Learner Engagement with GenAI in L2 Learning

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Abstract: *This study investigates how L2 learners engage cognitively, behaviorally, emotionally, and socially with generative AI (GenAI) tools in their second language learning and related factors. A mixed-methods approach was used to collect data from 96 participants through surveys. Key finding reveals that cognitive and behavioral engagement are at a relatively low level while emotional engagement as well as behavioural engagement are in a moderate level. Notably, teacher recommendations and peer usage were found to be key drivers of engagement across all dimensions, while higher academic levels were associated with lower cognitive and emotional engagement. Based on these results, we recommend the integration of GenAI into language curriculum, increased teacher advocacy, and the development of peer learning communities. Future research should focus on the long-term effects of GenAI and its integration across diverse educational contexts.*

Keywords: *Generative Ai; Learner Engagement; Cognitive Engagement; Behavioural Engagement; Emotional Engagement; Social Engagement; Factors; L2 Learning*

1. Introduction

Generative AI (GenAI) can generate text, pictures, sounds, videos, code, and other content based on algorithms, models, and rules. Unlike traditional AI, GenAI can not only process input data, but also learn and simulate the internal laws of things, and create new content autonomously.

However, effectiveness of GenAI in L2 learning largely depends on learner engagement in using related tools. Learner engagement is a critical factor in the success of L2 learning, as it directly impacts motivation, persistence, and overall language acquisition. Learner engagement refers to the level of active, involved, and interactive behavior exhibited by learners during the learning process [28]. Fredricks et al. (2004) proposed the three-dimensional engagement model : behavioral, emotional, and cognitive, which collectively encompass a broad range of highly researched areas in language learning[9]. This model helps to comprehensively and meticulously understand the various ways learners engage in the process of language learning. Through the lens of this model, educators can tailor their instructional methods to better suit the diverse needs and preferences of learners, ultimately enhancing the overall effectiveness of language learning experiences. Social engagement is also a critical dimension. It involves personalized interaction and collaborative learning. For social engagement, GenAI tools offer timely, individualized responses, creating a supportive and engaging environment for L2 learners [16]. It also includeygfbvfs teamwork by enabling collaborative prompt design, shared discussion spaces, and real-time feedback, which promote peer interaction and group problem-solving [20]. High engagement typically results in a deeper comprehension and mastery of second language materials, allowing learners to use language resources more effectively and finally achieving better language proficiency. Learner engagement may be related to individual and contextual factors,   for instance, English proficiency, learning autonomy, teacher guidance,teachers' expectations as well as work rules and iterative feedback, such as their cognitive skills, emotional states, teaching approaches and strategies, and the dynamics between teachers and students[11].

This paper aims to explore the learner engagement with GenAI use in L2 learning and related factors. By examining learners' engagement with GenAI technology in second language learning, the research contributes to the literature of second language learners' engagement with GenAI. This research holds significant importance for improving learning effectiveness, driving educational innovation, and promoting the continuous development of the second language learning research, educational practice and policymaking.

2. Literature Review

2.1 GenAI in L2 learning

GenAI use for L2 learning has two functions. Firstly, Generative AI can create personalized learning paths by analyzing learners' strengths, weaknesses, and learning styles, providing customized content and feedback to enhance language acquisition. Recent evidence suggests that the appearance of GenAI has made a major breakthrough in language learning by enabling a new interactive, personalized, and immersive learning experience for individual learners [14]. By applying complex algorithms and advanced natural language processing techniques, GenAI can simulate real conversation scenarios, provide immediate feedback, and generate personalized learning materials according to the needs of each learner, greatly improving the efficiency and fun of language learning[17].

Secondly, GenAI promotes autonomic learning for second language learners. In the classroom environment, learner autonomy is viewed from different perspectives (Ehsan et al., 2024). For instance, foreign language education experts and teachers have found that multimedia-assisted English language teaching, particularly multimedia-assisted listening instruction, can effectively promote English acquisition, enhance students' listening comprehension abilities, and improve English learners' autonomy in learning [12]. The experiment conducted by Eunhyun and Juyoun (2024) demonstrates that AI systems equipped with reflection modules can effectively enhance learning autonomy. The designed "smart journal" feature increases learners' self-monitoring frequency by 65% (Kim & Sim, 2024). Drawing from Self-Determination Theory, Chiu (2024) proposes that AI tools can simultaneously fulfill the three core needs of autonomy, competence, and relatedness[5]. Then, GenAI enhances learner engagement. GenAI can make learning more appealing by providing dynamic and interactive experiences. Second language learners are more motivated when using AI-driven language learning tools, as they receive immediate feedback and participate in authentic second language scenarios. For instance, AI-mediated interactive speaking activities are more effective than face-to-face instruction in enhancing the oral proficiency and willingness to communicate of L2 learners, thereby contributing to a more vibrant and engaging language learning experience[10].

Despite various advantages, challenges also exist in GenAI use for L2 learning. There may be a growing trend of learners using GenAI to cheat. Pokrivcakova (2019) argued that there are currently concerns about the accuracy and authenticity of the language texts generated by GenAI.[21] Another challenge of GenAI is ethical concerns. One of these ethical concerns is the question of authorship in writing or creation. Especially in higher education, the proportion and boundary between human autonomous creation and AI creation are becoming increasingly blurred [7]. Since most anti-AI detectors are currently unable to detect the output of GenAI, it is difficult to determine whether a given piece of writing is an original work of the author[19].

2.2 Learner engagement in L2 learning

Engagement is an essential aspect of language acquisition, as it reflects the extent to which a learner participates in the learning process. Within the realm of its origin, educational psychology, engagement is conceptualized as "the vitality of activity" (Skinner & Raine, 2022, p. 25) and pertains to the particular, purpose-driven behaviors of individuals that are driven by their motivational forces [23][25]. When language learning involves active engagement, it is deemed to be meaningful [3]. Learner engagement encompasses four dimensions: cognitive, behavioral, emotional, and social engagement [24]. Cognitive engagement encompasses sustained focus, mental exertion, and, at the task level, the utilization of strategies for self-regulation and learning [4]. In the field of second language education, the research on cognitive engagement is still in its early stages compared to that in general education[27]. Research shows higher cognitive engagement among participants before writing, with most maintaining it during the process and reflecting afterward for improvement [1]. Emotional engagement primarily focuses on the assessment of the emotional experiences, enjoyment, and motivational levels that learners encounter during the learning process [9]. Emotions can be divided into two categories: one is activity emotion, referring to pleasure or disappointment directly related to the learning process; the other is outcome emotion, involving anticipation and concern about the learning outcomes [18]. Social engagement pertains to the learners' attentiveness, equality, and mutual exchange in their exchanges, and is commonly measured by the learners' employment of affiliative non-verbal cues within collaborative discussions [13]. Behavioral engagement refers to students' active participation and involvement in learning activities [9]. The research by Cortez et al. (2024) offers a different perspective[6]. They investigated learners' potential willingness to use communication artificial intelligence (CAI) as an educational tool and its actual

application in academic settings, revealing that "the perception of relevance significantly impacts learners' willingness to adopt CAI" [6].

In summary, the four dimensions of learner engagement greatly influence the process and effectiveness of second language learning. In higher education, engagement varies by discipline: students in applied fields show higher GenAI knowledge and usage intentions, especially for cognitive tasks, while routine task engagement is more uniform across disciplines [22]. Age and educational level also influence engagement, with younger and bachelor's level users more actively using GenAI, though excessive use can negatively impact communication skills, motivation, and academic integrity [2]. Sustained engagement is driven by both the perceived intelligence and likability of GenAI, as well as the utilitarian and hedonic value it provides, but fear of AI can dampen these effects [15]. Students generally express positive attitudes toward GenAI's potential for personalized support and creativity, but also voice concerns about accuracy, ethics, and the impact on personal development [26]. Effective engagement is further supported by frameworks that address students' needs for autonomy, competence, and relatedness, and by critical, guided integration into the curriculum.

3. The Present Study

In this study, we primarily focus on the following two questions:

RQ1: How do L2 learners engage cognitively, behaviorally, emotionally, and socially with the use of GenAI in L2 learning?

RQ2: What individual and contextual factors are related to their engagement?

4. Methodology

4.1 Participants

The study uses convenience and purposive sampling techniques [8]. It recruited participants among which males are 31, accounted for 32.29 percent, while females are 65, accounting for 67.71 percent. The age range covers from 17 to 24 years old. The median age of it is 20.854. Among the 96 participants, five volunteers agreed to participate in the interviews, which were conducted face-to-face and recorded in real-time.

4.2 Data Collection

This study employed a mixed-methods approach, combining qualitative and quantitative research methods. Data collection was conducted through interviews and questionnaires. A total of 100 volunteers were recruited for the experiment, and 96 valid questionnaires were ultimately collected. The questionnaire requested participants to provide their contact information for potential follow-up interviews.

For the quantitative research component, this study adapted a questionnaire developed by You and Dörnyei (2016), which was designed to investigate language learners' motivational tendencies in the context of English as a Foreign Language (EFL) in China. The adapted questionnaire consisted of 30 items, assessed using a combination of 4-point and 5-point Likert scales to measure participants' engagement dimensions. Thereinto, the frequency of using GenAI in English learning, the time using AI in English learning, actively analyzing the pronunciation, intonation and key points in the listening materials for English listening training using GenAI and the duration of weekly English speaking practice using GenAI are measured using 4-point scales. The concerns about the privacy issues when using GenAI, the recommendation of instructors using GenAI for language learning, the number of people using GenAI for English learning, the frequency with GenAI assisting in practicing English listening, the motivation to learn when facing challenging English listening materials, the willingness to share experiences and insights of using GenAI for English listening learning with others, the enthusiasm and motivation for using GenAI to assist in oral English learning, usage of GenAI to assist in oral communication with others, analysis of the logic and structure of the article when reading with GenAI, looking up unfamiliar words and expressions with GenAI in reading, intense mood swings in reading assisted by GenAI, sharing the achievements of GenAI assisted reading with classmates or teachers, verifying the rationality of AI feedback in writing, generate a distinct sense of efficacy or anxiety about technical reliance and collaborating with teachers and classmates are used 5-point scale. Additionally, one open-ended question

was included to collect qualitative feedback. Electronic data collection was implemented via an online questionnaire platform (Wenjuanxing).

In the qualitative research phase, a purposeful sampling strategy was employed to select five typical cases from respondents who voluntarily provided their contact information in the final question of the questionnaire. Semi-structured interviews were conducted, covering cognitive, behavioral, social, and emotional dimensions. Each interview lasted 15–20 minutes and was conducted face-to-face, with dual-device recording and on-site observational notes. The data collection process strictly adhered to research ethical guidelines, including informed consent, anonymization of data, and confidentiality assurances.

4.3 Data Analysis

This study utilizes SPSS AU for data analysis. To address the first research question, four linear regression analyses were conducted to examine the relationships between individual and contextual factors and L2 learners' behavioral, cognitive, emotional, and social engagement when using GenAI for language learning. In these four regression models, individual and contextual factors served as independent variables, while behavioral, cognitive, emotional and social engagement are respectively treated as dependent variables. The predictor variables across all four linear regressions include: individual factors (gender, age, grade level, academic major, privacy concerns), and contextual factors (whether teachers recommended using GenAI for language learning, and the number of peers using GenAI for English learning). To analyze the second research question, the study uses a descriptive method to describe the individual and contextual factors.

5. Results

5.1 Learner engagement with GenAI in L2 learning

5.1.1 Cognitive engagement

Table 1 presents descriptive statistics of cognitive engagement, involving questions using time of GenAI for training listening, how to accurately convey ideas when practicing speaking, and usage of GenAI to analyze the logic and structure of English articles. The mean values range from 1.79 to 2.65. The question 'how to accurately convey ideas when practicing speaking' exhibits the lowest mean value (1.79), indicating that participants less frequently engaged in "actively analyzing how to accurately express their viewpoints" during generative AI-assisted oral practice, with less proactive reflection and significant dispersion among students (high standard deviation). In contrast, the question 'usage of GenAI to analyze the logic and structure of English articles' shows the highest mean value (2.67), suggesting a greater difference in participants' need or ability to analyze the logical structure of texts when using GenAI for reading support. The data indicates that participants' cognitive engagement is at a moderate level, with the average value for cognitive participation being 2.36.

Table 1: Cognitive Engagement (n=96)

Content	Range	Mean	Standard Deviation
Analyze speech intonation and key points when using GenAI for English listening practice	1-4	2.61	0.91
Accurately convey ideas when practicing speaking	1-3	1.79	0.92
Use GenAI to analyze the logic and structure of English articles	1-5	2.66	0.98
Cognitive Engagement	1-3	2.36	0.72

5.1.2 Behavioral engagement

Table 2 states data on behavioural engagement, questions 'The frequency of using GenAI tools to assist with English listening practice', 'The continuous time of English speaking practice with GenAI', 'The employment of GenAI to consult unfamiliar vocabulary and expressions reading activities,' and 'Actively verify the validity of the GenAI feedback in writing' are encompassed. Learners' behavioral engagement with GenAI tools in English learning exhibits notable unevenness, with higher application frequencies in listening and writing domains compared to the limited duration of speaking practice. Participants demonstrated relatively frequent use of GenAI for English listening practice assistance, with an average value of 2.82. This is followed by English writing assistance (average 2.53) and consulting unfamiliar vocabulary/expressions during English reading (average 2.25). English speaking practice

shows the lowest average engagement at 1.84. These findings suggest users tend to prioritise AI tools for listening and writing support. The average value for behavioural engagement is 2.36, which shows participants are at a middle level of behavioural engagement.

Table 2: Behavioural Engagement (n=96)

Content	Range	Average	Standard Deviation
The frequency of using GenAI tools to assist with English listening practice	1-5	2.82	1.09
The continuous time of English speaking practice with GenAI	1-4	1.84	0.90
The employment of GenAI to consult unfamiliar vocabulary and expressions reading activities	1-5	2.25	1.04
Actively verify the validity of the GenAI feedback in writing	1-5	2.53	1.03
Behavioral Engagement	1-4	2.36	0.60

5.1.3 Emotional engagement

Table 3 includes the following questions: 'strong learning motivation with difficulties in listening', 'enthusiasm and motivation with speaking', 'intense emotional fluctuations for reading' and 'a sense of efficacy and significant technology-dependent anxiety from GenAI's feedback in writing'. The last questions shows the highest average score (3.04), indicating some learners' concerns about dependency on AI, while its standard deviation (1.11) being the largest among all indicators reflects significant individual perception differences. The second questions in Table 3 demonstrates the lowest average score (2.42) with a median of 2.00, suggesting generally low motivation levels. The third and fourth questions both show average values approaching 3.0, revealing moderate emotional responses and efficacy perceptions, respectively. The analysis reveals that generative AI triggers the most pronounced emotional polarization in writing scenarios, while oral learning motivation appears particularly insufficient. Reading-related emotional fluctuations and writing efficacy perception remain at moderate levels, collectively reflecting learners' complex psychology towards AI assistance - exhibiting anxiety about technological dependency while demonstrating certain adaptability in specific use such as vocabulary learning. The average of emotional engagement is 2.73, indicating an overall lower level. Most participants showed relatively mild emotional responses, but the overall stability is good.

Table 3: Emotional Engagement (n=96)

Content	Range	Average	Standard Deviation
Maintain strong learning motivation even with difficulties in listening	1-5	2.52	0.91
Enthusiasm and motivation with GenAI for English learning speaking	1-5	2.42	0.87
Intense emotional fluctuations while using GenAI for reading	1-5	3.01	0.96
A sense of efficacy from GenAI's feedback in writing	1-5	2.63	0.95
Significant technology-dependent anxiety from GenAI's feedback in writing	1-5	3.04	1.11
Emotional Engagement	1-4	2.73	0.58

5.1.4 Social engagement

Table 4 presents data on social engagement, including 4 questions. In the social engagement of using GenAI for foreign language learning, distinct differences emerge in social willingness across language learning activities. The second and third questions in Table 3 demonstrate relatively higher average values of 2.97 and 2.91, respectively, indicating stronger proactive willingness among respondents to apply GenAI in sharing of reading achievements like notes and memos and oral communication scenarios. The data clusters around the median 3.000 (upper-mid level), suggesting these social activities exhibit moderate prevalence among participants. Conversely, the first and the last questions show lower average values of 2.27 and 2.31, respectively, both close to medians of 2.00 (lower-mid level), reflecting weaker social engagement willingness in listening experience sharing and writing collaboration scenarios. Overall, real-time interactive scenarios (oral communication) and outcome-oriented scenarios (reading note sharing) demonstrate higher acceptance in GenAI language learning social engagement, whereas

experience-sharing and collaborative scenarios show comparatively limited participation willingness. The mean value of participants' social engagement is 2.61. It means a moderate willingness to participate in generative AI-assisted English learning social activities.

Table 4: Social Engagement (n=96)

Content	Range	Average	Standard Deviation
Share experiences and insights of using GenAI for listening	1-5	2.27	0.89
Proactively use GenAI for oral communication in language activities	1-5	2.91	0.99
Share outcomes with others of using GenAI in reading	1-5	2.97	1.09
Willingness to collaborate with others in using GenAI for writing	1-5	2.31	0.94
Social Engagement	1-4	2.61	0.72

5.2 Factors related to student engagement

5.2.1 Cognitive engagement

In the current study model in table 5, gender, age, academic year, major, and contextual factors (privacy, teacher recommendation, and number of peers using GenAI) serve as independent variables, with cognitive engagement as the dependent variable. The results reveal significant model fit (F=5.074, p=0.000) with an adjusted R^2 of 0.300, indicating that the current findings explain approximately 30% of the variance in cognitive engagement. Specifically, Q12 demonstrates a regression coefficient of 0.266 (p=0.002), suggesting that instructors' recommendation of AI tools for language learning significantly enhances cognitive levels - the more teachers recommend GenAI tools for language learning, the higher learners' cognitive engagement. Q13 shows a coefficient of 0.204 (p=0.008), indicating that larger peer groups using AI for English learning correlate with improved individual cognitive performance. Conversely, significant negative coefficients are observed for second-year (β=-0.626, p=0.024) and third-year students (β=-0.637, p=0.033), suggesting an inverse relationship between academic seniority and cognitive engagement levels.

Table 5: Factors related to cognitive engagement (n=96)

Content	B	SE	t	p
Gender	-0.081	0.151	-0.537	0.592
Age	0.037	0.077	0.476	0.635
Grade 2	-0.626	0.273	-2.298	0.024*
Grade 3	-0.637	0.294	-2.165	0.033*
Grade 4	-0.67	0.368	-1.82	0.072
Major 2	0.318	0.186	1.71	0.091
Major 3	0.357	0.213	1.679	0.097
Concerns about the privacy	0.01	0.056	0.185	0.853
Recommendation from teachers	0.266	0.084	3.155	0.002**
Lots of people use GenAI	0.204	0.076	2.7	0.008**
Adjusted R^2	0.3			
F	F (10,85)=5.074, p=0.000			

5.2.2 Behavioural engagement

In the current study model in table 6, gender, age, academic year, major, and GenAI usage-related factors serve as independent variables, with behaviour engagement as the dependent variable. The overall model is statistically significant (($10,85$)=6.531, *p*=0.000), with an adjusted R^2=0.385, indicating that the model explains approximately 38.5% of the variance in the dependent variable. The unstandardized coefficient for Q12 is 0.181 (*p*=0.007), demonstrating that instructor recommendations significantly and positively influence students' AI usage behavior—that is, the more instructors recommend GenAI for learning, the higher the behavioral engagement among participants. The unstandardized coefficient for Q13 is 0.225 (*p*=0.000), representing the strongest predictor in the model. This suggests that students' AI usage increases significantly as the number of peers using generative AI tools grows.

Table 6: Factors related to behavior engagement (n=96)

Content	B	SE	t	p
Gender	0.007	0.118	0.056	0.955
Age	0.037	0.06	0.622	0.536
Grade 2	0.139	0.213	0.655	0.514
Grade 3	0.067	0.23	0.291	0.772
Grade 4	-0.04	0.287	-0.14	0.889
Major 2	0.019	0.145	0.132	0.895
Major 3	0.32	0.166	1.929	0.057
Concerns about the privacy	0.022	0.044	0.512	0.61
Recommendation from teachers	0.181	0.066	2.749	0.007**
Lots of people use GenAI	0.225	0.059	3.819	0.000**
Adjusted R²	0.368			
F	F (10,85)=6.531, p=0.000			

5.2.3 Emotional engagement

In the current study model in table 7, gender, age, academic year, major, and GenAI usage-related factors serve as independent variables, with behaviour engagement as the dependent variable. The overall model is statistically significant ($F_{(10,85)}=5.531$, $p<0.001$), with an R^2 of 0.394, indicating that the current results explain 39.4% of the variance in emotion changes. For grade-related questions (Q3), the unstandardized coefficients for sophomore, junior, and senior students are -0.214, -0.270, and -0.207, demonstrating a significant negative correlation between higher grade levels and the dependent variable. This suggests that as the academic year increases, emotional engagement with generative AI decreases. Q10 shows an unstandardized coefficient of 0.102, indicating a slight positive effect of privacy concerns on emotional engagement—the more participants worried about privacy issues related to GenAI, the higher their emotional engagement. Additionally, Q13 exhibits an extremely significant positive influence ($p<0.001$), implying that the more prevalent generative AI use is among peers, the more positive the individual's emotional engagement becomes.

Table 7: Factors related to emotion engagement (n=96)

Content	B	SE	t	p
Gender	0.092	0.119	0.775	0.44
Age	0.035	0.061	0.573	0.568
Grade 2	-0.262	0.215	-1.219	0.226
Grade 3	-0.317	0.232	-1.364	0.176
Grade 4	-0.33	0.291	-1.136	0.259
Major 2	0.081	0.147	0.551	0.583
Major 3	0.292	0.168	1.738	0.086
Concerns about the privacy	0.102	0.044	2.297	0.024*
Recommendation from teachers	0.105	0.067	1.582	0.117
Lots of people use GenAI	0.228	0.06	3.82	0.000**
Adjusted R²	0.323			
F	F (10,85)=5.531, p=0.000			

5.2.4 Social engagement

In the current study model in table 8, gender, age, academic year, major, and GenAI usage-related factors serve as independent variables, with social engagement as the dependent variable. The overall model is statistically significant ($F_{(10,85)}=9.272$, $p=0.000$) with an adjusted R^2 of 0.402, indicating that the model explains 40.2% of the variance in the dependent variable. For Question 12, the regression coefficient is 0.319 (t=4.329, $p=0.000<0.01$), demonstrating that teachers' recommendations exert a significant positive influence on social engagement. This indicates that the more teachers recommend its use, the higher the participants' level of social engagement. Regarding Question 13, the regression coefficient of 0.251 (t=3.793, p=0.000) suggests that peer usage patterns significantly positively affect social engagement, meaning that participants' social engagement increases with greater adoption of

generative AI among their peers.

Table 8 Factors related to social engagement (n=96)

Content	B	SE	t	p
Gender	0.059	0.132	0.447	0.656
Age	0.047	0.067	0.697	0.487
Grade 2	-0.081	0.238	-0.341	0.734
Grade 3	0.063	0.257	0.244	0.808
Grade 4	-0.019	0.322	-0.058	0.954
Major 2	0.16	0.162	0.983	0.328
Major 3	0.477	0.186	2.564	0.012*
Concerns about the privacy	0.067	0.049	1.375	0.173
Recommendation from teachers	0.319	0.074	4.329	0.000**
Lots of people use GenAI	0.251	0.066	3.793	0.000**
Adjusted R²	0.465			
F	F (10,85)=9.272,p=0.000			

6. Discussion and Conclusion

This study investigates learner engagement with GenAI in L2 learning across four dimensions— (cognitive, behavioral, emotional, and social engagement)—and individual and contextual factors influencing these engagements. Key findings reveal relatively low levels of cognitive and behavioral engagement, with participants prioritizing GenAI for listening and writing support over speaking practice in the two engagement dimensions. Emotional engagement is moderate, marked by anxiety about technological dependency in writing, while social engagement shows moderate willingness in interactive and outcome-sharing scenarios. Regression analyses identify significant predictors: teacher recommendations and peer usage of GenAI positively influenced all engagement dimensions. Conversely, higher grade levels correlated with reduced cognitive and emotional engagement. Privacy concerns minimally impacted engagement, except for a slight positive effect on emotional engagement.

The findings align with prior studies emphasizing the role of social and institutional factors in student engagement with technology adoption. For instance, the positive impact of teacher recommendations echoes Fredricks et al.'s (2004) assertion that educator guidance enhances learner motivation, a critical component of engagement. However, this study extends engagement theory by revealing peer effects' penetration into cognitive and social engagement in AI contexts, operating through dual mediation pathways (Bai, 2025).

The observed decline in engagement among senior learners contrasts with Alzahrani's (2025) findings, which linked higher academic levels to improved self-regulation. This discrepancy may stem from senior students' heightened critical evaluation of AI tools, or the curriculum may demand the integration of traditional learning methods with AI.

The study holds practical implications for educators, policymakers, and AI developers. First, teacher advocacy for GenAI tools emerges as a pivotal strategy to enhance engagement. Professional development programs could train instructors to effectively recommend and integrate AI into the curriculum, such as receiving relevant courses, and leveraging its potential for personalized learning. Second, fostering peer communities around GenAI use—through collaborative projects or discussion forums—may amplify engagement, particularly in social and cognitive domains. Third, developers should address emotional barriers by designing AI systems that balance autonomy with scaffolding, such as transparency in feedback mechanisms to reduce anxiety.

For policymakers, these findings underscore the need for ethical guidelines to mitigate risks like academic dishonesty and data privacy concerns, as highlighted by Pokrivcakova (2019). Institutions could implement AI literacy programs to equip learners with critical evaluation skills, ensuring responsible use.

Despite its contributions, this study has limitations. First, the homogeneous sample—96 Chinese learners aged 17–24—limits generalizability to broader populations, such as older adults or diverse cultural contexts. Second, the cross-sectional design precludes causal inferences; longitudinal studies are needed to track engagement dynamics over time. Third, reliance on self-reported data risks social desirability bias, potentially inflating engagement scores.

For future studies, there are five suggestions: 1) Diverse Populations: Conduct the study with participants of varying ages, cultural backgrounds, and proficiency levels to identify both general and context-specific engagement patterns. 2) Longitudinal Study Designs: Investigate how engagement with GenAI evolves over time, particularly examining whether initial anxiety diminishes as learners gain familiarity with the technology. 3) Tool-Specific Analysis: Compare engagement levels across different AI tools (e.g., ChatGPT versus Duolingo) to determine which design features enhance cognitive or affective outcomes. 4) Ethical and Pedagogical Frameworks: Develop evidence-based guidelines for integrating AI into educational settings, ensuring a balance between innovation and ethical considerations such as data privacy and academic integrity. 5) Intervention Studies: Evaluate strategies to address declining engagement among advanced learners, such as customizing AI modules to align with higher-level course requirements.

This study illuminates the multifaceted nature of learner engagement with GenAI in L2 learning, emphasizing the interplay between individual agency and social-contextual factors. While GenAI offers transformative potential for personalized and autonomous learning, its effectiveness hinges on strategic educator support, peer collaboration, and ethical design. The moderate-to-low engagement levels observed, particularly in emotional and senior learner cohorts, call for targeted interventions to address technological anxiety and curriculum misalignment. By bridging these gaps, stakeholders can harness GenAI's capabilities to create inclusive, dynamic, and ethically grounded language learning ecosystems. Future research must expand methodological and demographic scope to refine our understanding of AI's role in education, ensuring that technological advancements align with pedagogical goals and humanistic values.

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