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Exploring Emotional Connection with Virtual AI Tutors in Online Learning Among University Students

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ABSTRACT

Despite the growing integration of artificial intelligence (AI) in education, a clear research gap persists in understanding the emotional dimensions of student engagement with AI tutors. This study aims to explore how university students experience emotional connection with AI-driven virtual tutors in online learning environments. Adopting a descriptive phenomenological approach, we conducted in-depth, semi-structured interviews with twelve undergraduate students from diverse academic disciplines. Data were analyzed thematically using reduction and eidetic techniques. The analysis yielded four experiential themes: perceived attentiveness of the AI, emotional ambivalence, construction of trust without human presence, and longing for authentic human connection. Findings suggest that emotional bonds can form between students and virtual AI tutors, grounded in perceived consistency, non-judgmental interaction, and responsiveness, even when students are aware of the tutor's artificial nature. These results underscore the affective complexity of AI-mediated education and call for educational technologies that support not only cognitive outcomes but also the emotional needs of learners.

INTRODUCTION

The rapid evolution of digital technology has profoundly transformed education, reshaping learner interactions with knowledge, instructors, and virtual environments (Kuliukas et al., 2021). Artificial intelligence (AI)-powered platforms now play a central role in modern educational practices, offering personalized learning paths, real-time feedback, and adaptive instructional support. Among these, AI-driven virtual tutoring systems have gained prominence for mimicking certain aspects of human instruction while functioning autonomously.

As AI tutors become more prevalent in online learning environments, new forms of human-technology interaction are emerging—ones that not only support cognitive development but also evoke emotional and relational responses (Váradi, 2022). Contemporary students are increasingly engaging with AI entities that simulate empathy, attentiveness, and responsiveness. Such interactions raise important questions about the emotional experiences of learners in digitally mediated contexts, particularly when human educators are absent or inaccessible.

While prior studies have predominantly focused on the cognitive benefits of AI tutors, fewer have investigated their affective impact. This gap highlights the need to explore how students emotionally connect with virtual tutors and what meanings they construct from these interactions (Baltà-Salvador et al., 2021). Accordingly, this study addresses the following research question: How do university students experience emotional connection with AI-driven virtual tutors in online learning?

In educational contexts where emotional presence plays a critical role in learner motivation, engagement, and retention, the emergence of emotionally responsive AI tutors introduces a novel

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phenomenon: the perceived emotional connection between students and non-human agents (Mendoza et al., 2021). While this phenomenon reflects broader social and technological shifts, it also touches deeply on the subjective human experience raising essential questions about how students interpret, internalize, and make meaning of these interactions.

Understanding such experiences requires more than technical evaluation; it necessitates a deeper, phenomenological inquiry into the lived realities of learners navigating these technologically infused spaces. Only by exploring the nuanced, personal dimensions of these interactions can educators and developers gain insights into how emotional engagement is constructed, experienced, and sustained in digital learning environments.

Research on individuals lived experiences within technology-mediated learning environments has become increasingly significant, particularly as educators and designers seek to understand not only what learners achieve but how they engage, feel, and connect in virtual spaces (Garcia & Yousef, 2023). Emotional connection once considered exclusive to human-human interaction has now become a subject of inquiry in relation to human-AI relationships, especially in the context of intelligent tutoring systems. While these systems have demonstrated effectiveness in delivering adaptive content and cognitive scaffolding, little is known about how learners emotionally perceive and respond to such non-human instructional agents.

Existing studies have predominantly relied on quantitative methodologies aimed at measuring satisfaction levels, task completion rates, or performance indicators. Although these data points are valuable, they offer limited insight into the affective and relational dimensions that define the learner's emotional world. Attempts to quantify emotional engagement often overlook the subjective depth, ambiguity, and complexity embedded in learners' interactions with virtual tutors.

Moreover, the methodological focus on structured surveys or behavioral analytics fails to capture the richness of inner experiences, particularly the nuanced ways in which students interpret their emotional encounters with artificial systems. This presents a critical limitation: the lack of methodological depth prevents researchers from grasping the full essence of what it means to emotionally engage with a non-human educational entity.

Such constraints highlight the inadequacy of prior approaches in revealing the core meanings behind emotional connection in AI-driven education. In this light, a phenomenological investigation centered on the lived experiences of students offers a more suitable path for uncovering the intricacies of this emerging relational phenomenon.

Current responses to the challenge of emotional engagement in AI-driven educational environments have largely relied on practical and design-based solutions, such as refining interface usability, enhancing response algorithms, or incorporating sentiment analysis into tutoring systems (Ensmann et al., 2021). These strategies are grounded in technological optimization and behavioral measurement, aiming to improve user satisfaction and learning outcomes. While effective in certain respects, these approaches remain limited in their ability to reveal how students experience emotional connection, particularly at the subjective and existential level.

Such limitations stem from the dominant use of quantitative instruments, which prioritize observable indicators over introspective understanding. As a result, they tend to produce a surface-level portrayal of student engagement, failing to access the deeper emotional, relational, and interpretive layers of learner-tutor interaction (Radinsky & Tabak, 2022). This methodological gap leaves a critical question unanswered: what is the lived meaning of emotional connection as experienced by students interacting with virtual tutors in AI-mediated learning?

Addressing this gap requires a shift from instrument-based evaluations to a more holistic exploration of experience. Phenomenology provides an alternative and rigorous framework to investigate how emotional bonds are felt, constructed, and interpreted by learners themselves. By focusing on first-person narratives and the essence of lived experience, a phenomenological approach can illuminate the complex meanings students attribute to their emotional interactions with artificial tutors insights that are inaccessible through functional or outcome-oriented assessments.

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Previous research has explored emotional dynamics in online learning, focusing mainly on usability, system design, and user satisfaction. Studies such as Tackie (2022) and Lawson & Mayer (2022) have highlighted emotional presence and affective dimensions in digital education, yet often through interpretative or mixed-method frameworks. While useful, these studies rarely capture the full depth of lived emotional experiences from the perspective of learners themselves. Most prior work emphasizes outcomes over meaning, limiting our understanding of how students emotionally connect with AI-driven virtual tutors. This underscores the need for an inquiry rooted in direct experience and subjective interpretation.

To address this, the present study adopts a descriptive phenomenological approach based on Husserl's tradition. This method allows for the investigation of how emotional connection is consciously experienced by students without imposing external interpretation. It provides a pathway to understand the essence of what students feel, rather than just what they do or say. This approach answers the previous gap by prioritizing first-person accounts and enabling a deep exploration of affective meaning. The study is designed to uncover insights that quantitative tools and behavioral data alone cannot reveal.

This article begins with an introduction to the phenomenon and its broader educational context. It then describes the methodological framework of descriptive phenomenology and the rationale for its use. The data collection process through in-depth interviews is explained, followed by thematic analysis to identify core experiential themes. The results section presents these themes through rich narrative supported by participant quotations. Finally, the article concludes with a discussion on the implications of these findings for educational practice and the design of emotionally intelligent AI tutors.

RESEARCH METHODS

Study Design

This study employed a descriptive phenomenological approach to explore the lived experiences of university students in forming emotional connections with virtual tutors during AI-based online learning. Phenomenology, as a qualitative research design, emphasizes the exploration of individuals' subjective experiences and the meanings they assign to specific phenomena (Johnson, 2014). This approach was selected due to its capacity to elicit rich, first-person accounts that illuminate the essence of human experiences often overlooked in quantitative paradigms. Descriptive phenomenology, grounded in the philosophy of Edmund Husserl, was specifically applied in this study to bracket prior assumptions and focus on the unfiltered perceptions of participants, thereby enabling a deeper understanding of the phenomenon in its purest form.

Participants

Participants consisted of undergraduate students who had engaged in AI-based online learning environments for at least one academic semester. Selection was conducted through purposive sampling to ensure the inclusion of individuals with direct and meaningful experience of the studied phenomenon. Inclusion criteria required participants to be aged between 18 and 25, enrolled in higher education, and have used AI-driven virtual tutoring systems in their coursework. Those who had only experienced traditional e-learning platforms without AI integration were excluded. A total of twelve participants (7 female, 5 male) took part in the study, with an average age of 21.3 years. All participants came from diverse academic backgrounds, contributing varied perspectives on their emotional engagement with virtual tutors.

The decision to recruit twelve participants was informed by established phenomenological research conventions, which suggest that in-depth exploration of lived experiences can be achieved with 6 to 15 participants. In this study, data saturation was reached by the twelfth interview, as no new significant themes emerged beyond this point.

Data Collection

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Data were collected through in-depth, semi-structured interviews guided by a protocol designed to explore emotional and relational experiences with virtual tutors. Interviews were conducted either in-person or via secure video conferencing platforms, depending on the participant's preference and logistical constraints. Each session lasted between 45 to 70 minutes and was conducted in a quiet, private setting to ensure participant comfort and openness. All interviews were audio-recorded with permission and later transcribed verbatim for analysis. The interview guide was adapted from validated phenomenological instruments and revised based on pilot feedback to ensure clarity and relevance to the research focus.

Data Analysis

Data were analyzed using thematic analysis consistent with the principles of descriptive phenomenology. Transcripts were initially read multiple times to achieve immersion and familiarity. Significant statements were identified and coded, followed by the grouping of meaning units into emergent themes. The process involved thematic reduction and

eidetic analysis, which included imaginative variation, reflection, and abstraction to arrive at the essential structures of the phenomenon. This analytic method is rooted in Husserlian phenomenology and aims to uncover the invariant features of participants' experiences (Giorgi, 2009).

NVivo (version 12, QSR International) was utilized to assist in organizing and managing data systematically, though the interpretation remained grounded in the textual content. The analytic process was iterative, ensuring that themes accurately represented the shared meanings across participants without imposing external interpretations.

Ethical Considerations

Ethical approval for this study was obtained from the relevant institutional review board prior to data collection. All participants provided written informed consent after receiving detailed information about the study's aims, procedures, and confidentiality measures. Anonymity was maintained through the use of pseudonyms and the removal of identifiable details from transcripts. The study adhered to internationally recognized ethical standards for research involving human subjects, including voluntary participation, the right to withdraw at any time, and the protection of personal data.

RESULTS

This study sought to explore students lived experiences in developing emotional connection with virtual tutors during AI-based online learning. Through phenomenological analysis of in-depth interview data, several key themes emerged that collectively illuminate how emotional engagement was perceived, formed, and challenged within digitally mediated educational environments.

Feeling Heard in a Silent Space

Participants consistently described a sense of "being heard" even in the absence of human interaction. The programmed responsiveness and adaptive feedback of the AI tutor were often perceived as personalized, creating an illusion of empathy.

"It felt like the tutor understood when I was confused. Even though it's just a machine, the way it responded made me feel seen." (P3)

This perceived attentiveness was particularly meaningful for students learning in isolation. The AI's ability to recognize pauses, errors, and patterns of disengagement contributed to a pseudo-relational experience, simulating a caring presence that bridged the emotional void.

Emotional Ambivalence in Machine-Driven Interactions

Despite the initial comfort, participants frequently expressed emotional ambivalence. Some reported a lingering awareness of the artificiality of the interaction, which diluted the authenticity of their emotional experience.

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"Sometimes I would feel like opening up, like sharing my struggles, but then I'd realize it's just a program. And that thought made everything feel... hollow." (P6)

This internal conflict highlighted the tension between emotional projection and rational dissonance. Students oscillated between embracing the illusion of companionship and retracting emotionally due to the lack of human reciprocity.

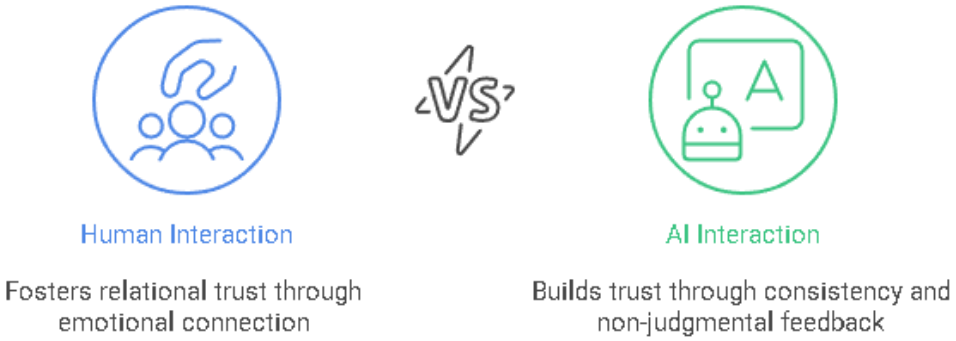
Constructing Trust Without Humanity

Several students recounted forming a sense of trust toward the virtual tutor, grounded not in emotion per se, but in consistency, non-judgmental feedback, and 24/7 availability.

"With my professor, I sometimes feel judged. But the AI? It never frowns, never interrupts, never makes me feel inadequate. That made me trust it more, weirdly." (P2)

Interestingly, this trust was not relational in the traditional sense but built upon predictable and emotionally neutral interactions. The absence of social anxiety allowed students to engage more openly, even if the emotional depth was perceived as limited.

How to build trust in educational settings?



Longing for Human Warmth

Despite positive feedback on functionality and responsiveness, many participants voiced a yearning for human touch, humor, spontaneity, and genuine empathy qualities they felt no algorithm could replicate.

"The tutor helps me pass my courses, sure. But when I'm struggling emotionally, I wish someone would just ask, 'Are you okay?' and actually mean it." (P5)

This theme underscored a persistent emotional gap. While AI facilitated cognitive learning efficiently, it often failed to meet deeper emotional and psychological needs, leaving students with a sense of emotional incompleteness.

The findings reveal a complex interplay between emotional connection, technological design, and student expectations in AI-based learning environments. While virtual tutors can simulate emotional presence through responsiveness and consistency, the authenticity and depth of emotional bonds remain limited by the inherent absence of human consciousness. Students navigate this gap by adjusting their expectations and redefining trust and connection within a technological framework experience that are deeply subjective, context-bound, and emotionally nuanced.

DISCUSSION

The findings of this study reveal that students experience a complex interplay of emotional connection, ambivalence, and relational longing when interacting with AI-based virtual tutors (Lawson et al., 2021). These experiences illuminate the nuanced ways in which emotional presence is constructed in machine-mediated learning environments, addressing the central question of how students emotionally engage with non-human educational agents.

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This study offers a unique contribution by demonstrating that students can develop a perceived sense of emotional connection with AI tutors, rooted not in traditional human interaction but in the predictability, non-judgmental nature, and attentiveness simulated by machine responses. The research question how students experience emotional connection in AI-based online learning is addressed by uncovering deeply subjective narratives that challenge conventional definitions of emotional engagement (Iqbal et al., 2022). Unlike prior studies that have assessed emotional presence through behavioral indicators or self-report scales, this study highlights the experiential core of emotional trust, dissonance, and unmet relational needs.

The results align with and extend prior phenomenological and interpretive studies on emotional presence in digital education (Kantola & Harju, 2023), particularly in their acknowledgment of affective elements in virtual learning. However, this study departs from earlier work by emphasizing the felt meaning of emotional connection rather than its observable manifestations. For example, where Zainuddin et al. (2022) explored the limits of social presence in AI systems, the current study goes further by articulating how students internalize those limits and make sense of the resulting emotional ambivalence. Moreover, it supports Logemann et al. (2022) assertion that emotional connectedness is a subjective construct shaped by context, but expands it to show how trust can paradoxically emerge in the absence of human authenticity.

The findings of this study hold important implications for both educational design and the broader understanding of emotional engagement in AI-mediated learning (Liu et al., 2024). From a social and pedagogical perspective, the recognition that students attribute emotional meaning to machine interactions underscores the need to reframe digital learning environments as affective as well as cognitive spaces. Virtual tutors are not only information-delivery tools but also perceived relational entities, and their design must consider the emotional expectations of learners. Culturally, the tendency to project human-like trust onto non-human agents may reflect shifting norms around connection and presence in an increasingly digital world. These insights may inform the development of AI systems that are more attuned to emotional nuance and can support learner well-being beyond task completion.

Despite these contributions, the study is not without limitations. As a qualitative inquiry grounded in phenomenology, the findings are deeply contextual and rooted in the subjective experiences of a small, purposively selected sample. The results are therefore not intended for statistical generalization but for theoretical and conceptual insight. Additionally, all participants had prior exposure to AI-based learning platforms, which may shape their perceptions differently from learners without such experience. The phenomenological reduction process, while rigorous, is also influenced by interpretive sensitivity during analysis, which requires reflexivity and transparency.

Future research could build on these findings by exploring emotional connection with AI tutors across different educational levels, cultural backgrounds, or technological platforms. Comparative studies between human tutors, hybrid AI-human models, and purely AI systems may further illuminate the boundaries and possibilities of emotional engagement in digital education. Furthermore, integrating phenomenological insights with design-based research may bridge the gap between lived experience and technological innovation, ultimately contributing to the creation of emotionally responsive learning systems that honor both human complexity and digital advancement.

CONCLUSION

This study explored how university students experience emotional connection with AI-based virtual tutors in online learning environments. The findings reveal that students construct emotional bonds through perceived attentiveness, reliability, and non-judgmental interaction, despite their awareness of the tutor's artificial nature. These results address a key gap in the literature by illuminating the subjective and affective dimensions of human-AI relationships, which previous outcome-focused studies have largely overlooked. By employing a descriptive phenomenological approach, the study offers a deeper understanding of how emotional presence is felt and interpreted in digitally mediated education. The insights gained here contribute to the development of emotionally responsive AI systems that support learner well-being, not just performance. Future research may

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extend this work by comparing emotional experiences across different platforms or by integrating phenomenological findings into AI design practices. As AI continues to shape educational landscapes, ensuring that these systems are ethically designed to foster emotional support, inclusivity, and psychological safety becomes imperative for equitable and humane digital learning.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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