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# From Chatbots to Heartbeats: AI-Driven EdTech and the Emo-Cog Journey of Language Learners

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**ABSTRACT**

*This study explored the emotional and cognitive (Emo-Cog) experiences of university students using AI-driven educational technology (EdTech) in the context of English language learning. As AI-based tools such as chatbots, personalized learning platforms, and mobile applications become increasingly integrated into education, understanding their impact on learners goes beyond test scores and usability—it included how students feel, think, and engage. This explorative case study involved 93 first-year non-English major students at Syiah Kuala University who were already familiar with AI tools. Data were collected through a structured Likert-scale questionnaire that examined students' emotional responses (e.g., motivation, anxiety, enjoyment), cognitive engagement (e.g., clarity, focus, memory), and perceptions of AI features (e.g., feedback, personalization, gamification). Findings revealed that students generally responded positively to AI-assisted language learning, reporting increased motivation, emotional comfort, and clearer understanding when using tools that offered real-time feedback, adaptive content, and gamified interaction. Many students described AI as a "partner" in learning, not just a tool—highlighting its role in fostering autonomy and reducing communicative anxiety. However, some limitations were identified, including over-automation and lack of contextual explanations. The study concluded that effective AI-driven EdTech must consider both the emotional and cognitive dimensions of learning, especially for novice language learners. The implications suggest that educators and developers should design emotionally responsive AI environments to enhance learner engagement. While limited to one institution and self-reported data, this research offers valuable insights into the Emo-Cog journey of language learners and calls for further studies integrating emotion and cognition in EdTech evaluation.*

**Keywords:** *AI in education, EdTech, emotional engagement, cognitive support, language learning, university students*

## 1. INTRODUCTION

The rise of Artificial Intelligence (AI) has dramatically transformed the educational landscape, reshaping not only how content is delivered but also how learners interact, feel, and think throughout the learning process. In the field of language learning, AI-powered educational technologies (EdTech) such as chatbots, personalized learning platforms, and emotion-aware applications are becoming increasingly prominent (Labadze et al., 2023). These tools are not merely passive carriers of information; they are responsive, adaptive, and in some cases, affectively sensitive. This shift has introduced a new dimension in education, one that goes beyond the traditional cognitive focus and begins to embrace the emotional and psychological aspects of the learning experience. In short, we are moving from chatbots that answer grammar questions to heartbeats—systems that monitor frustration, support motivation, and adapt to the emotional states of learners (Belda-Medina & Calvo-Ferrer, 2022). Language learning, by nature, is a cognitively demanding and emotionally charged endeavor. It requires sustained attention, memory, pattern recognition, risk-taking, and social engagement. For university students, the pressure to master a foreign or second language is often accompanied by anxiety, low confidence, and fluctuating motivation. In such contexts, the integration of AI-driven EdTech has the potential to serve as more than just a pedagogical tool—it can become a companion that supports both the emotional (affective) and cognitive journey of the learner. However, while the technological advancements are promising, their actual impact on learners' emotional-cognitive (or Emo-Cog) experience remains underexplored, especially within the context of university-level language education.

This study is situated within that intersection: between human emotion, cognitive engagement, and AI-powered learning tools in the language learning experiences of university students (Asimolowo, 2025). While much research has addressed the effectiveness of AI in delivering content or improving scores, far less attention

has been given to how learners feel and think while using these tools, and how such feelings and thoughts influence their overall language learning journey. The Emo-Cog lens invites a more holistic understanding—where emotions like curiosity, frustration, joy, and boredom are seen not as distractions but as integral parts of the learning process (Susanto & Fazlinda, 2017).

Despite the growing availability of AI-based EdTech platforms (e.g., Duolingo's smart feedback loop, Google's grammar correction AI, or adaptive chatbot tutors), the problem lies in how these technologies are implemented and interpreted. In many cases, educators and developers remain focused on functionality and performance, paying little attention to learner experience, especially in relation to emotions, motivation, and identity. For university students, who are often navigating complex academic and personal transitions, the emotional impact of AI in their learning tools can be profound, but it is seldom measured or even discussed.

Furthermore, the research gap is evident, as most existing studies on AI in education tend to focus primarily on technical outcomes such as learning analytics, test scores, and system accuracy. Others may explore aspects like cognitive load or task engagement, but often without making meaningful connections to learners' emotional or affective experiences. There is limited qualitative, learner-centered research that explores how university students emotionally and cognitively experience AI-based language learning tools in real academic settings. Studies often isolate either emotion or cognition, but rarely examine how both interact—especially in AI-mediated environments. Additionally, the majority of these studies are based in Western or high-tech environments, which may not reflect the nuanced experiences of learners in developing or resource-limited contexts. Several previous studies have examined the intersection of AI-driven educational technology and learner engagement. Kenya et al. (2023) found that students with strong metacognitive skills benefited more from digital learning tools, particularly when technology supported autonomy. Additionally, the cognitive benefits of adaptive digital learning platforms, noting improvements in clarity, focus, and retention among secondary learners (Haristiani, 2019). Barak and Dori (2009) highlighted the importance of real-time feedback in web-based systems, showing that such feedback promoted self-assessment and deeper thinking, although their study focused on in-service teachers. Eisenring et al. (2024) explored mobile-based language apps and found that features like gamification and self-tracking significantly enhanced learners' motivation and independence. Besides, self-efficacy and emotional comfort are essential for sustained engagement in online learning environments, noting that emotionally safe digital spaces reduce anxiety and increase willingness to participate. These studies collectively point to the cognitive and emotional dimensions of AI-supported learning (Pellas, 2014). However, few directly investigate how both aspects interact—particularly in university-level language learners using AI-based tools. The current study builds on these insights by explicitly examining the Emo-Cog experience of learners, highlighting how affective and cognitive engagement are co-shaped by specific features of AI-driven EdTech.

The novelty of this study lies in its combined focus on emotional-cognitive (Emo-Cog) experiences, emphasizing the interplay between how students feel and think while engaging with AI-driven educational tools. It centers on university students as users, a group often navigating complex academic pressures alongside emotional stress, making their learning experience uniquely intense (Harisha et al., 2024). Unlike many previous studies that treat AI-based EdTech as mere content delivery systems, this research views such technologies as interactive learning environments with real affective consequences—shaping not just what students learn, but how they emotionally and cognitively experience the process.

This study does not ask only *"Does AI help students learn better?"*, but also *"How do students feel and think while learning with AI?"* It frames the learner as a whole person—thinking, feeling, reflecting—rather than a passive user or a data point in a dashboard (Safar & Anggraheni, 2024). By exploring this topic, the research aims to contribute to the development of more human-centered AI design for language learning platforms and to inform educators and institutions about the emotional and cognitive impacts of AI use in their classrooms. It also seeks to raise awareness of the often-unseen emotional labor involved in mastering a new language with the aid of machine partners.

Therefore, the purpose of this study is to explore how university students emotionally and cognitively experience the use of AI-driven educational technologies in language learning contexts. Through interviews, observations, and reflective narratives, the study will illuminate how these tools influence motivation, engagement, confidence, mental fatigue, and sense of agency—ultimately shaping the learners' overall journey.

The study is guided by the following research questions:

1. How do university students emotionally and cognitively experience the use of AI-driven educational technology in their language learning process?
2. What aspects or features of AI-based EdTech tools influence students' emotional and cognitive engagement during language learning?

By answering these questions, this research intends to bridge the gap between AI-driven efficiency and human learning experience, highlighting not just what students learn, but how they feel and think along the way.

## 2. METHODS

This study employed an explorative qualitative case study design to examine how university students emotionally and cognitively experience the use of AI-driven educational technology in the context of language learning (Thuv, 2023). The case study approach was chosen to gain in-depth insights into the nuanced, lived experiences of students, particularly their perceptions, attitudes, and responses toward AI-based tools that support language acquisition. This method is suitable for exploring complex social and psychological phenomena within real-life educational settings.

### 2.1 Research Location and Participants

The participants in this study consisted of 93 first-year university students from Syiah Kuala University, Indonesia. All participants were from non-English majors, enrolled in general English language courses as part of their university curriculum. The students were selected using purposive sampling to ensure that they met the criteria relevant to the study, namely having prior experience with AI tools or chatbots in either formal or informal learning contexts. These students were part of the digital-native generation and were already familiar with technologies such as chatbots, generative AI tools (e.g., ChatGPT), voice assistants (e.g., Google Assistant or Siri), and language-learning apps that use AI features. Their existing familiarity with such tools provided a relevant context for exploring their emotional and cognitive engagement with AI-driven EdTech. Participation was voluntary, and informed consent was obtained from all participants. Students were informed that their responses would be used solely for academic research purposes and that their identities would remain anonymous.

### 2.2 Research Instrument and Data Collection Procedure

To gather data, the study employed a structured questionnaire using a 5-point Likert scale ranging from "strongly disagree" to "strongly agree". The questionnaire was designed to explore students' emotional and cognitive responses while interacting with AI-supported learning tools in their English learning process. The instrument included items related to various emotional responses (e.g., motivation, frustration, enjoyment, anxiety), cognitive engagement (e.g., focus, clarity of understanding, mental effort), and perceived support from AI features (e.g., real-time feedback, personalization, adaptive content). Some items also probed how students interpreted AI interaction, whether they saw the AI as a tool, a partner, or even a form of digital tutor.

The questionnaire was distributed electronically and administered during regular English language class time with the approval of the course instructors. Participants completed the survey independently, and their responses were anonymized to ensure confidentiality.

### 2.3 Data Analysis

Although the instrument was quantitative in format, the study adopted an explorative case study lens, and thus the analysis focused on identifying patterns, trends, and thematic insights rather than statistical generalization. Descriptive statistics (mean scores and standard deviations) were used to identify the most

prominent emotional and cognitive responses across the sample. Items were grouped into broader thematic categories, such as emotional impact (e.g., motivation, anxiety), cognitive support (e.g., understanding, memory), and perception of AI roles (e.g., passive tool vs. interactive support).

The results were then interpreted qualitatively to understand the students' overall Emo-Cog journey when using AI in language learning, framed through the lens of affective-cognitive theory in education. Selected open-ended feedback provided by students was also considered to enrich the interpretation and offer narrative illustrations of the quantified responses.

## 3. RESULTS & DISCUSSION

The results are presented based on the two research questions and analyzed thematically with support from descriptive data.

### 3.1 Results

#### *3.1.1 Emotional Experiences with AI in Language Learning*

Overall, students reported a predominantly positive emotional experience when using AI-driven EdTech tools. More than 70% of respondents agreed or strongly agreed with items indicating increased motivation when learning with AI-based applications. These applications, including AI chatbots and adaptive learning platforms, were perceived as engaging, convenient, and non-judgmental. One commonly endorsed statement was, *"I feel more motivated to complete English learning tasks when I use AI-based applications."* Feelings of enjoyment were also frequently reported, with 68% of students indicating that they found AI-powered language learning tools more enjoyable than traditional textbook-based activities. Students appreciated the gamified elements, instant feedback, and interactive design of the apps they used. For instance, students using Duolingo or ChatGPT expressed satisfaction in receiving immediate corrections and conversational interaction, which made the learning experience feel more like a game or a casual exchange rather than a rigid academic task.

However, emotional responses were not uniformly positive. Approximately 27% of students expressed occasional frustration, particularly when the AI provided feedback that seemed unclear or when the system failed to understand their inputs. This was especially evident among students using AI chatbots with natural language processing (NLP) limitations, where responses were perceived as robotic or irrelevant. Frustration also emerged in situations where the AI did not allow flexibility in navigating tasks, suggesting a need for better-designed adaptive features. Anxiety levels appeared lower when students worked with AI tools compared to in-class speaking or writing activities. Nearly 65% of students agreed that AI tools provided a safer space to make mistakes, especially for those with low language confidence. As one student noted in an optional comment section, *"I feel less nervous practicing English with a chatbot than in front of my lecturer."*

#### *3.1.2 Cognitive Engagement and Focus*

Cognitively, students reported that AI-driven EdTech helped them focus and understand learning content better. About 74% of students agreed or strongly agreed that AI-supported learning helped clarify difficult grammar structures, vocabulary use, and sentence formation. The adaptive content delivery used by apps such as Grammarly, Elsa Speak, and Google Translate was perceived as helpful in providing context-based support. Clarity and memory support were also commonly noted. Students appreciated that AI tools could repeat or rephrase content as needed, which supported individual pacing. For example, one item that received high agreement was: *"The AI helps me remember grammar or vocabulary better because it adjusts based on my mistakes."* Nonetheless, some students reported cognitive overload in situations where too many AI features were presented simultaneously. Around 21% of students felt overwhelmed when using platforms that combined video, text, quizzes, and AI recommendations within a single interface. This points to the need for EdTech designers to streamline user experiences for optimal cognitive engagement.

### *3.1.3 Perceived Role of AI in Learning*

Interestingly, students interpreted the role of AI in diverse ways. While 43% of respondents saw AI as a "tool" to support their learning, 38% referred to AI as a "partner," indicating a more relational view of the technology. These students described the AI as something that responded to their needs, tracked their progress, and even motivated them. Only a small portion (11%) viewed the AI as a "tutor" or authority figure, suggesting that the AI was not necessarily seen as a replacement for the teacher but rather as a support system. This differentiation in perception affected engagement patterns. Students who viewed the AI as a partner were more likely to report increased motivation, engagement, and enjoyment. They also demonstrated higher agreement with items related to goal-setting and self-monitoring, such as: *"I use AI apps to set my own targets in learning English"*. Meanwhile, those who viewed AI strictly as a tool were more likely to engage with it in a task-completion manner rather than an exploratory one.

### *3.1.4 Features Influencing Emotional-Cognitive Engagement*

Certain features of AI-based EdTech emerged as particularly influential in shaping students' emotional and cognitive experiences during language learning. One key feature was instant feedback, which provided immediate correction and guidance, allowing students to improve quickly and reducing feelings of uncertainty, thereby enhancing both emotional satisfaction and cognitive clarity. Personalization and adaptivity also played a significant role, as students appreciated tools that could adjust to their learning level, pace, and individual preferences. This personalization contributed to a sense of emotional comfort and cognitive support. Gamification elements, such as points, badges, streaks, and progress bars, further boosted motivation, with many students stating that these features encouraged them to continue using the apps regularly. Additionally, conversational interaction with AI chatbots that simulated natural dialogue prompted students to use English more actively and helped create a more engaging, emotionally connected learning experience, even when the conversation was not perfect. Finally, the perception of AI as a safe and judgment-free space was particularly meaningful; it allowed students to make mistakes and learn without fear of embarrassment, thus supporting emotional ease and encouraging cognitive risk-taking.

However, some features of AI-based EdTech negatively impacted the learning experience. One such issue was over-automation, where students felt that the AI was completing tasks for them rather than encouraging active learning, leading to a sense of passivity and reduced cognitive engagement. Additionally, the lack of context in explanations was a recurring concern. While AI tools often provided correct answers or corrections, they frequently failed to explain the reasoning behind them, leaving students with limited understanding of the underlying rules or concepts. Another limitation was the presence of inflexible learning pathways, where students were unable to skip, revisit, or customize their learning sequence, resulting in frustration and a feeling of constraint in navigating the content according to their personal needs or learning styles.

## 3.2 Discussion

The findings of this study show that AI-driven educational technology (EdTech) significantly influences both the emotional and cognitive experiences of university students learning English. Students reported high levels of motivation, enjoyment, and focus when using AI tools that provided personalized feedback, gamification, and conversational interaction as stated by Baek et al. (2025). These results support the concept of the *Emo-Cog journey*, where emotional and cognitive engagement are closely linked (Vibhavi et al., 2024). Consistent with Safar & Anggraheni (2024), students who viewed AI as a "partner" felt more engaged, suggesting that well-designed, responsive EdTech tools can enhance motivation regardless of students' academic backgrounds. Kong (2015), this study found that adaptive tools supported grammar understanding and vocabulary retention, though our results added an emotional lens, highlighting that enjoyment and reduced anxiety are key to cognitive success. Our findings also align with Barak and Dori (2009) on the value of real-time feedback, though our participants (Vibhavi et al., 2024), as novice learners, relied more on foundational support. Labadze et al. (2023) and Ismail & Sabrina (2023) insights into mobile learning and autonomy were echoed in our study,

especially regarding motivation through goal-setting and gamified features. Finally, Asimolowo (2025) and Syahputri et al. (2024) emphasis on self-efficacy aligns with our finding that emotional safety in AI-supported environments encourages risk-taking and deeper language engagement.

## 4. CONCLUSION

This study concludes that AI-driven educational technology plays a significant role in shaping the emotional and cognitive experiences of university students in language learning. Features such as instant feedback, personalization, and gamification not only enhance cognitive understanding but also foster emotional comfort, motivation, and engagement—especially for non-English majors. The findings support the importance of designing EdTech tools that consider both affective and cognitive dimensions, encouraging learner autonomy and reducing anxiety. The implication is thast educators and developers should prioritize emotionally responsive and pedagogically adaptive AI systems to optimize student learning outcomes. However, the study is not without limitations. It involved only first-year students from a single institution, limiting the generalizability of the results. Additionally, while the questionnaire provided rich insight, the absence of interviews or observation data restricted deeper exploration of student behavior. Future research should include diverse samples and mixed methods to capture the full complexity of the Emo-Cog learning experience.

**Declaration on AI Use**

Artificial Intelligence (which is *Perplexity AI*) was utilized to support topic exploration and refine word choices during the writing process. Its role was limited to assisting language clarity and structure. All content was critically reviewed and finalized by the authors. The authors take full responsibility for the originality, accuracy, and scholarly integrity of this work, in line with ethical academic standards.

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