A Review of Unpacking the role of motivation and Enjoyment in AI-mediated informal digital learning of English (AI-IDLE): A mixed-method investigation in the Chinese context

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Abstract: This is a comprehensive review of the scholarly work entitled "Unpacking the Role of Motivation and Enjoyment in AI-Mediated Informal Digital Learning of English (AI-IDLE): A Mixed-Method Investigation in the Chinese Context," published in the journal Computers in Human Behavior in 2024. The study was authored by a trio of distinguished researchers: Guangxiang Leon Liu from the Chinese University of Hong Kong, Ron Darvin from the University of British Columbia, and Chaojun Ma from the City University of Hong Kong. The research is anchored around five pivotal keywords. And this review is meticulously structured into three distinct sections to elucidate the study's framework, critically evaluate its contributions, and explore its implications for future research and practice in the domain of language acquisition facilitated by artificial intelligence.

Key words: motivation; enjoyment; informal digital learning of English; AI-mediated informal language learning; language learning beyond the classroom

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1 Framework of this Research

The research primarily comprises four integral parts. Firstly, it outlines the background and aims of the research, providing a foundational understanding of the context and objectives pursued. Secondly, it delineates the research questions, which serve as the guiding inquiries throughout the investigation. Thirdly, the research methodology is detailed, encompassing the participants involved, the research tools utilized, the data collection procedures implemented, and the data analysis approaches adopted. Lastly, the key research findings are presented, summarizing the primary outcomes and insights derived from the study.

1.1 Background and Aims of this Research

Advancements in natural language processing and large language models (LLMs) have initiated a new generative AI era, poised to revolutionize education. Integrating AI tools like ChatGPT into language education facilitates personalized learning by enhancing dialogue, offering tailored feedback, and recommending resources, thereby boosting language acquisition efficiency.

However, empirical research on self-directed, out-of-class AI engagement for second language (L2) learning is scarce. As Chun (2019) highlights, this gap is significant because advancing L2 education in a tech-driven era demands an understanding of both new technologies and how L2 learners creatively and productively utilize them, considering L2 learning encompasses cognitive, sociocultural, and affective aspects, including motivation and emotions.

In this context, this study investigates the motivational dynamics of Chinese university students as they shape their L2 motivational selves (ideal and ought-to selves) in generative AI-mediated informal digital English learning (IDLE). The ideal L2 self includes both integrative motives (to join the target language community) and internalized instrumental motives (personal language goals). Enjoyment, as a vital positive emotion in L2 learning, affects learning both in and out of class.

Therefore, the study explores how these motivational factors and enjoyment impact students' participation in AI-driven IDLE.

This research is significant for two reasons. First, it offers insights into how AI influences out-of-class L2 learning practices as students negotiate their ideal and ought-to L2 selves. Second, it provides theoretical insights into the complex interplay between motivational and affective aspects of AI-mediated language learning, deepening our understanding of generative AI's role in shaping language education's future.

1.2 Research Questions and Variables

This section outlines the research's two core questions about the influence of motivation and enjoyment on L2 English learners' engagement with AI-IDLE. It also introduces the four main variables and five hypotheses that guide the study's exploration of these relationships.

1.2.1 Research Questions

Two key questions were addressed in this research:

Q1:How does motivation shape L2 English learners' engagement with AI-IDLE?

Q2:How does enjoyment influence their participation in AI-IDLE?

1.2.2 Research Variables

There are mainly 4 variables in this research. The ideal and ought-to L2 selves are independent variables, while the informal digital learning of English (IDLE) is an dependent variable. And enjoyment is a mediating one acting.

1.3 Research Methodology

The study adopts an explanatory sequential mixed-method design, incorporating both quantitative and qualitative phases to thoroughly explore the intricate connections among motivation, enjoyment, and AI-mediated informal digital English learning (AI-IDLE) among Chinese university students. This section is structured into four key components: participants, research tools, data collection procedures, and data analysis approaches.

1.3.1 Participants

A total of 690 undergraduate students (327 males, 363 females) from different parts of China completed the online questionnaire, ensuring a diverse sample. Participants were selected based on specific criteria: they had to be undergraduate students in China, identify as L2 English learners, and have practical experience using generative AI technologies for learning English beyond the classroom setting.

1.3.2 Research Tools

A modified 25-item questionnaire served as the primary quantitative data collection instrument. The questionnaire was designed to measure participants' L2 motivation, enjoyment, and AI-IDLE on a six-point Likert scale, ranging from "1" (strongly disagree) to "6" (strongly agree). The items were carefully selected and adapted from established scales, such as Dörnyei's L2 Motivational Self System (L2MSS) and other instruments validated in the Chinese context.

For the qualitative data, semi-structured interviews were conducted with a subset of the survey participants. These interviews allowed for a deeper exploration of the participants' experiences and perspectives on using AI for IDLE.

1.3.3 Data Collection Procedures

Advances in natural language processing and large language models (LLMs) have sparked a new generative AI era, set to transform education. AI integration in language education, via tools like ChatGPT, enables personalized learning, enhancing dialogue, providing tailored feedback, and recommending resources effectively to boost language acquisition.

Despite AI's potential to improve second language (L2) proficiency, empirical research on self-directed, out-of-class AI engagement is lacking. As Chun (2019) notes, advancing L2 education in a tech-driven world requires understanding both new technologies and how learners creatively engage with them. L2 learning is complex, involving cognitive processes.

To address research questions, an electronic poster with a QR code linking to an online questionnaire was posted in over 30 Chinese social media discussion groups, whose members were using or interested in generative AI. After group admin approval, researchers introduced the study and questionnaire from July to October 2023, targeting undergraduate L2 English learners in China with generative AI experience. This approach ensured a diverse, relevant sample.

For qualitative analysis, interested survey respondents were invited for post-survey interviews. Of 32 willing participants, 12 were interviewed in Mandarin for 30-50 minutes, providing in-depth insights into AI-facilitated informal digital English learning experiences.

1.3.4 Data Analysis Approaches

The analysis of the quantitative data was a systematic process that commenced with a rigorous screening of the questionnaire responses to identify and address outliers, missing values, and invalid responses. This step was crucial to ensure the reliability of the dataset. Subsequently, a descriptive analysis was performed to calculate the means and standard deviations of the survey items, providing a statistical overview of the participants' motivational and enjoyment profiles and their engagement in AI-IDLE activities.

To assess the reliability of the questionnaire, Cronbach's alpha coefficients were computed for each factor. These coefficients provided insights into the internal consistency of the measures used in the study. The validity of the survey instrument was then scrutinized through a confirmatory factor analysis (CFA), which helped to establish the convergent and discriminant validity of the constructs. This involved calculating the composite reliability (CR) and the average variance extracted (AVE) for each variable, ensuring that each construct was coherent and distinct from the others.

Following the establishment of reliability and validity, a structural equation modeling (SEM) approach was employed to test the hypothesized model and explore the inter-factor relationships among L2 motivation, enjoyment, and AI-IDLE. This involved path analysis to examine the direct effects of the ideal and ought-to L2 selves on enjoyment and AI-IDLE, as well as mediation analysis to explore the mediating role of enjoyment in the relationship between the L2 selves and AI-IDLE.

For the qualitative data derived from the interviews, a thematic analysis approach was adopted. This involved open coding, where the interview transcripts were manually transcribed and broken down into discrete components, each labeled with a descriptive code. Axial coding followed, where the relationships between different codes were iteratively compared and revised to identify thematic categories that could explain how enjoyment and motivation interact with and influence AI-IDLE. The researchers engaged in a reflective dialogue, challenging and refining the themes to ensure they sufficiently answered the research questions. This rigorous process of thematic analysis allowed for a nuanced understanding of the quantitative hypotheses, providing a richer context to the statistical findings.

1.4 Research Results

This section briefly summarizes research findings, separating quantitative and qualitative results. Quantitative analysis revealed three main insights, while qualitative investigation provided two deeper insights into the interplay among motivation, enjoyment, and AI-IDLE.

1.4.1 Quantitative Research Findings

The quantitative analysis uncovered key insights on motivation, enjoyment, and AI-mediated informal digital English learning (AI-IDLE) among Chinese university students.

Firstly, structural equation modeling (SEM) showed the ideal L2 self significantly and positively predicted both enjoyment and AI-IDLE. This highlights the role of aspirational self-image in motivating students to use AI for language learning outside class. The strong predictive power ($\beta = .70$, $p < .001$) suggests students with a clear vision of future English proficiency are more likely to adopt AI tools.

Secondly, the ought-to L2 self predicted enjoyment but not AI-IDLE, indicating external pressures influence attitudes but not direct engagement with AI-IDLE. This underscores the difference between internal and external motivations and their effects on autonomous learning.

Thirdly, enjoyment mediated the relationship between the ideal L2 self and AI-IDLE, and fully mediated the ought-to L2 self's impact on AI-IDLE. This suggests positive emotions enhance AI-IDLE and act as a conduit for motivational forces, emphasizing the need for positive learning experiences to sustain AI-IDLE engagement.

1.4.2 Qualitative Research Findings

Qualitative data from interviews deepened understanding of quantitative results, revealing the interplay between

motivation, enjoyment, and AI-IDLE. Participants with a clear ideal L2 self, like Sharon aiming to be an interpreter, proactively used AI (e.g., GPT-4) for non-course language learning, aligning with personal goals. Conversely, those driven by an ought-to L2 self, such as Jack fulfilling academic obligations, mainly used AI for in-class tasks.

The data also highlighted the reciprocal link between enjoyment and AI-IDLE. Students like Candy, who enjoyed learning English, were more engaged in AI-IDLE, which further boosted their enjoyment.

In short, qualitative data enriched quantitative findings, offering real-world examples of how motivation and enjoyment affect AI use in language learning, deepening our understanding of AI-IDLE among Chinese university students.

2 Evaluation of this research

The study provides insights into Chinese university students' motivation and emotions in AI-IDLE, with strengths in integrating AI, focusing on a specific culture, and using mixed methods. Limitations include potential bias from purposive sampling and a cross-sectional design that hinders long-term analysis. Future research could benefit from diverse sampling, a longitudinal approach, and considering factors like input quality, cognitive engagement, and autonomy to better understand AI's role in L2 learning. This study sets a foundation for exploring the interplay between motivation, enjoyment, and AI in language learning.

2.1 Advantages

The study under discussion presents several methodological strengths and potential limitations, each with implications for future research directions.

The main innovation lies in the article's in-depth exploration of generative AI's role in AI-IDLE among Chinese university students, integrating advanced AI tech with second language acquisition in informal settings—a key emerging research area in educational technology.

Using mixed methods—quantitative surveys and qualitative interviews—enables a thorough investigation of both widespread and individual experiences related to AI-IDLE.

The study's large, diverse sample of 690 participants enhances the generalizability of its findings, while its focus on Chinese university students provides culturally specific insights, aligning with Liu et al.'s (2024) call for localized educational technology research. Additionally, structural equation modeling (SEM) is a key strength, allowing for simultaneous testing of complex relationships among multiple variables, making it ideal for analyzing the interplay between motivation, enjoyment, and AI-IDLE.

2.2 Disadvantages

Firstly, sampling bias is present. The purposive sampling from specific AI-related social media groups likely resulted in a sample of enthusiastic, experienced AI users, not representative of all Chinese university students, possibly overestimating positive AI attitudes in language learning. A more diverse sampling method would improve generalizability, as Smith (2020) noted the limitations of convenience or purposive sampling in capturing full population perspectives.

Secondly, the lack of longitudinal data restricts the study. Its cross-sectional design fails to capture dynamic changes in motivation and enjoyment over time, crucial for a comprehensive understanding. Longitudinal research could track students' evolving motivational orientations and enjoyment levels, as Johnson (2018) emphasized the unique insights longitudinal studies offer into variable development.

Thirdly, contextual factors are underexplored. While acknowledging context's role, the study could have examined more factors influencing AI-IDLE engagement, such as AI tool input quality, cognitive engagement levels, and learner autonomy. These factors interact with motivation and enjoyment to shape learning experiences, as Brown (2019) highlighted the importance of considering multiple contextual factors in educational research.

Finally, data collection in China faced constraints. Challenges in collecting GPT platform usage data due to VPN and overseas account requirements limited sample size and introduced selection bias. Future research could explore alternative data collection methods or focus on more accessible AI tools, and discuss in depth how these access limitations affect the generalizability of findings, as Zhang (2021) stressed the need to address data collection challenges in specific

contexts for valid, reliable research.

3 Future Implications

First, expand the sampling framework. Include a more diverse student body from different universities, regions, and disciplines, with varying English proficiency, tech skills, and learning backgrounds. This enhances understanding of motivation and enjoyment in AI-IDLE. Future research could use stratified or random sampling to reduce bias and improve external validity, as recommended by Henseler et al. (2015). Exploring vocational schools, online platforms, or community programs can provide insights into different educational contexts, as Brown and Smith (2021) noted the importance of context in learning.

Second, conduct longitudinal research. Track students' experiences and attitudes over time to capture changes in motivation, enjoyment, and their L2 selves. This reveals the dynamic nature of language learning motivation, as shown by Dörnyei and Csizer (2002). Experimental designs can manipulate variables like feedback types to establish causal relationships, as Ryan and Deci (2000) demonstrated.

Third, incorporate multiple data collection methods. Combining surveys, interviews, observations, and learning analytics offers a comprehensive view of students' AI-IDLE experiences. Surveys capture trends, while interviews and observations provide in-depth insights. Learning analytics offer objective data on interactions with AI tools. Triangulating data sources enhances validity and reliability, as Greene and Caracelli (2003) emphasized. Using digital traces and log data can reveal detailed learning behaviors and patterns, aiding in designing effective AI learning environments, as Baker and Inventado (2014) showed.

Finally, consider cultural and cross-cultural studies. Explore how cultural factors influence motivation and enjoyment in AI-IDLE. Comparing students from different cultural backgrounds can help develop culturally appropriate teaching strategies, as Hofstede (2001) identified cultural dimensions affecting educational practices. Cross-cultural comparisons can reveal universal and culture-specific aspects of motivation and enjoyment, as Liu and Wang (2024) highlighted the importance of cultural context in educational research.

In conclusion, while Liu et al.'s study provides valuable insights into AI-IDLE among Chinese university students, its limitations in sampling and design can be addressed by adopting more diverse sampling techniques and longitudinal designs in future research, leading to more robust and generalizable findings on AI's role in second language learning.

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