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RESEARCH ARTICLE

On the nascency of ChatGPT in foreign language teaching and learning

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Abstract
The emergence of ChatGPT as a leading artificial intelligence language model developed by OpenAI has sparked substantial interest in the field of applied linguistics, due to its extraordinary capabilities in natural language processing. Research on its use in service of language learning and teaching is on the horizon and is anticipated to grow rapidly. In this review article, we purport to capture its nascency, drawing on a literature corpus of 71 papers of a variety of genres – empirical studies, reviews, position papers, and commentaries. Our narrative review takes stock of current research on ChatGPT's application in foreign language learning and teaching, uncovers both conceptual and methodological gaps, and identifies directions for future research.

Keywords: ChatGPT; artificial intelligence; language teaching; language learning; nascency; narrative review

Introduction

Since its release by OpenAI in November 2022, ChatGPT has become one of the most sophisticated chatbots powered by large language models (LLMs). Building upon GPT-3.5 (Generative Pre-trained Transformer) and more recently GPT-4 language models, ChatGPT distinguishes itself by its ability to simulate highly humanlike conversations through text or voice interactions. It demonstrates exceptional capabilities in performing a wide range of natural language processing (NLP) tasks, including but not limited to machine translation, question-answering, and text summarization (Ignat et al., 2023; Yang et al., 2023). These extraordinary capabilities have prompted language researchers and educators alike to explore its potential to serve pedagogical purposes, such as supporting personalized learning, providing feedback, and generating teaching materials, among other applications (Kohnke et al., 2023).

AI-driven chatbots like ChatGPT are recognized for their potential to offer immersive language practice opportunities (e.g., Barrot, 2023a; Xiao et al., 2023). Powered by a sophisticated LLM that simulates humanlike interactions, ChatGPT can enhance

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language learning in various ways. According to Kohnke et al. (2023), it can contextualize the meanings of words, provide corrections with explanations, generate various types of texts (e.g., emails, stories, and recipes), create quizzes, annotate texts, and offer dictionary definitions, example sentences, and translations. Owing to its capabilities of real-time interaction, ChatGPT is increasingly adept at providing personalized feedback by accommodating individuals' diverse needs and learning styles (Zhai, 2022), which leads to improved learning outcomes (Pérez-Segura et al., 2022). The interaction between learners and ChatGPT is paving the way for a more customized and enriched language learning experience (Tsivitanidou & Ioannou, 2021).

However, ChatGPT has been criticized for its lack of ability to truly model how human language is used and acquired (Bolhuis et al., 2024; Chomsky et al., 2023). While some of these criticisms may persist, ongoing advancements in language models could help address them. Recent studies have provided promising evidence of LLMs' ability to make humanlike linguistic generalizations (e.g., Ahuja et al., 2024; Hu et al., 2024).

Setting aside this broader debate, Barrot (2023a) highlighted specific limitations of ChatGPT in the context of language learning and teaching, noting its inability to fully replicate authentic human interactions due to its lack of emotional depth and understanding of cultural nuances, both crucial for language learning. Moreover, ChatGPT's heavy reliance on text-based interaction does not support the development of oral language skills such as pronunciation and intonation. Barrot further suggested that overreliance on ChatGPT could lead to social isolation, as it does not offer exposure to a diverse range of language users, a factor deemed beneficial for language acquisition (cf. Verga & Kotz, 2013). In contrast, face-to-face interactive environments, such as multicultural classrooms, study-abroad settings, or community language meetups, provide learners with varied linguistic input and cultural perspectives, which foster both linguistic and sociolinguistic competence.

Emerging research on ChatGPT in foreign language teaching and learning is diverse and multifaceted, spanning various topics and learner populations. Studies have examined its role in foreign language writing (Li, Li, & Cho, 2023), student interactions with ChatGPT and their subsequent learning outcomes (Mahapatra, 2024), its influence on learning motivation (Ali et al., 2023), and personalized learning with ChatGPT (Bin-Hady et al., 2023). Other research has explored the use of ChatGPT in assessing foreign language writing (Pfau et al., 2023), assisting with language education research (Pack & Maloney, 2023a), and developing content for Task-Based Language Teaching (Kim et al., 2023). These studies included various learner populations, from second language (L2) learners of English (Yan, 2023) and Chinese (Li, Li, & Cho, 2023) to learners from refugee backgrounds (Athanassopoulos et al., 2023), employing qualitative (Koraishi, 2023) and/or quantitative approaches (Ali et al., 2023). The expanding body of empirical research provides a valuable foundation for assessing ChatGPT's benefits, drawbacks, or neutral effects in language learning, paying the way for future research with greater rigor and validity.

This paper explores emerging academic inquiries into applications of ChatGPT in foreign language teaching and learning, with a view to taking stock of existing findings, exposing research gaps, and identifying directions for furthering the empirical quest. The sections that follow are organized around three themes: (1) prevailing themes and

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emerging trends; (2) learner and teacher perceptions and reactions; and (3) the role, affordances, and impact of ChatGPT in foreign teaching and learning. We begin by outlining our analytical approach, then provide an overview of the current research landscape, and finally, highlight the nascency of research and suggest avenues for future study.

Analytical approach

Given the novelty of our discourse topic and the diverse genres of existing literature, we opted for a narrative synthesis approach, which enabled us to examine and integrate various types of research. These include qualitative, quantitative, and mixed methods studies focusing on ChatGPT as a tool or on students' experiences with it, as well as conceptual works such as position papers, reviews, and commentaries. Our analysis focused on identifying recurring themes across studies, extracting and synthesizing key findings, detecting major gaps, and outlining directions for future research advancement.

Our analytic process began with a search of major databases – APA PsycINFO, Linguistics and Language Behavior Abstracts, Education Resources Information Center, ProQuest, Web of Science, Scopus, and Google Scholar – using a combination of "ChatGPT" with terms related to language learning or teaching. Specifically, we searched these databases using Boolean phrases such as "ChatGPT" AND ("language learning" OR "language teaching") to ensure sufficient coverage of relevant studies. Multiple rounds of searches were undertaken through early May 2024, retrieving 104 papers. After an initial screening,[1] two additional rounds of searches were conducted, resulting in a final corpus of 71 English-medium papers for in-depth reading and analytical coding (see Appendix 1).

Given the mixed genres of the corpus, the coding scheme (see Table 1) was designed to be relatively broad, encompassing nine categories: (i) study identification, (ii) study context, (iii) demographics, (iv) research design and method; (v) statistical analysis; (vi) type of research, (vii) ChatGPT version; (viii) linguistic domain, and (ix) ChatGPT training. The sections below present the descriptive results of these study characteristics and provide a narrative review of conceptual and empirical studies discussing or examining the role and impact of ChatGPT in foreign language learning and teaching.

Taking stock

Themes and trends

First to note, the bulk of the articles (56 in total) were published in 2023, reflecting the burgeoning interest in ChatGPT following its release in November 2022. Among the 71 papers we examined, journal articles dominated at 96% (68 articles), with the remaining publications consisting of two conference proceedings and one book chapter.

Of the 71 papers, 48 were empirical (68%), including experimental, quasi-experimental, and perception studies, while 23 (32%) were conceptual, comprising position papers, commentaries, or reviews (see Table 2). The majority of empirical studies (85%) focused on students learning languages in foreign (as opposed to second)

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Table 1. Coding scheme

Categories	Characteristics/coded categorically	Characteristics/coded open-ended
Study identification		Author(s); year of publication; title of article; type of publication (Journal article, book chapter, conference paper)
Study context	Learning context (foreign, second, not specified); educational setting (elementary, secondary, university, multiple levels)	Country (where the study was conducted)
Demographics		L1s; target language; sample size; target participants of perception studies (student, teacher, both)
Research design & method	Type of research method (qualitative, quantitative, mixed methods); type of experimental design (true experimental, quasi-experimental, preexperimental (one-group pretest–posttest, one-shot case))	Data collection (questionnaire, interview, ChatGPT-generated examples)
Statistical analysis		Correlation; *t*-test; ANOVA; regression, etc.
Type of research		Empirical (perception, intervention-based experimental, other); conceptual (position papers, reviews, and commentaries)
ChatGPT version	3.5; 4; unspecified	
Linguistic domain		Vocabulary; writing; grammar, etc.
ChatGPT training	Yes; no	

language contexts. Among the empirical studies with clearly defined educational settings, most (36 studies) were conducted in higher education, with fewer in secondary (4 studies) and elementary (2 studies) settings, and one spanning multiple educational levels. These studies involved students and/or teachers as participants.

Geographically, a preponderance of empirical studies (46 out of 48) was conducted in Asia (78%), with fewer in North America (15%) and Europe (7%).

In terms of language focus, English as a foreign language (EFL) was predominant (35 studies, 81%), followed by Chinese in five studies (12%), German in two (5%), and Spanish in one (2%). The participants had miscellaneous L1 backgrounds (see Figure 1) with the largest proportion being Mandarin Chinese speakers ($k = 8$), followed by Arabic speakers ($k = 7$). A significant number of studies did not report participants' L1 backgrounds. Among the 25 perception studies, 44% focused on students, 40% on teachers, and 12% examined both students' and teachers' perceptions of ChatGPT usage. In addition, one study explored YouTubers' perceptions of ChatGPT's educational affordances. A total of 39 studies reported the sample size, with a combined total

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Table 2. Study characteristics

Characteristics	*k*	%
Type of publication		
Journal article	68	96
Conference proceeding	2	3
Book chapter	1	1
Nature of research		
Empirical	48	68
Conceptual	23	32
Learning context		
Second	1	2
Foreign	41	85
Not specified	6	13
Educational setting		
Elementary	2	4
Secondary	4	8
University	36	75
Mixed	1	2
Not specified	5	10
Region		
Asia	35	73
North America	7	15
Europe	3	6
Not specified	3	6

of 3,915 participants. If both experimental and control groups were present, only the sample size of the experimental group was counted. The average sample size per study was 100, with a median of 43 and a range from 4 to 543 participants. The majority of studies had a sample size either in the range of 31–100 or fewer than 31.

Empirical studies

The 48 empirical studies employed varied approaches (see Table 3), ranging from mixed methods (15 studies, 31%) to qualitative (21 studies, 44%) and quantitative (12 studies, 25%) methods. The quantitative studies generally used questionnaires with Likert scales (e.g., Liang et al. 2023; Liu & Ma, 2024) or intervention-based experimental designs (e.g., Kucuk, 2024; Mousazadeh, 2023) to assess the impact of ChatGPT on language learning outcomes. The interventional studies typically employed a school-based, experimental or quasi-experimental design, comparing pretest and posttest results within or between an experimental and a comparison group.

The qualitative studies mainly adopted a descriptive approach, collecting data through semistructured interviews (19%) (e.g., Jeon & Lee, 2023; Marzuki et al.,

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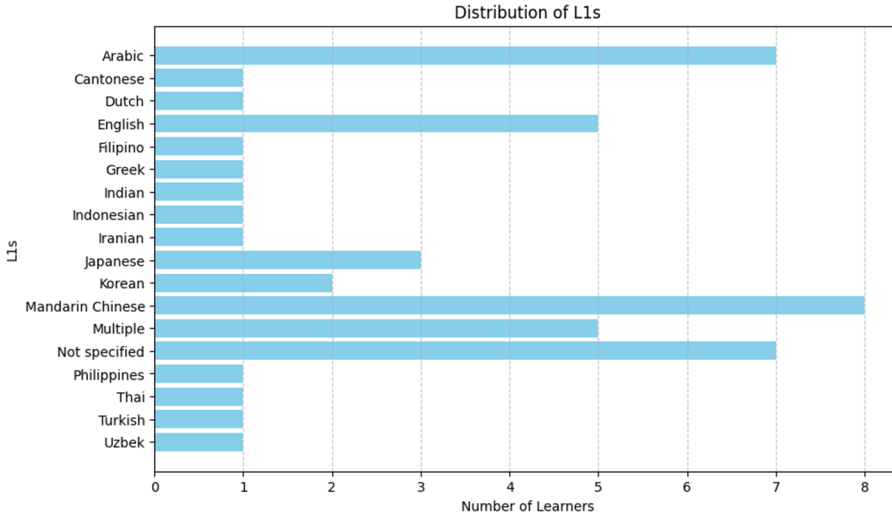


Figure 1. L1 backgrounds of participants.

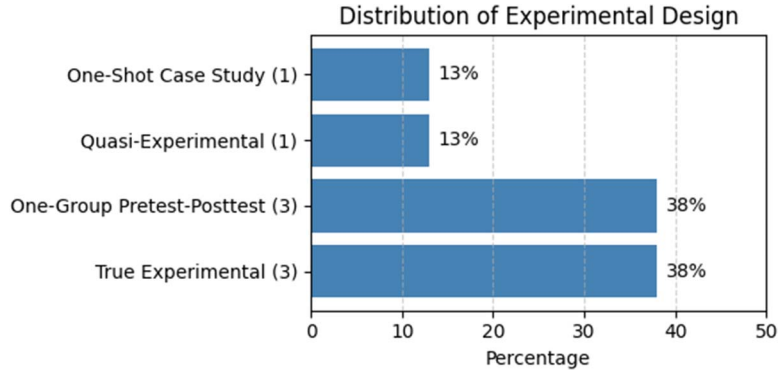


Figure 2. Distribution of experimental designs in interventional studies.

2023), open-ended questionnaires (10%) (e.g., Al-khresheh, 2024), in-class observations (5%) (e.g., Al-Obaydi et al., 2023), analysis of ChatGPT-generated examples (33%) (e.g., Koraishia, 2023), and a combination of multiple qualitative methods (19%) (e.g., Yan, 2023). Data analyses were carried out through thematic identification and classification.

The mixed methods studies combined quantitative and qualitative data, using a variety of methods such as surveys, interviews, and thematic analysis (e.g., Dong, 2024; Mabuan, 2024).

Among the 27 studies categorized as either quantitative or mixed methods, correlation was the most frequently used statistical method (26%), followed by ANOVA (19%), *t*-tests (11%), and structural equation modeling (11%). Regression analysis and

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Table 3. Research methods and designs

Categories	*k*	%
Research method		
Qualitative	21	44
Quantitative	12	25
Mixed methods	15	15
Statistical test		
ANOVA	5	19
Correlation	7	26
t-test	3	11
Structural equation modeling	3	11
Regression	1	4
Bootstrap mediating effect test	1	4
Descriptive statistics only	7	26
Type of empirical research		
Perception	25	52
Intervention-based experimental	8	17
Others	18	38
ChatGPT version		
3.5	17	35
4	2	4
Both	2	4
Not specified	27	56

the bootstrap mediating effect test were each used in one study, respectively. In addition, 26% of studies did not employ inferential statistics and, instead, reported only descriptive statistics, including means and/or standard deviations.

The 48 empirical studies – including both interventional and perception studies – covered three primary themes: 25 studies (52%) focused on the perceptions, attitudes, and satisfaction of students or teachers with ChatGPT for language learning and teaching (e.g., Cai et al., 2023; Gao et al., 2024); 8 studies (17%) examined ChatGPT's efficacy in language teaching and learning in terms of learning outcomes, using (quasi-)experimental designs in classroom settings (see, for example., Javier et al., 2023; Strobl et al., 2024); and 18 other studies (38%) explored ChatGPT's potential in areas such as foreign language writing assessment (Jiang et al., 2023; Pfau et al., 2023), materials development (e.g., Bonner et al., 2023; Li et al., 2024; Young & Shishido, 2023), and the development of language or critical thinking skills (Bin-Hady et al., 2023; Muñoz-Basols et al., 2023).

Of the 25 perception studies, 22 focused solely on students' and/or teachers' perceptions of ChatGPT in language learning and teaching, while three studies examined both its effectiveness in language learning and students' perceptions of it (e.g., Kucuk, 2024;

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Yan, 2023). Eight studies explicitly introduced ChatGPT to participants, allowing them to gain some experience with the tool before providing their perceptions (e.g., Javier & Moorhouse, 2023; Schmidt-Fajlik, 2023). Four other studies included only participants who had already had experience with ChatGPT (e.g., Dong, 2024; Liu & Ma, 2024).

In studies where participants were not introduced to ChatGPT ($k = 17$), perception data was primarily collected through self-report. In contrast, studies where participants were introduced to ChatGPT ($k = 8$) followed a preexperimental design. Specifically, two studies used a one-group pretest–posttest design (Javier & Moorhouse, 2023), comparing perceptions before and after ChatGPT was introduced as a learning tool. Six studies used a one-group case design, assessing students' perceptions and/or the effectiveness of ChatGPT after its introduction (e.g., Jeon & Lee, 2023; Schmidt-Fajlik, 2023).[2]

Among the eight studies examining ChatGPT's efficacy as an intervention in language teaching (see Figure 2), 38% ($k = 3$) employed true experimental designs (e.g., Kucuk, 2024), while another 38% ($k = 3$) used a one-group pretest–posttest design (e.g., Athanassopoulos et al., 2023). One study adopted a quasi-experimental design (Mahapatra, 2024), and one study had a one-shot case study design (Yan, 2023).

As for the ChatGPT version used in the empirical studies, 35% reported using version 3.5, 4% used version 4, another 4% used both versions, and 56% did not specify which version was used.

A significant feature of the present corpus of empirical studies is that writing, as a productive skill, has attracted the most research attention, with 24 studies focusing on this aspect. Among these, 11 studies examined perception and/or efficacy, with 55% focusing on perception, 27% on efficacy, and 18% on both. Only one study specifically addressed grammar learning and teaching (Kucuk, 2024), and another investigated the use of ChatGPT on smartphones to enhance speaking and listening skills (Hayashi & Sato, 2024).

The predominant focus on writing can be attributed to ChatGPT's strengths in text generation and personalized feedback. Moreover, writing instruction inherently involves grammar and vocabulary, as these elements are fundamental to writing development. As such, writing instruction may simultaneously facilitate grammar and vocabulary learning.

Conceptual studies

The burgeoning interest in ChatGPT within language education has spurred a wave of non-empirical, conceptual works, including position papers, reviews, and commentaries. These contributions discuss the potential benefits and disruptions associated with using ChatGPT in foreign language teaching and learning (e.g., Barrot, 2023a, 2023b; Kostka & Toncelli, 2023; Topal, 2024). The discussions echo many of the findings from perception studies. The opportunities highlighted include ChatGPT's ability to provide students with authentic practice, personalized tutoring, immediate feedback, and a low-stress learning environment. ChatGPT is also seen as capable of alleviating teachers' workload by aiding in the preparation of teaching materials and assessment. On the flip side, challenges include potential encouragements of academic dishonesty, a reduction in students' critical thinking and writing abilities, a lack of human and social interaction, an inability to assess students' pronunciation and

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speaking skills, and an absence of culturally sensitive language use and communication styles.

The general interest in ChatGPT's role in supporting students' writing is reflected in several review papers (Barrot, 2023b; Baskara, 2023; Tseng & Warschauer, 2023; Warschauer et al., 2023; Zadorozhnyy & Lai, 2023). For example, Barrot (2023b) explored the benefits and downsides of ChatGPT as a foreign language writing aid, noting its ability to engage students with natural, humanlike interactions and provide timely and adaptive feedback at various linguistic levels. In the same breadth, however, Barrot also highlighted ChatGPT's limitations as a writing aid, such as giving inaccurate responses to human prompts, lack of sensitivity to how prompts are worded, inability to convey emotions or a writer's voice, and lack of rhetorical flexibility. In addition, ChatGPT may inadvertently encourage plagiarism and overreliance, potentially stunting critical and creative thinking. Similarly, Baskara (2023) emphasized ChatGPT's interactive and lifelike qualities, which can enhance students' engagement and motivation during their writing practice, while cautioning about potential biases in AI-generated content, which could compromise the accuracy and fairness of ChatGPT's feedback.

In discussing strategies to mitigate ChatGPT's limitations, Tseng and Waschauer (2023) proposed a five-part pedagogical framework to guide teachers and students in effectively using ChatGPT as a writing assistant. This framework involves understanding, accessing, prompting, corroborating, and incorporating. First, students need to understand what ChatGPT is; second, they need access to it; third, they should learn how to prompt it for their specific needs; fourth, they must evaluate ChatGPT's output, including fact-checking, and finally, they should decide what to incorporate from ChatGPT's responses. Waschauer et al. (2023) emphasized the need for students to develop ChatGPT literacy, which includes, among other things, the ability to generate effective and meaningful prompts and refine ChatGPT's outputs. Their underlying message is clear: *proficient ChatGPT users can train the model to better serve their needs*.

Foreign language assessment has been another prominent topic garnering attention in several review papers. For instance, Moqbel and Al-Kadi (2023) discussed the necessity of re-evaluating traditional assessment methods in light of AI's capacity to facilitate autonomous and informal learning, embracing the adoption of alternative assessments facilitated by ChatGPT, and arguing that these assessments would more accurately capture students' real-world performance in diverse contexts, an aspect that often eludes traditional assessments. According to Moqbel and Al-Kadi, alternative assessments, which may include performance-based tasks, self-assessments, and peer assessments, would allow for more dynamic, interactive, and contextually relevant evaluations, thus better capturing students' communicative competence and problem-solving abilities than standardized tests.

Reviewing studies on the teaching and learning of Chinese as a foreign language, Xiao et al. (2023) concluded that similar to its application in teaching EFL, ChatGPT offered considerable benefits for Chinese language teaching. But they also noted unique hurdles, especially in areas like classical Chinese and Chinese poetry, which are underrepresented in ChatGPT's training data. The gap often led to its unsatisfactory performance, including inaccurate historical or literary references, misinterpretation of classical texts, and even fabrication of sources or meanings that do not exist in

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traditional Chinese scholarship, when ChatGPT was tasked with answering questions or generating responses related to these subjects. Addressing issues such as ChatGPT's ability to easily solve homework problems for beginners, Xiao et al. recommended increasing the use of oral assignments, creating written assignments that would require students to tie personal experiences and critical thinking into their writing.

Taking a broader perspective, recent commentaries (e.g., Handley, 2024; Thorne, 2024) have pondered AI's potential and limitations and ChatGPT in education. Handley (2024) asserted that while AI tools like ChatGPT can provide valuable repetitive practice and feedback, they cannot replace expert language teachers. Likewise, AI can relieve teachers of mundane tasks (e.g., lesson planning, grading), freeing them for more consequential tasks such as fostering deep knowledge and creative language use, but it cannot fully substitute the holistic role of human instructors. The limitations stem from AI's inability to replicate the diverse pedagogical strategies and the emotional engagement that expert teachers can offer. Thorne (2024) stressed the enduring importance of human teachers, underlining the irreplaceable value of human teachers in providing motivation, focused feedback, and modeling pragmatic norms. This view is grounded in the conviction that humans are instrumental in shaping the relationship between technological development and the advances of humanity.

A number of position papers have articulated perspectives specifically on ChatGPT in foreign language learning and teaching, discussing both its potential and limitations. Han (2024), for instance, pointed out that, despite the ongoing debate over whether ChatGPT presents more benefits or harms, its use has already become ubiquitous among both learners and teachers. Emphasizing the significance of this trend, she advocated for comprehensive and systematic research to evaluate ChatGPT's influence on second language acquisition (SLA), calling for empirical studies to explore (1) the capabilities and limitations of ChatGPT as a language model; (2) how learners utilize ChatGPT's affordances and the resulting impact on their language learning; and (3) the role of learner agency in interactions with ChatGPT, including changes in learner engagement and learning outcomes over time.

Kern (2024), for his part, argued that technologies like ChatGPT should neither be seen as a panacea nor a peril. Despite its humanlike functionalities, ChatGPT cannot replicate the educational role of human teachers, echoing the views of Handley (2024) and Thorne (2024). ChatGPT compiles information from various data sources and lacks genuine understanding, generating responses based on predicted probabilities, which can lead to issues such as fabricated or biased content and limited capabilities in non-English language (see also Xiao et al., 2023). He admonished overreliance on ChatGPT for content generation, cautioning that it could lead to grave educational and epistemological consequences. Kern underscored the necessity for technology to augment, rather than replace, essential educational elements like cultural integration and critical thinking.

In summary, the growing interest in ChatGPT in the context of language education has led to conceptual and review papers discussing its benefits and limitations. It has been argued that while ChatGPT has the potential to support foreign language learning and instruction through offering authentic practice, personalized tutoring, and reducing teacher workload, concerns persist regarding academic dishonesty, diminished critical thinking, and cultural insensitivity. Among the proposed solutions is the

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development of AI literacy, particularly the ability to engage effectively with ChatGPT through strategic prompting.

Regarding language assessment, scholars highlight ChatGPT's ability to provide alternative assessments that may better capture real-world language use.

Research on ChatGPT's role in teaching languages other than English points to both its benefits and challenges, as manifested in, for example, the teaching of classical Chinese and poetry.

General discussions suggest that while ChatGPT can enhance language education, it cannot replace human teachers' pedagogical expertise, emotional engagement, and role in fostering critical thinking and pragmatic competence. Scholars emphasize the need for empirical research to assess ChatGPT's long-term impact on language learning and teaching.

Perceptions and attitudes toward ChatGPT

Students' perceptions

Studies have mostly reported positive findings regarding the use of ChatGPT for foreign language learning and teaching. Among the 25 perception studies, 11 focused on learners' perceptions of utilizing ChatGPT for language study, 10 investigated teachers' perceptions, 3 explored both learners' and teachers' perceptions, and 1 looked into how language communities on YouTube perceived the educational advantages of using ChatGPT across various languages (Li, Kou, & Bonk, 2023). In addition, some studies explored mediating factors influencing participants' perceptions (e.g., Cai et al., 2023; Liu & Ma, 2024).

By way of illustration, Xiao and Zhi (2023) conducted semistructured interviews with five EFL learners. Participants reported that ChatGPT enhanced their learning experience by providing personalized and adaptive feedback, facilitating idea generation, and encouraging critical reflection on the information it generated. Participants also perceived prompt revision and refinement as helpful for obtaining accurate information, ultimately contributing to better learning outcomes.

Shaikh et al. (2023) conducted a controlled study with 10 EFL learners from various L1 backgrounds, who engaged with ChatGPT on their devices in a meeting room environment, completing tasks like writing paragraphs, conversing, and vocabulary practice within a 1-hour session. Immediately after engaging in these activities and gaining direct experience with ChatGPT, they filled out a post-task questionnaire that quantitively evaluated their perceptions of ChatGPT's usability, ease of use, and satisfaction. Results showed positive perceptions.

In yet another study, Javier and Moorhouse (2023) found through administering a post-use survey a "delayed" acceptance: after using ChatGPT for a period of time, students recognized its value for practicing foreign language interactions.

Some studies have probed learners' perceptions of the usefulness and affordances of ChatGPT for specific language skills and linguistic domains, such as writing and grammar (e.g., Kucuk, 2024; Yan, 2023). Yan (2023) conducted an in-depth interview with 8 out of 35 Chinese undergraduate EFL majors after they participated in a 1-week practicum on using ChatGPT's text generation functionality for foreign language writing tasks. Students acknowledged ChatGPT's effectiveness in multilingual writing,

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praising its ability to generate texts in different writing styles, which greatly facilitated their writing process following the planning phase. However, these perceived affordances were overshadowed by concerns about academic honesty, educational equity, and overreliance on AI, which they feared could diminish critical thinking and hinder the development of writing skills. Consequently, they favored stricter guidelines and regulations for its use.

To evaluate the effectiveness of ChatGPT as a grammar checker for second language writing, Schmidt-Fajlik (2023) surveyed 68 Japanese-speaking English learners, finding overall positive perceptions. Similarly, Kucuk's (2024) focused group interviews revealed that most students welcomed ChatGPT in their grammar lessons, especially for answering grammar questions. However, some students expressed concerns about the accuracy and reliability of corrections, lack of contextual understanding, potential for misinterpretation of feedback, overcorrection, unwanted stylistic changes, and challenges in prompt usage. Despite these reservations, there was a consensus that the benefits outweighed the drawbacks.

Further contributing to the perception research, several studies have explored factors influencing learners' experiences and attitudes toward using ChatGPT. In a study by Cai et al. (2023), a survey of 458 learners found that behavioral intention or a user's willingness to adopt ChatGPT was a stronger predictor of learning effectiveness than perceived satisfaction or performance expectations. The findings suggest a need for future ChatGPT development to prioritize hedonic motivation (i.e., the enjoyment derived from using ChatGPT) and information services.

Dong (2024) found that behavioral intention significantly predicted the actual usage of ChatGPT among foreign language learners when completing writing tasks. Similarly, Liang et al. (2023), examining individual factors, found, *inter alia,* that self-efficacy (i.e., a learner's confidence in using ChatGPT) acted as a mediating factor between ChatGPT usage and learning outcomes. In other words, learners who felt more confident using ChatGPT were more likely to achieve positive learning effects.

Finally, in a more comprehensive study, Liu and Ma (2024) examined the attitudes, intentions, and behaviors of 405 EFL learners in informal digital English learning contexts. Their findings suggested that perceived usefulness, that is, the extent to which learners believe ChatGPT is beneficial, had a greater impact on attitudes than ease of use, that is, how effortless learners find ChatGPT to operate, and this, in turn, influenced learners' intentions and actual engagement with ChatGPT.

Teachers' perceptions

Most studies examining teachers' perceptions employed qualitative methods, collecting data through interviews, interaction logs, and open-ended questionnaires (e.g., Al-khresheh, 2024; Ulla et al., 2023). While the majority of these studies focused on college-level teachers, some investigated the perspectives of elementary school teachers (e.g., Allehyani & Algamdi, 2023; Jeon & Lee, 2023) or preservice teachers (Söğüt, 2024).

A study by Ulla et al. (2023) revealed college teachers' favorable views on using ChatGPT to assist with teaching activities like lesson planning, creating language practice activities, and responding to queries. The study illuminates the significance of teachers' ability to identify ChatGPT's affordances to serve pedagogical purposes.

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Teachers seemed particularly drawn to ChatGPT's capability of providing individualized and personalized learning experiences, a finding corroborated by several other studies (e.g., Al-khresheh, 2024; Mabuan, 2024). According to Al-khresheh's (2024) survey of 46 English language teachers from various countries recruited via ResearchGate, using an open-ended questionnaire, ChatGPT was effective in providing immediate, adaptive feedback that boosted students' comprehension and enabled personalized learning. Moreover, ChatGPT facilitated students' learning through providing contextual and scenario-based activities, making lessons more interactive and contributing to the development of analytical and conversational skills.

Marzuki et al. (2023) investigated the perceptions of four university teachers of foreign language writing. While only two teachers had used ChatGPT to simulate brainstorming conversations, all four recognized its benefits in helping students improve writing clarity, including the development of a logical progression of thoughts and arguments.

Positive perceptions extended to preservice teachers as well. Söğüt (2024) gathered the views of 28 preservice teachers and 10 teacher trainers, all of whom expressed optimism about ChatGPT, affirming its ability to assist with prewriting, idea generation, text production, use of search engines, generation of language patterns, and providing instant, personalized feedback. The teacher trainers, however, sounded a cautionary note, recommending that AI tools, including ChatGPT, be used primarily as a supplemental resource rather than primary teaching aids to prevent overreliance.

Curious about factors mediating teachers' perceptions, Gao et al. (2024) performed a correlational analysis of data from a scale-based questionnaire, finding that teachers' prior experiences with LLMs, their frequency of use, and self-evaluation played a significant role in shaping their perceptions.

Despite generally positive perceptions from teachers, research reveals a notable discrepancy between teachers' and learners' perceptions of ChatGPT. Har (2023) found that while university students generally regarded ChatGPT as a valuable aid in language learning, university lecturers saw it as a hindrance to effective teaching and assessment. The gap reflects differing priorities: students consider ChatGPT a useful tool that provides instant feedback, enhances fluency, and increases engagement, whereas teachers are concerned about students' overreliance on ChatGPT, diminished critical thinking, and difficulties in assessing students' real language use ability.

Perceptions, however, may evolve over time with experience and exposure to ChatGPT. Yan (2023) found that students' perceptions varied based on their level of engagement with ChatGPT. After 1 week of using ChatGPT, students expressed more concerns than satisfaction about its unregulated use in foreign language writing.

Much as expected, empirical research on ChatGPT use with children is less common than with adult learners, mirroring trends in research on technology-mediated language teaching (e.g., Parmaxi, 2023; Plonsky & Ziegler, 2016) and, more broadly, in SLA research (Hiver et al., 2024; Kang et al., 2019). Consequently, perception studies involving elementary school teachers are significantly fewer than those focusing on college instructors. Among the handful of studies in our corpus, Allehyani and Algamdi (2023) and Jeon and Lee (2023) sought elementary school teachers' views on employing ChatGPT in teaching EFL to children. Allehyani and Algamdi surveyed 543 first-grade teachers in Saudi Arabia using an online questionnaire, yielding two main

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findings. First, most teachers saw ChatGPT as a valuable tool for providing immediate language assistance to young EFL learners, recognizing its potential to cultivate creative thinking through storytelling tasks, and supported its integration into EFL instruction for young learners. Second, teachers expressed a need for training to enhance their digital competence in effectively using ChatGPT (González-Lloret, 2020).

Jeon and Lee (2023), meanwhile, looked into teachers' perceptions following their utilization of ChatGPT in their teaching. The study involved 11 elementary school EFL teachers who first received 60-minute training on ChatGPT usage and then applied it in their classes over a 2-week period (see Shaikh et al., 2023, discussed earlier, for a similar study design with adult learners). The teachers' experiences and perceptions were subsequently probed through semistructured interviews, and their interaction logs were analyzed. Results showed that teachers and ChatGPT played complementary roles: While ChatGPT functioned as an interlocutor, content provider, teaching assistant, and evaluator, teachers incorporated various resources in their teaching, encouraged active learner engagement, and promoted awareness about AI ethics.

Across the studies on teachers' perceptions, optimism, enthusiasm, and excitement were palpable. Still, teachers were not shy about voicing concerns. One major concern they had was that students might become overly dependent on ChatGPT, which could impede the development of critical thinking and independent problem-solving skills – both essential for evaluating ChatGPT's language output – and stifle their creativity (e.g., Derakhshan & Ghiasvand, 2024; Söğüt, 2024). Other concerns included ChatGPT's potential to generate biased or inappropriate content (e.g., Allehyani & Algamdi, 2023; Mohamed, 2024) and its inability to convey complex cultural nuances or provide the emotional support that language learners often need (Al-khresheh, 2024; Derakhshan & Ghiasvand, 2024).

Some teachers feared that integrating ChatGPT into teaching might diminish genuine human interactions between teachers and students, leaving them unprepared for real-world conversations (e.g., Mabuan, 2024; Söğüt, 2024). Compounding the concerns were issues related to teachers' digital literacy, social awareness, pedagogical compatibility (Allehyani & Algamdi, 2023), as well as the risk that ChatGPT's human-like text-processing capabilities could encourage cheating behaviors (e.g., Derakhshan & Ghiasvand, 2024; Gao et al., 2024) and pose challenges for teaching listening and speaking skills (Al-khresheh, 2024; Derakhshan & Ghiasvand, 2024).

Summing up, research on the perceptions of ChatGPT in foreign language learning and teaching generally reveals positive attitudes among both learners and teachers. Learners appreciate the ability of ChatGPT to provide personalized feedback, support writing and grammar learning, and enhance engagement in language practice. Teachers, meanwhile, recognize ChatGPT's potential to facilitate lesson planning, generate language exercises, and provide adaptive feedback, but they also highlight risks such as reduced human interaction, ethical concerns, and students' dependence on AI-generated content. Factors such as prior experience, self-efficacy, and digital literacy can mediate teachers' and learners' perceptions.

Impact and role of ChatGPT in foreign language teaching and learning

Relative to perception studies, there has been substantially less research assessing the impact of ChatGPT on learning outcomes. Of the eight studies identified, five

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employed an experimental design, though not all were strictly true experiments (e.g., Athanassopoulos et al., 2023; Li, Li, & Cho, 2023), and the remaining three began with an experimental design followed by elicitation of perceptions (e.g., Mahapatra, 2024).

Among these interventional studies, five investigated the efficacy of ChatGPT in enhancing students' foreign language writing skills (e.g., Mahapatra, 2024; Strobl et al., 2024). Given ChatGPT's NLP capabilities, it is no surprise that researchers focused on its role in foreign language writing. For instance, two studies (Athanassopoulos et al., 2023; Mahapatra, 2024) explored the effectiveness of ChatGPT as a feedback tool.

Athanassopoulos et al. (2023) investigated the potential of ChatGPT to improve vocabulary and grammar in writing by learners of German who were refugees and migrants at a junior high school. A 2-week intervention was implemented, involving three phases. In the first phase, students each composed a personal email in German, which was then fed to ChatGPT for revision. In the second phase, students reviewed ChatGPT's output, that is, a revised version of student writing, with a focus on the "corrections" made by ChatGPT. In the final phase, students wrote an email on a related topic using the refined language elements suggested by ChatGPT. The study observed notable improvements in students' writing, including an increase in word count, greater lexical diversity, and more complex sentence structures. That students' writing improved after comparing their own drafts with ChatGPT's revisions suggests that ChatGPT's feedback may have functioned as a form of consciousness-raising (Schmidt, 1990), helping them notice discrepancies between their output and the target-language input provided by ChatGPT.

Similarly, Mahapatra (2024) evaluated ChatGPT's effectiveness as a feedback tool for undergraduate EFL learners' academic writing. Spanning one semester, the study involved an experimental group, which used ChatGPT for feedback for 1 month, and a control group, which did not receive such feedback. Both groups' writing performance was assessed through a pretest, an immediate posttest, and a delayed posttest. Results indicated that the experimental group achieved significant improvements in writing on both the posttest and delayed posttest, with notable differences compared to the control group. This affirms the positive impact of ChatGPT as a feedback tool, as it provides explicit feedback through direct corrections and metalinguistic explanations on grammar, vocabulary, organization, and content, which enhances foreign language writing skills and corroborates findings reported by Athanassopoulos et al. (2023).

Further evidence of ChatGPT's role as a writing assistant comes from Li, Li, and Cho (2023) who investigated the utility of ChatGPT in supporting Chinese as a foreign language writing outside the classroom. The study involved four high school freshmen participating in 20-minute sessions with ChatGPT twice weekly for 3 weeks. During these sessions, they learned to use various ChatGPT functionalities to generate prompts and develop ideas for writing. These sessions were supplemented with writing assignments, individual feedback from the teacher, and peer reviews. Assignments were given at the start, during, and at the end of the intervention to evaluate changes in writing performance. Results showed improvements, especially in correcting errors and constructing well-formed sentences during the intervention, but that the changes were not fully sustained, tapering off to some extent after the intervention ended. Evidence for this includes the following: (1) all participants saw some decline in writing scores after the intervention, though their reversal-phase scores remained

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above baseline and (2) lower-proficiency participants benefited immediately from ChatGPT's scaffolding but experienced a greater drop in scores once it was removed compared to higher-proficiency students. These findings raise questions about whether AI-mediated language learning could lead to the internalization of language knowledge for long-term retention. They also highlight the need for further research on learning retention influenced by ChatGPT intervention and its interaction with other factors such as L2 proficiency. However, because no control group was included in the study, it would be premature to draw any conclusion regarding a causal relationship between the adoption of ChatGPT and learning outcomes.

In a slightly different configuration of the intervention, Yan (2023) investigated the effects of incorporating ChatGPT into a week-long intensive practicum for 35 EFL students. The intervention involved, first, introducing students to ChatGPT's text generation functionalities via video tutorials. After that, the students were given an opportunity to use some of these functionalities in their writing and share insights and experiences with their peers. This process, according to Yan, not only fostered self-directed learning but also improved the quality of students' writing, as revealed by students' learning logs and classroom observations.

Using ChatGPT as a resource to support foreign language writing was also explored by Strobl et al. (2024). The study implemented a 2-week intervention whereby 22 university students revised their German as a foreign language writing by comparing their drafts with ChatGPT-generated texts. This type of utility of ChatGPT tapping its capacity as a source of feedback reportedly fostered students' self-assessment skills and higher-order thinking, in addition to improving their writing. ChatGPT provided both explicit and implicit feedback. Explicitly, it improved grammatical accuracy, lexical variety, and structural clarity, which students used to refine their texts. Implicitly, it triggered inner feedback, encouraging self-correction and deeper engagement through comparison, even when no direct feedback was available.

Beyond the role of ChatGPT as a writing assistant, researchers have explored its capacity as a grammar guide. Kucuk (2024) undertook a 7-week intervention study with EFL learners, who were assigned to an experimental group or a control group. The experimental group used ChatGPT for questions about grammar and spelling, while the control group did not. The control group, instead, received grammar instruction exclusively through textbooks. Pretests yielded no significant difference between the two groups in grammar knowledge, but posttests showed a significant difference, with the experimental group exhibiting notable improvements. The study, therefore, demonstrated that ChatGPT effectively served as a grammar guide.

Research has also looked into whether ChatGPT can be used to enhance learners' metacognitive skills and motivation and reduce anxiety. In a study by Mousazadeh (2023), 50 EFL learners were put into an experimental or a control group. For 1 week, the experimental group engaged with ChatGPT explanations, while the control group did not. Participants thereafter completed a meta-awareness questionnaire and a self-monitoring task in which they identified grammatical, spelling, and vocabulary errors in two short English essays. Results indicated no difference between the two groups in metacognitive skills, suggesting that involving ChatGPT had little effect. But the intervention did lead to notable improvement in their accuracy in spotting linguistic errors.

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Exploring ChatGPT as a potential source of motivation for language learners and an antidote to anxiety, Hayashi and Sato (2024) had 31 Japanese university EFL students form an experimental and a comparison group. For 10 minutes daily over 4 weeks, the experimental group engaged with ChatGPT for interactive language practice, while the comparison group watched YouTube videos as a kind of non-interactive activity. Participants were pre- and posttested to see if there was any difference following the intervention. Results indicated a significant reduction in foreign language speaking anxiety in both groups, but no significant improvement in their speaking skills.

Still another increasingly distinct line of research pertains to teachers' use of ChatGPT to help with their routine tasks such as developing materials, doing lesson planning (e.g., Pack & Maloney, 2023b; Young & Shishido, 2023), evaluating teaching materials, assessing students' output (e.g., Pfau et al., 2023; Sakai, 2023), and course design (Kim et al., 2023). Koraishi (2023) demonstrated how ChatGPT was utilized to assist EFL teachers in creating assignments, quizzes, learning activities, and lesson plans. Kim et al. (2023) showed ChatGPT's capabilities in designing English writing courses and teaching them in a task-based way. For instance, to teach business email writing, ChatGPT was employed to guide learners through a target task of writing a professional email declining an invitation, using pedagogical tasks such as analyzing model emails, learning polite refusal strategies, and structuring effective responses. ChatGPT also provided individualized feedback, identifying tone and grammar issues (e.g., replacing "Hey" with "Dear" in a formal email). Likewise, Pack and Maloney (2023b) explored ChatGPT's potential for creating teaching materials, offering suggestions on how to craft prompts for this purpose.

Our literature corpus also reveals a line of effort to establish ChatGPT's capability to grade and assess foreign language learners' writing. Pfau et al. (2023), for instance, explored ChatGPT's potential to measure linguistic accuracy in foreign language writing. The study compared the human coding with ChatGPT's detection of errors in 100 essays written by Greek learners of English. Results showed ChatGPT's potential as an assessment tool. A study by Jiang et al. (2023) found that ChatGPT outperformed other LLMs in gauging linguistic accuracy in foreign language writing. Further research found that ChatGPT was able to assess discourse elements of foreign language writing (Zhou et al., 2023) and comprehend sociolinguistic expressions when the context was clear, but unable to understand communication strategies used by foreign language learners (Sakai, 2023).

A number of studies have attempted to support learning by co-opting ChatGPT for multiple types of assistance – developing teaching materials, conducting assessments, assisting in grammar learning, facilitating cultural conversations, providing feedback on drafts of writing, evaluating academic assignments with constructive revisions, acting as a peer-like figure to encourage critical thinking and engagement, and so on. Li et al. (2023), for example, explored ChatGPT's abilities to develop teaching materials and assess learning. Muñoz-Basols et al. (2023) tried facilitating learning by integrating ChatGPT's translation function, enhancing digital literacy and critical thinking. Bin-Hady et al. (2023) provided scaffolding for language learning using ChatGPT as a vessel for personalized feedback and conversational practice. Pérez-Núñez (2023) focused on having ChatGPT generate customized teaching materials and offer feedback on writing. Bonner et al. (2023) deployed ChatGPT for lesson planning, delivering

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feedback, and creating learner-centered materials. Li, Kou, and Bonk (2023) analyzing YouTube topics related to language learning with ChatGPT, categorized its role as a virtual tutor, content generator, interactive partner, on-demand resource, and innovative learning tool.

In sum, extant research demonstrates that ChatGPT offers unique affordances for language learning and teaching that distinguish it from conventional computer-assisted and technology-mediated tools. Compared to rule-based chatbots or static learning platforms, ChatGPT exhibits far larger "social and cognitive" capacity and holds, in turn, greater potential to enrich teaching and learning, including engaging teachers and learners in real-time, dynamic, and contextual interactions and adapting to their cognitive, linguistic, and communicative needs. Its ability to provide personalized scaffolding, generate task-based learning scenarios, and offer iterative feedback on writing supports both learner autonomy and differentiated instruction. Future research should continue to explore such potential and actual affordances of ChatGPT for foreign language teaching and learning.

General discussion and conclusions

This paper sought to capture the nascency of research on integrating ChatGPT in foreign language teaching and learning. Reviewing 71 publications including empirical studies, reviews, position papers, and commentaries, we endeavored to identify current trends, topics, and empirical and pedagogical practices, rendering a largely descriptive narrative synthesis without drawing firm conclusions. Our work led to some general observations. In this final section, we begin with a recap of our main findings before highlighting the nascency of this research, noting gaps, and offering thoughts on future research directions.

Current landscape

Since its debut in late 2022, academic interest in ChatGPT as a resource for language learning and teaching has surged, experiencing exponential growth. With the introduction of ChatGPT-4o in mid-May 2024, which comes with multimodal functionalities, marking a crucial expansion in its applicability, the research is expected to continue to expand and diversify.

Much of extant empirical research on ChatGPT in language learning and teaching shows a heavy focus on the teaching and learning of adult learners (of English) in higher education, echoing similar findings in other domains of research in applied linguistics (e.g., Andringa & Godfroid, 2020; Zhang & Plonsky, 2020), including technology-mediated language teaching (Kim & Namkung, 2024). The ostensible similarity across the domains of research, however, may in fact speak to a differential need for expansion of the scope of research. Consider technology-mediated teaching. The tools are wide-ranging allowing for accommodations of the learning needs of a broad spectrum of learners – young and old, proficient or otherwise – with greater or lesser access to the technological tool. In contrast, ChatGPT, at least in its current form and with its current set of functionalities, works better for mature learners.

Further mirroring a finding from other domains of applied linguistics research (e.g., Bryfonski et al., 2024), existing investigations of ChatGPT have predominantly taken

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place in foreign language contexts (85%), with only 2% of the studies conducted in second language contexts. This distribution is not entirely surprising, given that ChatGPT primarily models English language use and that foreign language settings, compared to second language settings, are generally less favorable learning environments (Ellis, 1989; Gass, 2007; Han, 2023). ChatGPT (and other digital tools, for that matter) may help bridge the gap by serving as a pedagogical and learning resource. In other words, the "skewed" distribution of studies reflects a form of "natural selection," and as such, is not, and should not be considered, a methodological anomaly or weakness.

Broadly, current studies come in two types: conceptual and empirical. The conceptual works take the form of position papers, reviews, and commentaries, while the empirical studies are mostly descriptive, bottom-up, and exploratory in nature. Much of the empirical research focused on eliciting student and teacher perceptions, typically through open-ended questionnaires or semistructured interviews. Studies using scale-based questionnaires, on the other hand, generally presented descriptive statistics summarizing users' perceptions of ChatGPT's potential uses and benefits. A few correlational studies sought to ascertain factors influencing perceptions and attitudes toward ChatGPT (e.g., Gao et al., 2024; Liu & Ma, 2024). A small number of studies adopted a quasi-experimental, pretest–posttest design that incorporated ChatGPT as part of a treatment to assess its effectiveness, especially in the context of foreign language writing instruction (e.g., Mahapatra, 2024). These studies explored how ChatGPT assisted with generating ideas, providing feedback, and automating assessments. Overall, the current research has displayed a favorable disposition toward ChatGPT, demonstrating in some contexts that instruction integrating it as a resource can be beneficial to foreign language learning.

Extant research shows that personal attitudes can influence ChatGPT adoption (Liaw, 2008). Understanding learners' and teachers' perspectives is, therefore, key to fostering effective learning environments (Cai et al., 2023). Studies have established that students across the board generally hold a positive view of ChatGPT, appreciating its speedy response, whether it is to provide adaptive feedback, assist with idea generation, or enable real-time interaction.

Teachers, however, hold mixed views, seeing ChatGPT as a double-edged sword. On one hand, it can be a useful tool for supporting individualized learning and lesson planning. On the other hand, it may discourage processes essential for developing critical thinking, creativity, and problem solving – skills essential for cognitive development. At the same time, it may reduce human engagement, including student–teacher interaction, which is critical for language acquisition (Derakhshan & Ghiasvand, 2024; Lantolf, 2000; Söğüt, 2024).

Additional concerns relate to ChatGPT's language authenticity and cultural depth (Allehyani & Algamdi, 2023; Barrot, 2023a). Some note that its reliance on monolingual models of language use may limit its ability to support code-switching and translanguaging, which can be vital for real-world communication (Goodman & Tastanbek, 2021).

One factor that seems to influence teachers' hesitation in adopting ChatGPT is their own prior experience (Gao et al., 2024). Those with prior exposure to ChatGPT tend to hold a more positive view of its potential. This points to a need for professional development to enhance teachers' digital competence (Allehyani & Algamdi, 2023).

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Consonant with the perception studies, experimental and quasi-experimental research on the effectiveness of ChatGPT in enhancing learning outcomes has yielded positive findings, particularly in the instructional domains of writing (e.g., Li, Li, & Cho, 2023; Mousazadeh, 2023) and grammar (Kucuk, 2024). Studies indicate, *inter alia*, that explicit instruction on prompting as part of the intervention led to improved outcomes (Li, Li, & Cho, 2023; Mahapatra, 2024). Further research is needed to validate and expand these findings, particularly in relation to learners of varying proficiency levels and age-groups.

Nascency of research

Extant research marks a keen academic interest in ChatGPT's potential as a pedagogical and learning tool. As expected, the empirical studies exhibit the hallmarks of nascent scholarly inquiry (for a parallel, see a review of research on English-medium instruction by Macaro et al., 2018). Notably, most studies have focused on students' or teachers' perceptions. A similar prevalence of perception studies has been observed in other areas of applied linguistics research – such as speech recognition chatbots (Jeon et al., 2024) and technology-mediated task-based learning (Kim & Namkung, 2024).

Relatedly, the methodology is somewhat skewed toward qualitative approaches. While quantitative analyses are present, true experimental designs remain scarce, with preexperimental designs predominating. However, the current lack of experimental research may shift as empirical evidence accumulates, research questions broaden, and interest in ChatGPT's impact on learning outcomes intensifies.

Current empirical studies are primarily bottom-up, exploratory, and descriptive, often context-dependent with idiosyncratic research foci. Nevertheless, the widespread interest in ChatGPT as a writing assistant has resulted in a convergence of findings that transcend specific contexts, particularly regarding its role as a feedback provider, an area of great relevance to foreign language teachers at large. However, there remains much to explore and uncover, using a variety of methodologies.

The sampling of current empirical research appears limited, narrowly focusing on young adults learning EFL at the university level. This trend mirrors a common pattern in applied linguistics research, where sampling is often driven by convenience and accessibility (Plonsky, 2023). To mitigate sampling bias and enhance the ethical, theoretical, and practical validity of research (Andringa & Godfroid, 2020; Ortega, 2005), future research on ChatGPT should incorporate more diverse populations across L1 and L2 backgrounds and instructional contexts to improve the generalizability of research findings.

Another sign of nascency is the lack of transparency in reporting practices, which has been argued to significantly impact research quality in applied linguistics (Plonsky, 2024). Many studies failed to explicitly report key demographic and contextual information. A substantial portion of studies did not specify the version of ChatGPT used, and/or provide information on how ChatGPT was introduced as part of the intervention (Li, Li, & Cho, 2023). The lack of transparency poses challenges for interpreting research findings and conducting replications.

The issue of underreporting also reflects a broader deficit in L2 studies in digital language learning (Han et al., in press). In their methodological treatise on

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quasi-experimental research in digital language learning, Han et al. pointed out several major conceptual and methodological gaps, including but not limited to insufficient descriptions of the digital tools used, lack of definitions of key constructs – such as independent and dependent variables – and inadequate documentation of intervention processes and content.

Future directions

Research on the relevance of ChatGPT to foreign language teaching and learning requires substantiation, both in terms of breadth and depth. Clearly, a continuation of isolated or idiosyncratic studies will not suffice; instead, a concerted effort by the research community is needed to pursue systematic investigations. To that end, researchers should converge around key questions, such as those outlined in Han (2024), which provides a systematic and comprehensive "to-do list" examining ChatGPT from its origin and capabilities to its pedagogical relevance and learner agency in leveraging it for language learning.

In more specific terms, there is a multitude of variables warranting investigation, particularly their interactions over time, from a Complex Dynamic System Theory perspective (Larsen-Freeman, 2020), which views language learning as an evolving and adaptive process shaped by cognitive abilities and contextual influences. This perspective is especially relevant here, as it underscores the nonlinear, emergent interactions among factors that shape the use of ChatGPT, including its expanding capabilities, teachers' and learners' agency, and evolving pedagogical adaptations.

Thus, within this framework, three interdependent variables must be examined: (a) ChatGPT and its professed functionalities; (b) instructed use of ChatGPT; (3) learners' spontaneous use of ChatGPT. As this review has shown, while some studies have incorporated ChatGPT training as part of an intervention (Li, Li, & Cho, 2023; Mahapatra, 2024), none have explicitly treated it as a variable to assess its impact. Given that effective use of ChatGPT – particularly in prompt engineering – is a skill that must be developed, further research is needed to explore how learners can build literacy in crafting high-quality prompts, effectively obtain and interpret information, and how this interacts with motivation, learner agency, creativity, and pedagogical interventions.

Tracking the process of intervention and learner response is crucial for ensuring both the internal and external validity of future research. As noted earlier, current studies have largely overlooked the cognitive and psycholinguistic processes underlying teachers' and learners' interactions with ChatGPT. If this gap persists, our understanding will remain fragmented, speculative, and incomplete.

Over time, research on ChatGPT is expected to increasingly intersect with the established literature on instructed second language acquisition, a subfield of SLA, thus being enriched both conceptually and methodologically. The complex relationship between ChatGPT and foreign language teaching and learning necessitates a diverse methodological approach, including group-based experimental and quasi-experimental designs as well as individual-oriented case studies. Each method provides complementary findings and insights, collectively contributing to a more systematic and comprehensive understanding.

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With that, future ChatGPT research is expected to be both exploratory and confirmatory, as empirical findings accumulate, especially from studies guided by similar research questions. Both bottom-up and top-down investigations will likely become commonplace. Quasi-experimental studies, in particular, are expected to dominate the empirical landscape, given that interest in ChatGPT as a tool primarily stems from foreign language classrooms (Han et al., in press).

Furthermore, future research should incorporate a temporal dimension, going beyond the pretest, posttest, and delayed posttest design. Organic longitudinal studies are needed to capture the evolution of ChatGPT-assisted learning and track changes in L2 learning outcomes and learners' perceptions over time.

Future research on ChatGPT's potential to alleviate teachers' workload may expose its Achilles' heel, namely that its capabilities are constrained by its training data. Anecdotally, this past summer at Teachers College, students in the SLA in the Classroom course attempted to use ChatGPT to generate lesson plans but found the results disappointing. The most striking issue was that the lesson plans were outdated, reflecting the foreign language pedagogy in the 1940s—50s, where grammar fragments were central to instruction. However, teachers' ChatGPT literacy can matter. Experienced users know how to "train" ChatGPT through refining prompts and strategies to guide ChatGPT toward more relevant and effective outputs. Tracking teachers' development and application of ChatGPT literacy should constitute another key topic in future research, as part of an effort to understand the interaction between teacher intervention and student learning processes and outcomes.

As this review has made clear, despite the fear and reluctance among foreign language instructors, ChatGPT (and generative AI, for that matter) is here to stay. Rather than being left behind as it takes over numerous human tasks, it would be wise to get ahead, or at least keep up, by leveraging its (ever evolving) capabilities[3] to enrich learning and pedagogy.

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Endnotes

1. For our purposes, we excluded papers focusing on ChatGPT for applied linguistics research beyond language learning and instruction, such as ethical considerations in language education, general speech recognition chatbots, or its impact on human cognitive functions. Other than that, in searching the databases we endeavored to be inclusive, without imposing restrictions on the type of publication. In the end, the search yielded only journal articles, conference proceedings, and book chapters, with no dissertations.

2. Preexperimental designs differ from true experimental designs in lacking a control or comparison group (Nunan, 1992; Rogers & Révész, 2019). Common preexperimental types include the one-group pretest–posttest design and the one-shot case study design.

3. As we put finishing touches on this article, OpenAI announced its new ChatGPT, OpenAI o1, which can perform human tasks of greater complexity, such as math and science reasoning and breaking down the cognitive processes (Metz, 2024).

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