative phase, a smaller group of participants was purposively selected from the survey respondents to participate in semi-structured interviews. Purposive sampling was employed to ensure the inclusion of participants with varied experiences of loneliness and social connection in online learning environments (Ahmad & Wilkins, 2025). A total of 12 students participated in the interview phase. These participants were invited to share their personal experiences, interpretations, and perceptions regarding interaction, belonging, emotional engagement, and isolation in online higher education contexts. To protect participants' privacy and confidentiality, pseudonyms were used throughout the study, and all participants provided informed consent prior to data collection.

Data Collection

Data collection was conducted concurrently in accordance with the convergent mixed-methods design employed in this study. Both quantitative and qualitative data were collected during a similar timeframe to enable the integration and comparison of findings during the interpretation stage. The study utilized online surveys and semi-structured interviews to explore university students' experiences of loneliness and social connection in online higher education contexts.

For the quantitative phase, data were collected through an online questionnaire distributed using digital platforms. The questionnaire consisted of closed-ended items designed to examine students' experiences of loneliness, social connection, interaction, and emotional engagement in online learning environments. The survey employed a five-point Likert scale ranging from strongly disagree to strongly agree. The questionnaire was distributed electronically to university students who had experienced online higher education courses for at least one academic semester. Prior to the main data collection process, the questionnaire was reviewed to ensure clarity, relevance, and appropriateness of the survey items.

For the qualitative phase, semi-structured interviews were conducted with selected participants who volunteered after completing the survey. The interviews aimed to obtain deeper insights into students' lived experiences, perceptions, and interpretations regarding loneliness and social connection in online learning environments. The semi-structured interview format allowed participants to freely describe their emotional experiences, interpersonal interactions, sense of belonging, and challenges related to online learning. Interviews were conducted through online communication platforms and were audio-recorded with participants' consent. The recorded interviews were subsequently transcribed for analysis. The combination of survey and interview data enabled the study to capture both broader patterns and deeper personal experiences related to loneliness and social connection in online higher education contexts.

Data Analysis

The data obtained from the quantitative and qualitative phases were analyzed separately and subsequently integrated during the interpretation stage in accordance with the convergent mixed-methods design. The purpose of this analytical process was to develop a comprehensive understanding of university students' experiences of loneliness and social connection in online higher education contexts by combining statistical patterns with participants' lived experiences and interpretations.

For the quantitative data, responses from the online questionnaire were analyzed using descriptive statistical analysis (Slater & Hasson, 2025). The analysis included frequencies, percentages, means, and standard deviations to identify patterns related to students' experiences of loneliness, social connection, interaction, and emotional engagement in online learning environments. Descriptive statistics were employed to provide an overview of students' perceptions and tendencies regarding interpersonal connection and isolation in digitally mediated educational settings. The quantitative findings were presented through tables and narrative descriptions to facilitate interpretation of the emerging patterns. For the qualitative data, the interview transcripts were analyzed using thematic analysis (Braun & Clarke, 2021). The analysis process involved several stages, including familiarization with the data, initial coding, categorization of recurring ideas, identification of themes, and interpretation of patterns across participants' experiences. Through thematic analysis, the researcher explored how students described and interpreted their experiences of loneliness, social interaction, belonging, emotional connection, and isolation within online learning environments. To enhance the credibility of the findings, the researcher repeatedly reviewed the interview transcripts throughout the analytical process to ensure consistency and accuracy in theme development.

After the separate analyses were completed, the quantitative and qualitative findings were integrated and compared during the interpretation stage. The integration process aimed to identify areas of convergence, complementarity, and divergence between the two datasets. Through this process, the study was able to provide a more holistic understanding of loneliness and social connection by connecting broader quantitative

patterns with students' personal experiences and emotional interpretations in online higher education contexts.

FINDINGS AND DISCUSSION

How university students describe and interpret their experiences of loneliness and social connection in online learning environments

The qualitative findings revealed that university students experienced loneliness and social connection in online learning environments in complex and sometimes contradictory ways. Although participants appreciated the flexibility and accessibility offered by online higher education, many described online learning as emotionally distant and socially limited. Students frequently associated online classes with reduced interpersonal interaction, minimal emotional engagement, and weakened relationships with peers and instructors. At the same time, several participants acknowledged that online learning environments could still foster meaningful social connection when communication, collaboration, and interpersonal responsiveness were actively maintained. Three major themes emerged from the analysis: (1) feelings of emotional isolation in digitally mediated learning, (2) the importance of interaction and visibility for social connection, and (3) negotiating belonging in online learning communities.

Table 1. Themes and Representative Excerpts

Theme	Description	Representative Excerpt
Feelings of Emotional Isolation in Digitally Mediated Learning	Students perceived online learning environments as emotionally distant, impersonal, and socially limiting.	"Even though we met online every week, I still felt alone during classes." (P3)
The Importance of Interaction and Visibility for Social Connection	Active communication, collaborative learning, and visible participation contributed to students' sense of connection.	"Small group activities helped me feel like I was actually learning with other people." (P7)
Negotiating Belonging in Online Learning Communities	Students continuously negotiated their sense of membership and belonging within virtual learning environments.	"I joined the classes and completed the assignments, but I did not really feel like part of a learning community." (P10)

Feelings of Emotional Isolation in Digitally Mediated Learning

Many participants described online learning environments as emotionally isolating despite being constantly connected through digital technologies. Several students explained that online classes often felt “silent,” “impersonal,” and “emotionally empty” because interaction was frequently limited to task completion and academic instruction. The absence of face-to-face communication, spontaneous conversation, and informal social interaction contributed to feelings of loneliness and emotional detachment among participants. One participant stated:

“Even though we met online every week, I still felt alone during classes. Everyone just turned off their cameras and focused on finishing the lesson.”
(P3)

Similarly, another participant explained:

“In online learning, I sometimes felt invisible because there was very little interaction beyond academic tasks.” (P5)

Several participants also described how online communication lacked emotional warmth and interpersonal immediacy. Although students remained academically connected through digital platforms, many still experienced emotional disconnection from peers and instructors. As one participant noted:

“The classes were efficient academically, but emotionally they felt distant.”
(P1)

These findings suggest that technological connectivity did not automatically generate meaningful social connection. Instead, many participants interpreted online learning as functionally effective yet socially and emotionally limited.

The Importance of Interaction and Visibility for Social Connection

The findings further revealed that students’ sense of social connection was strongly influenced by the quality of interaction within online learning environments. Participants consistently emphasized that active communication, collaborative learning activities, instructor responsiveness, and peer participation contributed significantly to feelings of connection and belonging. One participant explained:

“I felt more connected when lecturers encouraged discussion instead of only giving presentations or assignments.” (P6)

Another participant similarly stated:

“Small group activities helped me feel like I was actually learning with other people, not just studying alone in front of a screen.” (P7)

Students also highlighted the importance of visibility during online interaction. Seeing classmates' faces, hearing voices, and receiving immediate responses during communication were perceived as important elements that strengthened emotional closeness and social presence. As one participant noted:

"When people turned on their cameras and interacted actively, the class felt more alive and less isolating." (P9)

Conversely, participants reported that classes characterized by minimal participation, silence, and limited communication often intensified feelings of loneliness and emotional distance. These findings indicate that social connection in online learning environments was closely associated with interpersonal engagement rather than technological access alone.

Negotiating Belonging in Online Learning Communities

The findings additionally demonstrated that students continuously negotiated their sense of belonging within online learning communities. Some participants described successfully developing meaningful relationships through collaborative activities, peer support, and informal online communication. These students perceived online learning environments as socially supportive when opportunities for interaction and emotional expression were actively encouraged. One participant explained:

"Even though everything was online, I still felt connected because our class communicated frequently outside formal sessions." (P11)

However, other participants expressed difficulties establishing deeper interpersonal relationships in virtual learning environments. Several students explained that online interaction often remained highly academic and task-oriented, making it difficult to form genuine emotional connections with peers and instructors. One participant stated:

"I joined the classes and completed the assignments, but I did not really feel like part of a learning community." (P10)

Another participant similarly reflected:

"Online learning made communication easier technically, but emotionally it sometimes felt distant." (P12)

These findings suggest that students' experiences of belonging in online higher education were dynamic and continually negotiated through interaction, participation, and emotional engagement. While some students were able to develop meaningful social relationships in digitally mediated environments, others continued to experience emotional isolation despite ongoing technological connectivity. Overall, the findings indicate that loneliness and social connection in online learning environments were

shaped not only by communication technologies but also by the quality of interpersonal interaction and perceived social presence within virtual educational spaces.

Patterns of loneliness and social connection emerge among university students in online higher education contexts

The quantitative findings examined the patterns of loneliness and social connection among university students in online higher education contexts. The quantitative questionnaire investigated several dimensions related to students' experiences in online learning environments, including loneliness, perceived social connection, peer interaction, instructor interaction, and sense of belonging. These dimensions were conceptually informed by Social Presence Theory and existing literature concerning online learning, interpersonal interaction, and student well-being. Descriptive statistical analysis revealed that students experienced moderate levels of loneliness alongside moderate levels of social connection in online learning environments. The findings indicate that students' experiences were characterized by a dynamic coexistence of emotional isolation and interpersonal connection within digitally mediated educational settings.

Table 2. Descriptive Statistics of Survey Dimensions Related to Loneliness and Social Connection

Survey Dimension	Mean	Standard Deviation	Interpretation
Loneliness in Online Learning	3.62	0.71	Moderately High
Perceived Social Connection	3.41	0.68	Moderate
Peer Interaction	3.27	0.74	Moderate
Instructor Interaction	3.45	0.66	Moderate
Sense of Belonging	3.18	0.79	Moderate

The findings showed that feelings of loneliness were relatively common among participants. Many students reported experiencing emotional distance, reduced interpersonal interaction, and limited social engagement during online learning activities. The highest mean score emerged in the dimension of loneliness in online learning ($M = 3.62$), suggesting that students frequently experienced isolation despite remaining academically connected through digital platforms. These findings indicate that online learning environments may not always adequately fulfill students' social and emotional needs.

At the same time, the results also demonstrated that students experienced moderate levels of perceived social connection within online higher education contexts. Participants

reported that communication with peers and instructors, collaborative learning activities, and online discussions contributed positively to their sense of interpersonal connection and emotional engagement. Among the interaction-related dimensions, instructor interaction ($M = 3.45$) received slightly higher responses than peer interaction ($M = 3.27$), suggesting that instructor responsiveness and communication may play an important role in supporting students' social experiences in online learning environments.

The findings additionally revealed that students' sense of belonging in online classes remained moderate rather than strongly positive. Although some participants perceived online learning communities as supportive and interactive, others reported difficulties developing meaningful interpersonal relationships in virtual educational settings. The relatively lower mean score for sense of belonging ($M = 3.18$) suggests that many students continued to experience emotional distance and partial disconnection within online learning communities.

Overall, the quantitative findings demonstrate that university students' experiences in online higher education were characterized by a simultaneous experience of loneliness and social connection. While online learning environments provided opportunities for interaction and communication, many students still experienced moderate levels of emotional isolation and limited belonging. These findings suggest that technological accessibility alone may not be sufficient to establish meaningful social presence and emotional connection within digitally mediated educational environments.

Integration of Qualitative and Quantitative Findings

The integration of the qualitative and quantitative findings revealed several areas of convergence and complementarity regarding university students' experiences of loneliness and social connection in online higher education contexts. Overall, both datasets demonstrated that students simultaneously experienced emotional isolation and interpersonal connection within digitally mediated learning environments. While the quantitative findings indicated moderate levels of loneliness, social connection, interaction, and belonging, the qualitative findings provided deeper insights into how students personally interpreted and negotiated these experiences in online learning spaces.

Table 3. Integration of Qualitative and Quantitative Findings

Quantitative Findings	Qualitative Findings	Integrated Interpretation
Students experienced moderately high levels of loneliness ($M = 3.62$).	Participants described online learning environments as "emotionally distant," "silent," and "impersonal."	Online learning environments may maintain academic connectivity while still contributing to emotional isolation and loneliness.

Students reported moderate levels of perceived social connection (M = 3.41).	Participants explained that meaningful connection emerged through discussion, collaboration, and interpersonal responsiveness.	Social connection in online learning depends largely on the quality of interaction rather than technological access alone.
Instructor interaction received slightly higher responses than peer interaction.	Participants emphasized the importance of instructor responsiveness and active communication.	Instructors play an important role in strengthening students' sense of social presence and emotional engagement.
Sense of belonging remained moderate (M = 3.18).	Participants continuously negotiated their sense of belonging within virtual learning communities.	Belonging in online learning environments is dynamic and shaped by participation, visibility, and interpersonal interaction.

The integration of findings further suggests that loneliness and social connection should not be understood as mutually exclusive experiences in online higher education contexts. Quantitatively, students reported moderate levels of social connection despite simultaneously experiencing relatively high levels of loneliness. Qualitatively, participants explained that although online learning environments enabled communication and accessibility, they did not always generate emotional closeness or meaningful interpersonal relationships. This convergence indicates that students may remain technologically connected while still experiencing emotional disconnection within virtual learning environments.

The merged findings also highlight the importance of interaction quality, visibility, and interpersonal responsiveness in shaping students' emotional experiences in online higher education. Across both datasets, collaborative activities, active participation, instructor responsiveness, and visible communication were consistently associated with stronger feelings of connection and belonging. Conversely, limited participation, silence, and highly task-oriented communication often intensified feelings of loneliness and emotional distance. These findings reinforce the central assumptions of Social Presence Theory by demonstrating that students' experiences in online learning environments are strongly influenced by perceived social presence and the quality of mediated interpersonal interaction.

Overall, the integration of qualitative and quantitative findings provides a more comprehensive understanding of loneliness and social connection in online higher education contexts. While the quantitative findings identified broader patterns related to students' emotional and interpersonal experiences, the qualitative findings revealed the meanings, interpretations, and lived realities underlying those patterns. Together, the merged findings demonstrate that online learning environments are not inherently

isolating or socially supportive; rather, students' experiences are continuously shaped by the interactional, emotional, and communicative dynamics present within digitally mediated educational spaces.

DISCUSSION

The findings of this study demonstrate that university students' experiences in online higher education were characterized by a complex coexistence of loneliness and social connection. Both the qualitative and quantitative findings revealed that although online learning environments provided accessibility and opportunities for communication, many students still experienced emotional isolation, reduced interpersonal interaction, and limited belonging within digitally mediated educational spaces. These findings support the argument that technological connectivity alone does not necessarily guarantee meaningful social connection in online learning environments. Consistent with Social Presence Theory (Short et al., 1976), students' perceptions of emotional closeness, interpersonal visibility, and interaction quality significantly influenced how they experienced connection and isolation in online higher education contexts.

The qualitative findings revealed that many participants perceived online learning environments as emotionally distant and socially limited. Students frequently described online classes as "silent," "impersonal," and lacking emotional warmth due to reduced face-to-face interaction and limited spontaneous communication. These findings align with previous studies suggesting that online learning environments may contribute to feelings of emotional detachment, isolation, and weakened interpersonal relationships among students (Kitano & Lane, 2025; Oyarzun et al., 2025). Similarly, Liu and Lin (2024) and Wheele et al. (2025) argued that the absence of physical interaction and limited social cues in online learning environments may intensify students' experiences of loneliness and emotional disconnection. The present study extends these discussions by demonstrating that loneliness in online higher education is not merely associated with physical separation but also with students' subjective perceptions of invisibility, limited participation, and emotionally restricted interaction within virtual classrooms. Importantly, invisibility emerged not simply as the absence of communication but as the feeling of being unnoticed, unacknowledged, and insufficiently engaged despite participating in online learning activities. From the perspective of Social Presence Theory, these findings suggest that the psychological experience of "being seen" is a fundamental component of social presence, extending the theory beyond the availability of communication technologies or interaction opportunities. In other words, technological connectivity alone does not ensure that students perceive themselves as socially present within a learning community. Conceptually, this finding highlights that loneliness in online higher education is shaped not only by the quantity of interaction but also by the perceived quality of interpersonal recognition and emotional responsiveness, indicating that students' sense of connection depends on whether online interactions successfully convey visibility, acknowledgment, and genuine human engagement.

At the same time, the findings also revealed that online learning environments could still foster meaningful social connection when interaction, communication, and participation were actively encouraged. Participants emphasized the importance of collaborative activities, instructor responsiveness, and visible interaction in strengthening their sense of belonging and interpersonal connection. These findings are consistent with previous studies highlighting the importance of peer communication, collaborative learning, and supportive online communities in promoting social connectedness within digitally mediated learning environments (Ransanz Reyes et al., 2025; Weng et al., 2024). Furthermore, the findings support research grounded in Social Presence Theory demonstrating that higher levels of perceived social presence are associated with stronger engagement, participation, and emotional connection among students (Weidlich et al., 2023; Zhong et al., 2022). The present study particularly emphasizes the significance of visibility and interpersonal responsiveness, suggesting that students' emotional experiences in online learning are shaped not only by communication frequency but also by the perceived quality and immediacy of interaction.

The quantitative findings further demonstrated that students simultaneously experienced moderately high levels of loneliness alongside moderate levels of social connection, peer interaction, instructor interaction, and belonging. These findings suggest that loneliness and connection should not necessarily be understood as opposing conditions but rather as experiences that may coexist within online higher education contexts. This finding supports previous research indicating that online learning environments produce varied and dynamic social experiences among students (Ransanz Reyes et al., 2025; Wheele et al., 2026). While some students successfully developed meaningful interpersonal relationships and supportive online communities, others continued to experience emotional isolation despite participating in digitally connected learning environments. The coexistence of loneliness and social connection identified in this study therefore highlights the complexity of students' emotional experiences in online higher education.

Another important finding concerns the distinctive role of instructors in shaping students' social experiences within online learning environments. Quantitatively, instructor interaction received slightly higher ratings than peer interaction, while the qualitative findings consistently revealed that students felt more socially connected when instructors actively encouraged discussion, acknowledged students' contributions, and created opportunities for meaningful participation. These findings support previous studies emphasizing the importance of communication immediacy, instructor responsiveness, and interaction quality in strengthening students' perceptions of connectedness in online education (Gao et al., 2024; Liang & Ren, 2025). However, the present study extends this literature by suggesting that instructors function not merely as facilitators of academic learning but as primary mediators of social presence within digitally mediated classrooms. Rather than social connection emerging naturally from the online environment or peer interaction alone, students' sense of belonging appeared to depend substantially on instructors' ability to cultivate visibility, encourage reciprocal communication, and create emotionally responsive learning spaces. Conceptually, this finding indicates that, in online higher education, instructors assume a dual pedagogical

role: supporting students' cognitive learning while simultaneously fostering the interpersonal conditions necessary for students to feel recognized, connected, and included within the learning community. This highlights that effective online teaching involves not only delivering content but also intentionally designing interaction that sustains students' emotional engagement and sense of belonging.

Overall, the findings reinforce the central assumptions of Social Presence Theory by demonstrating that students' experiences of loneliness and social connection are strongly influenced by the perceived quality of interpersonal interaction within digitally mediated communication environments. The study further contributes to existing literature by integrating quantitative patterns with qualitative interpretations of students' lived experiences, thereby providing a more holistic understanding of the emotional and interpersonal dimensions of online higher education. While previous studies have often focused separately on technological effectiveness, student satisfaction, or emotional well-being, the present study highlights the importance of examining how emotional connection, belonging, and interpersonal interaction are continuously negotiated within contemporary online learning environments.

CONCLUSION

This study explored university students' experiences of loneliness and social connection in online higher education through a convergent mixed-methods design grounded in Social Presence Theory. The findings revealed that students' experiences were characterized by the dynamic coexistence of emotional isolation and interpersonal connection. While online learning provided flexibility, accessibility, and opportunities for communication, many students continued to experience loneliness, invisibility, emotional distance, and limited belonging within digitally mediated educational spaces. At the same time, meaningful social connection remained possible when interaction, collaboration, instructor responsiveness, and interpersonal visibility were intentionally fostered. These findings support the central assumptions of Social Presence Theory by demonstrating that the quality of perceived social presence, rather than technological connectivity alone, shapes students' emotional and interpersonal experiences in online learning. At the same time, the study extends the theory by showing that social presence should be understood not only as the availability of communication or interaction but also as students' subjective experience of being recognized, acknowledged, and emotionally engaged within a learning community. From this perspective, loneliness and social connection are not mutually exclusive conditions but dynamically coexist depending on how learners perceive interpersonal visibility, responsiveness, and belonging in digitally mediated environments. By integrating quantitative patterns with qualitative interpretations, this study therefore contributes both empirically and theoretically to a more nuanced understanding of the emotional and interpersonal dimensions of contemporary online higher education.

Despite these contributions, the study has several limitations. First, the study involved a relatively limited number of participants, which may restrict the broader generalizability

of the findings across different higher education contexts. Second, the quantitative component relied primarily on descriptive statistical analysis, limiting the exploration of more complex relationships among the examined dimensions. Third, the study focused specifically on students' self-reported experiences within online learning environments, which may not fully capture the influence of institutional, cultural, or technological factors on students' social experiences. Future research may therefore expand the participant population across diverse educational settings and employ more advanced quantitative analyses to examine the relationships among loneliness, social presence, interaction, and belonging in greater depth. Additionally, longitudinal and cross-cultural studies may provide richer insights into how students' experiences of loneliness and social connection evolve across different online learning contexts and educational environments.

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