Exploring Chinese EFL learners' beliefs about AI-mediated informal digital learning of English: Insights from Q Methodology

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ABSTRACT: Artificial intelligence (AI) plays an important role in language learning; however, research on its role in informal contexts remains limited. To address this gap, this study used Q methodology with a sample of 20 Chinese English as a Foreign Language (EFL) learners to explore their beliefs about AI-mediated informal digital learning of English. Results reported three primary types of beliefs: optimistic *AI beliefs*, critical *AI beliefs*, and hesitant *AI beliefs*. Optimistic *AI beliefs* reflect learners who view AI as a revolutionary tool that boosts learning efficiency and engagement, showing enthusiasm for new AI applications in language learning. Critical AI beliefs characterize learners who recognize AI's benefits but remain cautious, critically assessing its limitations and potential drawbacks. *Hesitant AI beliefs* describe learners who, while acknowledging AI's potential, harbor doubts about its overall effectiveness in informal English learning. These findings have some implications for the design and development of more effective and personalized AI-based educational tools that cater to diverse learner needs and preferences.
Keywords: AI, Informal digital learning of English, Learner belief, Q-Methodology, Chinese EFL learners

Exploración de las creencias de los estudiantes chinos de inglés como lengua extranjera sobre el aprendizaje digital informal mediado por IA: Perspectivas desde la metodología Q

RESUMEN: La inteligencia artificial (IA) desempeña un papel importante en el aprendizaje de lenguas; sin embargo, la investigación sobre su papel en contextos informales sigue siendo limitada. Para abordar esta laguna, este estudio utilizó la metodología Q con una muestra de 20 estudiantes chinos de inglés como lengua extranjera (ILE) para explorar sus creencias sobre el aprendizaje informal del inglés mediado por IA. Los resultados reportaron tres tipos principales de creencias: creencias optimistas sobre la IA, creencias críticas sobre

la IA y creencias dudosas sobre la IA. Las creencias optimistas sobre la IA reflejan a los estudiantes que ven la IA como una herramienta revolucionaria que mejora la eficiencia y el compromiso en el aprendizaje, mostrando entusiasmo por las nuevas aplicaciones de la IA en el aprendizaje de lenguas. Las creencias críticas sobre la IA caracterizan a los estudiantes que reconocen los beneficios de la IA pero permanecen cautelosos, evaluando críticamente sus limitaciones y posibles inconvenientes. Las creencias dudosas sobre la IA describen a los estudiantes que, aunque reconocen el potencial de la IA, tienen dudas sobre su efectividad general en el aprendizaje informal del inglés. Estos hallazgos tienen implicaciones para el diseño y desarrollo de herramientas educativas basadas en IA más efectivas y personalizadas, que se adapten a las diversas necesidades y preferencias de los estudiantes.
Palabras clave: IA, aprendizaje digital informal de inglés, creencias de los estudiantes, metodología Q, estudiantes Chinos de ILE

1. Introduction

In recent years, informal learning has gained prominence as a significant mode of education, complementing traditional classroom settings (Lee & Lee, 2021; Soyoof et al., 2023). Informal digital learning of English (IDLE), in particular, has emerged as a vital area of interest, driven by the increasing use of technology and online platforms for language acquisition (Lee, 2021). With advancements in artificial intelligence (AI), IDLE has transformed further, allowing for highly personalized, adaptive learning experiences that respond to individual needs and preferences (Lee & Sylvén, 2021). To be exact, AI-powered tools can provide real-time feedback, tailor content to different proficiency levels, and simulate conversational practice with natural language processing, enabling learners to practice English in more interactive and meaningful ways (Derakhshan, 2025; Fathi et al., 2024; Xin & Derakhshan, 2025; Wang & Xue, 2024). This form of learning allows learners to engage with English in diverse and flexible contexts, fostering a more personalized and accessible learning experience (Derakhshan et al., 2025; Guo & Wang, 2025; Khazaie & Derakhshan, 2024; Liu & Fan, 2024). However, research specifically focusing on AI-mediated IDLE remains limited. Given the increasing integration of AI into informal learning environments, understanding how learners perceive and engage with AI in informal contexts is essential for designing more effective and personalized language learning tools.

This study aims to explore the beliefs of Chinese English as a Foreign Language (EFL) learners regarding AI-mediated IDLE using Q methodology. A sample of 20 Chinese EFL learners participated in the study, providing subjective perspectives through the sorting of statements about their beliefs on AI-mediated IDLE. The innovative contributions of this research are twofold: first, it investigates IDLE within an AI context, a relatively unexplored area. This approach sheds light on how AI-driven tools can uniquely shape IDLE, offering new insights into the role of AI in supporting personalized language learning experiences. Second, it utilizes Q methodology to capture Chinese EFL learners' complex beliefs in AI-mediated IDLE. By using this methodology, the study reveals nuanced perspectives and patterns in learner beliefs, providing a deeper understanding of how AI integration can be optimized in diverse educational settings. The findings of this study are expected to inform educators, policymakers, and developers of AI-driven tools about the specific needs and preferences of Chinese EFL learners, enabling them to design more effective, culturally responsive, and learner-centered AI applications for IDLE.

2. Literature Review

2.1. Informal digital learning of English

IDLE is defined as "self-directed English activities in informal digital settings, motivated by personal interests and undertaken independently without being assessed by a teacher" (Lee & Lee, 2021, p. 359). According to Lee and Drajati (2019), EFL learners engage in two types of IDLE activities: receptive IDLE activities (RIA) and productive IDLE activities (PIA). RIA emphasizes the comprehension of English content, while PIA focuses on producing output in English. IDLE can be understood within Benson's (2011) framework, which outlines the key characteristics of out-of-class language learning. This framework consists of four dimensions of out-of-class second language learning: (1) formality, which distinguishes between formal, non-formal, and informal learning; (2) location, which considers the physical context of language learning, such as in-class, out-of-class, extracurricular, or extramural settings; (3) pedagogy, which addresses the extent to which formal language learning processes are integrated, ranging from instructed to self-instructed and naturalistic approaches; and (4) locus of control, which assesses the degree to which language learners exert control over their learning, differentiating between self-directed and other-directed processes. Collectively, this comprehensive framework provides valuable insights into the dynamics of IDLE within the broader landscape of AI.

Building upon the foundational understanding of IDLE and its dimensions outlined above, recent research has explored the impact of IDLE on language learners from multiple perspectives, uncovering both linguistic and affective benefits. Linguistically, studies indicate that IDLE activities, particularly receptive and productive forms of engagement, contribute to improvements in vocabulary, speaking, listening, and overall language proficiency (Lee, 2019; Lee & Dressman, 2018). On the affective level, IDLE has been associated with increased learner enjoyment, confidence, learning efficacy, and willingness to communicate in English (Chen et al., 2025; Gao et al., 2025; Liu et al., 2024). Additionally, scholars have emphasized the significance of IDLE quality, noting that diverse and autonomous engagement with English content online can enhance learning outcomes and foster a more immersive language learning experience (Wu, 2023; Zadorozhnyy & Lee, 2024). Although these studies have made notable advancements, few have investigated IDLE within the context of AI-driven tools and platforms. As AI technologies increasingly permeate informal learning environments, it is essential to examine how AI-mediated IDLE might support or reshape language learning, particularly in terms of personalization, adaptive feedback, and learner autonomy.

2.2. Learner beliefs about technology-enhanced language learning

Learners' beliefs are recognized as a significant individual difference in second language (L2) learning (Loewen et al., 2009). Early studies defined learners' beliefs as the relatively stable information individuals hold about their own and others' cognitive processes (Wenden, 1998). Grotjahn (1991) suggested that learners' beliefs are highly personal, generally stable, and enduring, arguing that examining these beliefs can help explain and predict the behaviors learners exhibit when acquiring an L2. However, recent studies have proposed a more

dynamic perspective, viewing beliefs as fluid, situational, and open to change over time and across diverse contexts (Gao et al., 2022, 2024). This evolving view emphasizes the need to understand learners' beliefs in relation to their specific environments and experiences (Barcelos, 2003; Barcelos & Kalaja, 2011). As technology plays an increasingly central role in language learning, a growing body of research has started to examine learners' beliefs within technology-enhanced language learning (TELL) environments. This shift has allowed scholars to explore how these beliefs interact with digital tools and influence learners' engagement and outcomes in TELL contexts.

Researchers have explored learner beliefs about TELL from diverse perspectives, revealing valuable insights into how beliefs shape language learning behaviors and outcomes. Many studies focus on learners' beliefs about specific digital tools, examining how these beliefs impact motivation, engagement, and persistence in language learning (Alfadda & Mahdi, 2021; Bailey et al., 2021). Other researchers investigated cultural and social factors, highlighting that learners from different cultural backgrounds may hold distinct beliefs about technology's role in language learning, which influences their willingness to adopt and use technological tools (Hoi & Mu, 2021; Wu et al., 2024). Some studies also investigate how learners' beliefs about the effectiveness of technology affect their engagement in language education contexts (Huang et al., 2024; Wang et al., 2024). Scholars have further investigated beliefs about TELL's effectiveness in improving specific language skills, such as listening, speaking, and reading, and how these beliefs shape study habits and learning approaches (Chen, 2024; Gutiérrez-Colón et al., 2023; Zhang & Zou, 2022). Although this body of research provides a comprehensive understanding of TELL, studies on AI-driven language learning tools remain scarce, especially in IDLE contexts. This gap is particularly significant as AI technologies become more prominent in offering personalized, self-directed language learning experiences outside traditional classrooms.

3. Method

3.1. Research method: Q-Methodology

This study aims to investigate Chinese EFL learners' beliefs in AI-mediated IDLE. To achieve this, it employs Q-Methodology, a mixed-methods approach designed to capture individual subjectivity and commonly used in educational research (Brown, 1980; Rimm-Kaufman et al., 2006). Initially introduced by Stephenson in 1935 as an inverted factor analysis (Watts & Stenner, 2012), Q methodology aims to systematically examine the subjectivity embedded in complex constructs and to establish "… 'order' even in domains where variability and disparity seem initially to have prevailed" (Watts & Stenner, 2005, p. 73). Given its focus on personal perspectives, Q-Methodology is particularly suited for exploring nuanced attitudes and beliefs in language learning contexts. Specifically, for this study, we used Q methodology to address the following research question:

RQ: What are the different types of beliefs held by Chinese EFL learners regarding AI-mediated IDLE?

3.2. Participants

Participants were recruited through online channels using a purposive sampling technique. To be eligible, participants had to meet the following two criteria: (1) they had previously used AI tools for IDLE, and (2) they were willing to participate after being informed about the study's objectives and procedures. To ensure anonymity and streamline data analysis, each of the 20 participants was assigned a unique identifier, labeled as P1 to P20. These identifiers were used throughout the study to reference participants while maintaining their confidentiality. Detailed participant information is provided in Table 1.

Table 1. *Demographic information*

	Category	Frequency	Percentage
Gender	Male	12	60%
	Female	8	40%
Age	18-21	7	35%
	22-24	9	45%
	25 and above	4	20%
University Level	985	10	50%
	211	6	30%
	Others	4	20%

3.3. Instrument

This study follows a systematic approach, comprising three key steps to develop a Q-set that captures the beliefs of Chinese EFL learners regarding AI-mediated IDLE. The initial set consisted of 80 statements, typically constructed from interviews and focus groups (McKeown & Thomas, 2013). In the second step, a panel of five experts in language education, each with extensive experience in educational technology integration and language education, reviewed these items for redundancy, relevance, and overall coverage, resulting in a reduction to 45 items. In the third step, this refined set was pilot tested with a group of five English language learners, all of whom were familiar with AI-mediated IDLE. Their detailed feedback led to the removal of 11 ambiguous or redundant items, resulting in a final set of 34 statements. A detailed presentation of the Q-set is provided in the Appendix.

3.4. Data collection

This study utilized HTMLQ for the Q sorting process, with data being stored locally for ease of access during subsequent analysis. The HTMLQ code, adapted using the EQ-Configurator client from the Q Method website, was tailored specifically for this study's sorting requirements. A quasi-normally distributed sorting table was employed, organized into nine piles and covering a range from -4 to +4 (see Figure 1). The Q statements were then cat-

egorized into three groups: Agree, Neutral, and Disagree, with further sorting according to the strength of agreement. This process continued until each statement was positioned in the table. Statements with the highest agreement were assigned a score of +4, while those with the strongest disagreement were assigned -4. After completing the sorting task, participants were asked to provide explanations for their choices, especially for the statements with which they strongly agreed or disagreed.

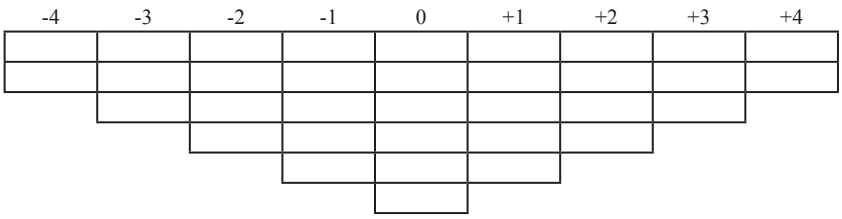

Figure 1. *Q sort*

3.5. Data analysis

The data were analyzed using KADE software, following a structured process grounded in Q methodology. The analysis began with a principal component analysis of the correlation matrix. Initially, five factors were identified based on eigenvalues greater than 1.0, as recommended by McKeown and Thomas (2013). However, subsequent factors displayed a steep decline in eigenvalues, followed by a more gradual decrease (see Figure 2). This pattern indicated that the first few factors captured the most substantial variance, while the later factors accounted for progressively smaller contributions. After evaluating the scree plot and the distribution of explained variance, three factors were chosen for rotation using Varimax rotation. This decision was based on the significant proportion of variance explained by the first three factors, which cumulatively accounted for 62% of the total variance (see Table 2). Next, factor loadings were calculated to assess the statistical significance of the factors, retaining values equal to or greater than $2.58 \times (1/\sqrt{N})$, where N is the total number of Q statements (34 in this study), as outlined by Watts and Stenner (2005). This analysis identified three factors with loadings of 0.443 or higher, with larger absolute values indicating greater statistical significance. Finally, factor interpretation was carried out based on items with the highest values (+4 and +3), as this approach provided the clearest explanatory power, following Watts and Stenner (2005) and McKeown and Thomas (2013).

Table 2. *Eigenvalues and explained variance*

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
Eigenvalues	7.535	2.634	2.122	1.333	1.224	0.993	0.801	0.707
% explained variance	38	13	11	7	6	5	4	4
cumulative % explained variance	38	51	62	69	75	80	84	88

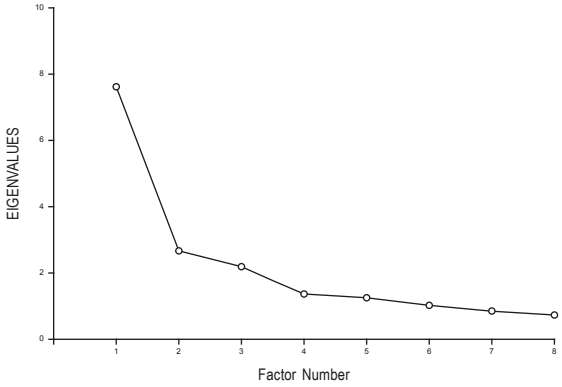

Figure 2. *Scree plot*

4. RESULTS

4.1. Factor 1: Optimistic AI beliefs

Factor 1 explains 38% of the variance, with nine participants loading significantly on this factor. This group actively embraces AI in IDLE, viewing it as a revolutionary tool that can enhance efficiency and engagement. They are enthusiastic about exploring new AI applications, fully trusting that these innovations will significantly improve their learning experiences. Specifically, they strongly believe that AI will revolutionize traditional learning methods (24: 4), significantly enhance learning efficiency (25: 3), and help learners overcome challenges (26: 3). They are eager to explore more AI applications (27: 4) and view AI as a key tool in informal English learning (23: 3). Despite some common concerns about AI, such as its lack of emotional support (15: -3) or occasional confusion caused by feedback (30: -3), this group does not share these doubts. They reject the notion that AI is unsuitable for learning (33: -3), and express minimal concern about data privacy issues (34: -4). Furthermore, they are confident that AI will not diminish their ability to learn independently (29: -4). Overall, this group exhibits full support for the potential of AI in English learning, demonstrating no reservations or concerns regarding its integration. The interviews with P3 further deepen the understanding of this group's characteristics, particularly their strong belief in the empowering role of AI in informal English learning. The specific interview content is as follows:

> P3: *I truly believe that AI is going to revolutionize the way we learn English out of classroom; it's not just about grammar and vocabulary anymore; it's about integrating technology to make learning more dynamic and engaging.*

Table 3. *Distinguishing statements for factor 1*

No.	Statement	Z-score	Q-Sort Value
	Top 5		
24	I believe AI will completely change traditional English learning methods.	1.628	4
27	I am willing to try more applications of AI in informal English learning.	1.501	4
25	I think AI will enhance learners' efficiency in informal English learning.	1.476	3
26	I feel that AI will help more people overcome the difficulties in informal English learning in the future.	1.317	3
23	I believe AI will become an important part of informal English learning.	1.241	3
	Bottom 5		
15	Although the feedback from AI is immediate, it lacks genuine interpersonal emotional support, which sometimes makes me feel that learning is tedious.	-1.283	-3
33	I don't think AI is suitable for informal digital learning of English.	-1.496	-3
30	Sometimes the feedback from AI confuses me during informal English learning, and I don't know how to improve.	-1.507	-3
34	I am concerned that my personal data may be misused when using AI for extracurricular English learning.	-1.704	-4
29	I worry that AI will make me lose the ability to learn English independently.	-1.816	-4

4.2. Factor 2: Critical AI beliefs

Factor 2 explains 13% of the variance, highlighting its significance among the six participants who rely on AI for support in IDLE. These learners exhibit a critical approach to AI, acknowledging its potential benefits while remaining cautious about its limitations. To be exact, they appreciate AI's ability to enhance reading comprehension (3: 4), correct writing errors (8: 4), provide instant feedback (10: 3), help with vocabulary integration (2: 3), and assist in brainstorming for writing (7: 3). In addition, they reject common concerns about AI's limitations, confidently asserting that AI is well-suited for informal learning (33: -3), that its feedback is generally helpful (30: -3), and that it does not undermine their ability to learn independently (29: -4). Furthermore, they do not believe that additional training is necessary to effectively use AI tools (32: -3). However, their critical stance emerges when discussing AI's limitations. They acknowledge that AI is not flawless and can make mistakes (31: -4). While they value AI as a resource, they emphasize the need for more refinement and a more cautious, informed approach to its integration in learning. The interviews with P12 further highlight the group's critical and discerning use of AI in informal English learning. The specific interview content is as follows:

> P12: *AI is very useful in my informal English learning, providing quick feedback and helpful suggestions. However, I've noticed that AI sometimes makes mistakes, so I always approach its recommendations critically and choose content carefully based on my judgment.*

Table 4. *Distinguishing statements for factor 2*

No.	Statement	Z-score	Ranking
	Top 5		
3	When I don't understand extracurricular reading materials, AI can provide me with detailed explanations and sentence-by-sentence translations, enhancing my reading comprehension.	1.809	4
8	When I encounter grammatical or spelling errors in extracurricular writing, AI automatically corrects my mistakes, improving my writing accuracy.	1.461	4
10	The instant feedback provided by AI has greatly helped me in my English learning.	1.215	3
2	AI can help me integrate difficult-to-remember words into sentences, making it easier for me to remember their usage.	1.091	3
7	I feel that AI can provide me with writing ideas and suggestions when I am brainstorming for essays, helping me to better develop my themes.	1.077	3
	Bottom 5		
32	I feel that more training is needed to better utilize AI tools for extracurricular English learning.	-1.139	-3
33	I don't think AI is suitable for informal digital learning of English.	-1.152	-3
30	Sometimes the feedback from AI confuses me during informal English learning, and I don't know how to improve.	-1.645	-3
31	AI makes very few mistakes while assisting me with informal digital learning of English.	-1.742	-4
29	I worry that AI will make me lose the ability to learn English independently.	-2.168	-4

4.3. Factor 3: Hesitant AI beliefs

Factor 3 accounts for 11% of the variance, with six participants loading significantly on this factor. This group exhibits a hesitant stance toward AI in informal English learning, acknowledging its potential but expressing significant doubts about its overall effectiveness. They are open to exploring more AI applications (27: 4) and recognize that AI can enhance learning efficiency and improve writing accuracy (25: 3, 8: 3). They also believe that AI will become an important part of informal English learning (23: 3) and is suitable for informal learning (33: -3). However, they feel more training is needed to fully utilize AI tools (32: 4) and prefer not to rely on them for instant explanations (18: -3). They also doubt their ability to consistently provide accurate and authoritative content (31: -3, 17: -4). Additionally, they do not believe that AI will completely transform traditional learning methods (24: -4), reflecting their preference for more traditional approaches. Overall, this group recognizes some of AI's benefits but remains more skeptical, with their hesitations outweighing their acceptance of its potential. The interviews with P13 highlight the hesitant and skeptical attitude of this group toward AI in informal English learning. The specific interview content is as follows:

> P13: *Although many people say AI will revolutionize English learning, I believe its capabilities are not that powerful. The real value in education still lies with human teachers, and that will never change.*

Table 5. *Distinguishing statements for factor 3*

No.	Statement	Z-score	Ranking
	Top 5		
27	I am willing to try more applications of AI in informal English learning.	2.221	4
32	I feel that more training is needed to better utilize AI tools for informal English learning.	1.939	4
23	I believe AI will become an important part of informal English learning.	1.572	3
8	When I encounter grammatical or spelling errors in extracurricular writing, AI automatically corrects my mistakes, improving my writing accuracy.	1.392	3
25	I think AI will enhance learners' efficiency in informal English learning.	1.113	3
	Bottom 5		
33	I don't think AI is suitable for informal digital learning of English.	-0.992	-3
18	I rely on AI to provide instant explanations when I encounter unfamiliar words, helping me understand extracurricular reading materials.	-1.087	-3
31	AI makes very few mistakes while assisting me with informal digital learning of English.	-1.268	-3
17	I feel that the content recommended by AI is authoritative, so I am more willing to rely on it to guide my learning.	-1.367	-4
24	I believe AI will completely change traditional English learning methods.	-2.034	-4

5. Discussion

This study employed Q methodology with 20 Chinese English learners to explore their beliefs about AI-mediated IDLE, identifying three main belief types: Optimistic, Critical, and Hesitant. The discussion examines these belief types, examining how each influences learners' engagement with AI in informal language learning.

First, the Optimistic AI Belief group consists of learners who fully embrace AI as a transformative tool in informal English learning. These individuals believe that AI has the potential to enhance learning efficiency, engagement, and accessibility, viewing it as a dynamic force capable of revolutionizing traditional English learning methods. Their optimism is reflected in their strong belief that AI can address learning challenges, provide personalized feedback, and foster learner autonomy. This aligns with previous studies that highlight the growing role of AI in educational contexts (Vo & Nguyen, 2024). This research enriches our understanding of how AI is perceived and utilized specifically in AI-mediated IDLE. By focusing on this group, the study sheds light on how learners with an optimistic belief see AI as an indispensable resource for enhancing language learning and educational experiences.

Second, the Critical AI Belief group represents learners who recognize AI's value but adopt it with caution and critical thinking. These individuals see AI as a useful resource for informal English learning, yet they approach it with a reflective stance, carefully weighing its benefits against its limitations. While they appreciate AI's ability to provide immediate feedback and improve learning efficiency, they remain wary of its inability to replace human interaction or provide emotional support. This aligns with previous studies that emphasize both the advantages and drawbacks of AI in language education (Jeon, 2024; Wang et al., 2024). These studies underscore the importance of adopting AI in a balanced way. This

research further contributes by exploring the nuanced perspectives of learners who critically engage with AI, recognizing it as a valuable supplementary tool for informal language learning while adopting a cautious approach to its integration.

Third, the Hesitant AI Belief group comprises learners who express doubts about AI's effectiveness in informal English learning. These individuals are generally skeptical about AI's ability to significantly enhance their language acquisition, often questioning its role in comparison to traditional methods. While they may acknowledge AI's potential, they remain unconvinced that it can replace human teachers or adequately support their learning process. This group's hesitance reflects findings from previous studies reporting resistance to AI due to concerns over data privacy, lack of emotional connection, or fear of dependence on technology (Airaj, 2024; Jabar et al., 2024; Rienties et al., 2024). Despite their reservations, some members of this group are open to trying AI tools under specific conditions, such as additional training or guidance. This study offers insights into the complexities of learner attitudes toward AI, showing that hesitance is not a complete rejection but rather a cautious approach informed by experience, personal concerns, or insufficient exposure.

Based on the findings, three practical implications emerge for integrating AI into informal digital language learning. For learners with an Optimistic AI Belief, educators and developers should provide diverse, feature-rich AI tools that support personalized feedback, autonomy, and interactivity, maximizing these learners' engagement and the positive impact of AI on language learning. For those with a Critical AI Belief, a balanced approach that combines AI with traditional human-centered methods could address their cautious stance, encouraging the use of AI as a supplementary tool while maintaining essential human interaction and emotional support. Finally, for learners who are hesitant about AI's effectiveness, institutions should offer structured workshops, ongoing support, and resources to alleviate concerns about data privacy, emotional connection, or over-reliance on technology. This gradual, guided exposure can build confidence and foster more equitable access to AI's benefits in language learning.

6. Conclusion

This study used Q methodology with a sample of 20 participants to explore Chinese EFL learners' beliefs about AI-mediated IDLE, identifying three main belief types. First, Optimistic AI Belief describes learners who view AI as a revolutionary tool that enhances learning efficiency and engagement, showing enthusiasm for new AI applications in language learning. In contrast, Critical AI Belief characterizes learners who acknowledge AI's potential benefits but remain cautious, carefully evaluating its limitations and possible drawbacks. Meanwhile, Hesitant AI Belief reflects a group that, while recognizing AI's potential, harbors doubt about its overall effectiveness in informal English learning.

This study has two primary limitations that suggest future research directions. First, with a sample size of only 20 participants, the findings may not fully represent the broader population of Chinese EFL learners. Second, the study's focus on Chinese EFL learners limits the applicability of its findings to other cultural and educational contexts, which may influence beliefs about AI in language learning. Building on these limitations, future research could expand the participant pool to include EFL learners from varied regions and backgrounds, offering insights into cultural influences on AI-mediated language learning. Additionally,

examining specific AI features such as adaptive feedback, personalized learning paths, or AI-driven conversational agents could help identify which elements most effectively support learning outcomes and positively shape beliefs. Longitudinal studies would also be valuable in tracking how learners' beliefs about AI evolve over time, especially as these technologies continue to advance and integrate into informal and formal learning contexts.

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8. Appendix: Q Statements

1. After using AI for informal English learning, I feel that my English proficiency has significantly improved.
2. AI can help me integrate difficult-to-remember words into sentences, making it easier for me to remember their usage.
3. When I don't understand extracurricular reading materials, AI can provide me with detailed explanations and sentence-by-sentence translations, enhancing my reading comprehension.
4. I found that the spoken dialogue materials generated by AI allow me to simulate real-life communication scenarios when practicing speaking outside of class.
5. I feel that AI can provide pronunciation demonstrations, which makes me more confident when practicing speaking in my free time.
6. AI can provide me with resources relevant to my writing topics, allowing me to develop my content more effectively.
7. I feel that AI can provide me with writing ideas and suggestions when I am brainstorming for essays, helping me to better develop my themes.
8. When I encounter grammatical or spelling errors in extracurricular writing, AI automatically corrects my mistakes, improving my writing accuracy.

9. I think AI's interface is simple and easy to use, allowing me to quickly start informal English learning.
10. The instant feedback provided by AI has greatly helped me in my English learning.
11. I feel that AI's personalized learning recommendations make my informal English learning more efficient.
12. I discovered that AI provides a variety of learning resources, meeting my informal English learning needs in different contexts.
13. I believe AI supports my independent English learning outside of class, allowing me to arrange my study time flexibly.
14. AI-generated materials are limited in cultural background, making it difficult to understand the deeper meanings behind the language.
15. Although the feedback from AI is immediate, it lacks genuine interpersonal emotional support, which sometimes makes me feel that learning is tedious.
16. AI feedback cannot provide in-depth explanations and suggestions like a teacher can.
18. I feel that the content recommended by AI is authoritative, so I am more willing to rely on it to guide my learning.
19. I rely on AI to provide instant explanations when I encounter unfamiliar words, helping me understand extracurricular reading materials.
19. I trust AI's pronunciation demonstration feature, believing it helps me learn proper pronunciation more effectively.
20. I trust the writing ideas generated by AI, feeling that it helps me express my ideas more clearly.
21. I trust AI's error correction function, as I believe it helps me avoid common mistakes in extracurricular learning.
22. When I encounter difficulties in informal English learning, I first consider seeking help from AI.
23. I believe AI will become an important part of informal English learning.
24. I believe AI will completely change traditional English learning methods.
25. I think AI will enhance learners' efficiency in informal English learning.
26. I feel that AI will help more people overcome the difficulties in informal English learning in the future.
27. I am willing to try more applications of AI in informal English learning.
28. I believe that in the future, every learner should have a certain level of AI literacy to improve the efficiency of informal English learning.
29. I worry that AI will make me lose the ability to learn English independently.
30. Sometimes the feedback from AI confuses me during informal English learning, and I don't know how to improve.
31. AI makes very few mistakes while assisting me with informal digital learning of English.
32. I feel that more training is needed to better utilize AI tools for extracurricular English learning.
33. I don't think AI is suitable for informal digital learning of English.
34. I am concerned that my personal data may be misused when using AI for extracurricular English learning.