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Self-Regulated Language Learning and Generative AI: A Systematic Review

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Abstract

This systematic review aims to investigate the integration of generative artificial intelligence tools within foreign and second language (L2) education contexts and their influence on learners' self-regulated learning. Adhering to the PRISMA and PICO protocols, the review encompasses five empirical studies. These studies were systematically coded and analyzed employing a two-cycle coding approach. The findings regarding the research context indicate that most of the included studies adopted an experimental design, primarily involving university-level English as a Foreign Language (EFL) learners. ChatGPT emerged as the most frequently utilized GenAI tool, and English was the dominant target language. Across the studies, self-regulated learning was examined through cognitive, affective, motivational, and metacognitive processes. Key outcomes included learners' high acceptance of GenAI tools, reports of increased cognitive load while using ChatGPT, and overall positive impacts of GenAI integration on self-regulated learning processes. The paper concludes by offering insights for educators and proposing recommendations for future research.

Keywords: generative artificial intelligence, self-regulated language learning, systematic review

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Introduction

In 2022, with the emergence of the generative artificial intelligence (GenAI) tool (ChatGPT) and the subsequent development of other GenAI tools (e.g., Gemini, Copilot), tools capable of communicating like human interaction, writing text and code, drawing based on commands, and translating between different languages have become increasingly common (Godwin-Jones, 2022; Kasneci et al., 2023). While these tools provide personalized teaching and feedback environments, multilingual teaching environments, and adaptive teaching environments that augment the educational process, they also have the potential to completely replace certain human tasks (Molenaar et al., 2025). Therefore, it is crucial to examine how individuals use GenAI in learning environments. To this end, this study aims to conduct a systematic review of studies investigating the self-regulation skills of students who use GenAI tools for foreign language or second language learning.

Studies published in the Web of Science, Scopus, ERIC, and PsycINFO research databases between 2022 and 2025 and based on GenAI, SRL, and foreign/second language education were screened following the PRISMA and PICO steps and adhering to inclusion/exclusion criteria. After the screening stages, the five studies included in this review were examined according to the research questions.

The findings regarding the research context indicate that most of the included studies adopted an experimental design, primarily involving university-level English as a Foreign Language (EFL) learners. ChatGPT emerged as the most frequently utilized GenAI tool, and English was the dominant target language. Across the studies, self-regulated learning was examined through cognitive, affective, motivational, and metacognitive processes. Key outcomes included learners' high acceptance of GenAI tools, reports of increased cognitive load while using ChatGPT, and overall positive impacts of GenAI integration on self-regulated learning processes.

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Literature Review

Generative Artificial Intelligence and Language Education

The Generative Pre-trained Transformer (GPT) is a sophisticated computational model that relies on an artificial neural network and yields remarkable outputs in terms of natural language understanding and natural language generation, having been trained on a vast amount of multilingual data (Godwin-Jones, 2021). ChatGPT started a new era in November 2022 when it was launched by OpenAI, an American start-up, and it was the most advanced version of GPT models at that time (Barrot, 2023). Since then, other notable generative artificial intelligence (GenAI) tools, such as Gemini and Copilot, have appeared (Perifanou & Economides, 2025).

The GenAI tools can facilitate translations, generate human-like text and images, simulate conversation, and write computer programs (Godwin-Jones, 2022; Kasneci et al., 2023). These advances have an undeniable impact on education, presenting both opportunities and challenges. Some notable educational benefits include personalized learning environments, individualized and adaptive feedback for students, tracking learner performance, exploring hidden learner patterns through data mining, planning course content, and collaborative and interactive learning environments for students (Godwin-Jones, 2021; Kasneci et al., 2023). Yet, these opportunities have led to some concerns, such as users' overreliance on GenAI tools and issues of academic integrity (Barrot, 2023; Warschauer et al., 2023).

The potential opportunities and challenges presented by GenAI have motivated researchers to investigate its application in various contexts, including language learning. Consequently, numerous studies have explored the use of GenAI tools in language education, primarily in the context of EFL, highlighting areas of uncertainty. For instance, research has examined ChatGPT's promise to assist EFL writing teachers with feedback (Guo & Wang, 2024), compared the effects of GenAI-driven feedback versus hybrid feedback (combining GenAI and human-generated input) in EFL settings (Zhang et al., 2025), analyzed the impact of GenAI tools on the writing processes of both native and non-native English learners (C. Wang, 2025), explored the identification of AI-generated texts in the EFL context (De Wilde, 2024), and investigated how graduate students revise academic texts using GenAI tools (Koltovskaia et al., 2024), among others. Wu et al. (2025), on the other hand, studied the AI literacy of Spanish language teachers at Chinese universities.

Another vital aspect of utilizing GenAI in education is its relationship with self-regulated learning, as "the notion of offloading" may come into play (Molenaar et al., 2025, p. 263). The term "offloading" refers to transferring actions and behaviors that humans can perform to AI systems (Molenaar et al., 2025). In this regard, currently, language learners may overly depend on GenAI tools, potentially hindering their learning process because of replacement or offloading. However, when used responsibly and ethically, GenAI tools can enhance language learning outcomes (Godwin-Jones et al., 2024) since the purpose of using AI in education is to augment the learning and teaching process (Molenaar et al., 2025). Therefore, it is important to understand how learners can monitor their learning progress and actively regulate their learning while engaging with GenAI tools.

Self-regulated Language Learning in the GenAI Age

Self-regulated learning (SRL), which refers to a dynamic progression through which learners create their educational objectives and subsequently inspect, regulate, and direct their cognitive, metacognitive, and behavioral dimensions (Pintrich, 2000). Consequently, the nature of learning encompasses various self-regulatory processes (Azevedo, 2009). Winne and Hadwin (1998) divide the learning process into four distinct steps: describing a task, setting a goal and planning, organizing study methods, and adapting to metacognition. Zimmerman (2002), on the other hand, categorizes the process into three phases: the forethought, the performance, and the self-reflection phases. Pintrich (2000) proposes a taxonomy that incorporates not only phases (describing a task, setting a goal and planning, organizing study methods, and adapting to metacognition) but also areas of SRL (cognition, motivation, behavior, and context). And recently, a framework incorporating CAMM (cognition, affective states, metacognition, and motivation) processes and data streams has gained prominence in SRL research, particularly to help visualize how the studies identify SRL (Azevedo, 2015; De Mooij et al., 2025). The CAMM processes within this framework involve study methods (cognitive processes), emotional state while studying (affective processes), effort and interest while studying (motivation), and active regulation of learning (metacognitive processes) (Azevedo, 2015; De Mooij et al., 2025), which have been adopted in this review.

Meanwhile, a line of empirical research has been conducted to explore the integral role of SRL in a second and/or foreign language education. For instance, self-regulated instruction has a significant impact on

academic writing (Anggraeni et al., 2025), and H. Zhang, Li, and Liao (2024) have explored the various SRL strategies adopted by Chinese MA-TESOL students in an English for Academic Purposes course, analyzing participants' reflections, reading notes, and interview responses. Given the proliferation of online classes and the potential differences in teaching content between traditional and online formats, a series of studies has revealed the SRL of Chinese language learners in online courses, using the Motivated Strategies for Learning Questionnaire to assess the learners' motivation (Lin et al., 2021), questionnaires and reflection journals to investigate the participants' self-efficacy for online learning and their willingness to join online courses (Xu et al., 2022), and Online Self-regulated Learning Questionnaire and semi-structures interview to explore the participants' engagement with online learning and their use SRL strategies, such as goal-setting, task strategies, help seeking, time management, and self-evaluation (W. Zhang, Liu, & Wilson, 2024). The investigation of SRL has also extended to educational technology-based research. For instance, Liu et al. (2025) have found that Automated Corrective Feedback has not only improved the pronunciation of French language learners but also enhanced their intrinsic motivation and self-regulated learning. Similarly, flipped classrooms have been shown to enhance EFL learners' cognitive and higher-order thinking skills (Samadi et al., 2024), as well as the effectiveness of AI-mediated language instruction, such as Duolingo, in an EFL context (Wei, 2023). Most studies included in this paragraph display that the majority of studies have been conducted in either an EFL or an academic writing setting, which presents the scarcity of research to explore SRL in second language education contexts and in languages other than English (LoTE).

Since the introduction of GenAI tools, SRL has emerged as a critical component in related research because how learners manage their learning processes while interacting with GenAI tools is a vital aspect that warrants investigation. In this regard, in a more recent study, real-time analytics with GenAI has been blended with three adaptive SRL scaffolds in a Moodle English Academic Writing course. The first scaffold has been designed to guide the participants to focus on and orient the task (Metacognition – Orientation), while the second scaffold has guided the participants in organizing their ideas and writing their text (High-cognition – Organization and elaboration). The last scaffold has been to direct the participants to evaluate their written texts (Metacognition – Evaluation). The results of this experimental study showed that this integration led to higher metacognitive learning patterns in L2 writers (Li et al., 2025, pp. 670-672). Xu et al. (2025) have also highlighted the salience role of metacognitive support, involving the provision of tools and strategies to assist learners in controlling their learning process, in effectively utilizing GenAI tools for task completion. In the absence of such support, there is a potential decline in learners' SRL. Other empirical studies have showed that students with higher self-regulated learning skills tend to use GenAI tools more responsibly, ethically, and creatively (Ji et al., 2025; Wang & Huang, 2025) and have more metacognitive awareness and positive attitudes towards using GenAI tools (Karaoglan Yilmaz & Yilmaz, 2025). In terms of practical dimensions, a human-centered learning and teaching framework has been proposed to enhance educational practices by leveraging GenAI tools for SRL development through domain knowledge acquisition for K-12 teachers (Kong & Yang, 2024). With a similar aim, Kong et al. (2024) have offered a model based on SRL, which involves six interactive and iterative steps to enhance L2 writers' critical thinking skills using GenAI tools.

Past Reviews and Research Questions

Few syntheses have been conducted on GenAI, SRL, and language learning. For example, Yang and Li (2024) and Lee et al. (2025) focused on GenAI and language education in their reviews. Yang and Li (2024) examined 44 studies involving ChatGPT in L2 contexts and categorized the findings into dimensions, such as content generation, feedback provision, teacher support, and user perceptions; however, SRL was not a focal concern. Lee et al. (2025) analyzed 49 empirical studies on GenAI and language education, highlighting the dominance of higher education contexts and English as the target language, but with limited attention to SRL processes. Both reviews contributed to illustrating the integration of GenAI in language education settings, but they inadequately addressed the SRL within their frameworks.

Mohebbi (2025) also explored the intersection of AI and language learning in his systematic review, conducting a careful examination of 18 peer-reviewed articles, and he reported positive effects on SRL through AI's personalised and real-time feedback nature, though the main focus of the study did not rely on the intersection of SRL, AI, and language education. Sardi et al. (2025), on the other hand, directly focused on GenAI and SRL, identifying its metacognitive and motivational benefits, but noted a gap in language learning applications. Lastly, Chang and Sun (2024) reviewed AI and SRL in language learning but restricted their dataset to the studies published between 2000-2022, omitting the recent surge in GenAI tools. Collectively, these reviews highlight a growing body of work but reveal a lack of targeted synthesis on how GenAI tools support SRL specifically within L2 learning contexts.

While these review studies contribute valuable insights to the field, to my knowledge, there is currently no comprehensive review that examines the interrelations among generative artificial intelligence, self-regulation skills, and language acquisition in addition to encompassing articles on that interrelation and published between 2022 and 2025. To address this gap in the existing literature, this systematic review has involved empirical studies, adhering to the Preferred Reporting Items for Systematic reviews and Meta-Analyses PRISMA (Page et al., 2021) and Population, Intervention, Comparison, and Outcome PICO protocols (Chong & Plonsky, 2021) and aims to examine studies that investigate the self-regulation skills of individuals who use generative artificial intelligence for second or foreign language learning. The studies included in the dataset have been subsequently analyzed in accordance with the specified research questions below:

(1) How can the selected studies for this systematic review be mapped in terms of the research design, participants' characteristics, sample size, educational level, GenAI tool, target language, targeted language skill(s), and duration?

(2) How are the CAMM (cognitive, affective, motivational, metacognitive) processes of self-regulated learning and their corresponding data collection methods represented in the selected studies for this systematic review?

(3) How do GenAI tools, when integrated into second and foreign language education contexts, influence learners' self-regulated learning CAMM processes, including cognitive, metacognitive, motivational, and affective processes?

Methodology

Dataset

This study embraced the PRISMA procedure to search for the related studies to be included in the analysis (Page et al., 2021) since it offers a transparent, replicable, and methodologically rigorous framework for systematic reviews. By doing so, suggested steps to increase the validity of the findings were also adopted (Chong & Plonsky, 2021). Accordingly, creating the dataset relies on four main steps: identification of search terms and research databases, searching for the related studies, screening of the related studies, and eligibility of the selected studies.

After examining some foundational studies in self-regulated learning and the use of GenAI in education (Godwin-Jones et al., 2024; Kasneci et al., 2023; Molenaar et al., 2023) to decide the most relevant search terms, three sets of search terms were selected. Then, asterisk (*) was used to eliminate spelling problems and for flexibility of spelling (e.g., *autonomy* vs *autonomous*), and Boolean Operators *AND* and *OR* were used to maximize the search results (Chong & Plonsky, 2021). Moreover, ChatGPT was inserted in the search term list since it is a commonly adopted GenAI tool in the relevant studies. At the end, the following search term list was adopted:

("second language learn" OR "L2 learn*" OR "foreign language learn*") AND ("generative AI" OR "generative artificial intelligence" OR GenAI OR ChatGPT) AND*

("self-regulat learn*" OR autonom*)*

As for the research databases, Web of Science, Scopus, IEEE Xplore, PsycINFO, and Educational Resource Information Centre (ERIC) were selected to reach the relevant studies based on the integration of Generative Artificial Intelligence, self-regulated learning, and language learning. The choice of these databases is based on their relevance to the study's focus, which intersects educational psychology (specifically self-regulated learning), educational technology (particularly GenAI), and foreign/second language education. Also, these selected databases offer established quality control on the published studies with their peer-reviewed content (Aryadoust & Zhang, 2025; Heck et al., 2024).

Using the selected search terms and research databases, relevant studies published between November 2022, the official launch of ChatGPT and Generative Artificial Intelligence, and April 19, 2025, the final date for searching related studies, were searched. This initial search identified 181 studies, which were documented in the PRISMA diagram:

- Web of Science – 4 articles

- Scopus – 6 studies (5 articles and 1 conference proceeding)
- Ieee xplore – 14 studies (5 articles and 9 conference proceedings)
- PsycInfo – no article was found
- ERIC – 157 articles

Prior to the screening phases, thirteen studies were excluded due to accessibility issues, despite institutional account access. Then, a total of 168 peer-reviewed articles and conference papers published in English were procured and systematically organized into a primary collection and distinct sub-collections according to their respective research databases utilizing Mendeley Reference Manager. Afterwards, four duplicates were detected and manually eliminated within Mendeley. All alterations were meticulously recorded in the PRISMA diagram.

For the first screening step through reading the titles and abstracts of 164 studies, some exclusion criteria were decided (Chong & Plonsky, 2021). Accordingly, non-empirical studies (e.g., opinion papers, editorials, reviews, meta-analyses) and empirical studies that do not engage with GenAI tools or do not concentrate on self-regulation and/or language learning were excluded from the collection. These excluded papers were documented in an Excel file, which detailed their research database, journal, publication year, author(s), country, and the rationale for exclusion. Additionally, they were recorded in the PRISMA diagram. The subsequent table presents the reasons for exclusion along with their respective counts. In total, 148 studies were excluded from the collection; of these, 40 studies did not utilize any GenAI tools and address self-regulated language learning, and 34 studies lacked a focus on both self-regulated learning and language learning, among others.

Table 1

Exclusion Criteria

Reasons for exclusion	Count
The study does not involve any GenAI tools and focus on self-regulation and language learning.	40
The study does not focus on self-regulation and language learning.	34
The study is non-empirical.	29
The study does not focus on language learning	15
The study does not involve any GenAI tools and focus on language learning.	10
The study does not involve any GenAI tools and focus on self-regulation.	8
The study does not involve any GenAI tools.	6
The study does not focus on self-regulation.	6
Total	148

Following the initial screening phase, the eligibility of 16 studies was assessed through a thorough examination of their research questions and methodologies. Of these, 11 studies were excluded due to their limited scope, which included a singular focus on perceptions regarding the use of ChatGPT, the utility and efficiency of ChatGPT, and scale development. This decision was made to ensure that the review captured empirical evidence based on observable changes in SRL behaviors rather than self-reported opinions and presented measurable results. Ultimately, 5 studies were incorporated into the dataset for coding and subsequent analysis.

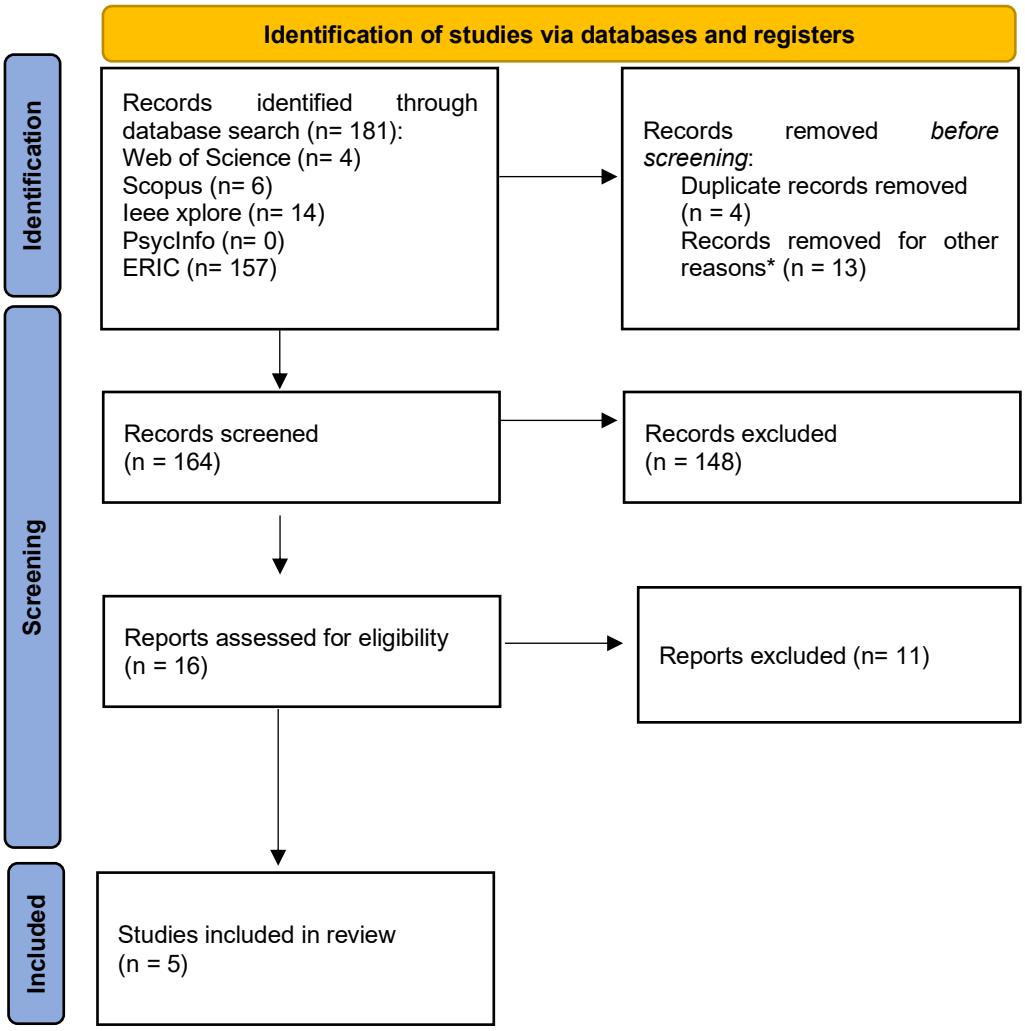
Table 2

Inclusion Criteria

Reasons for inclusion
The study involves GenAI tool(s) and focus on self-regulation and language learning.
The study is empirical.
The study is written in English.

Figure 1

PRISMA Diagram



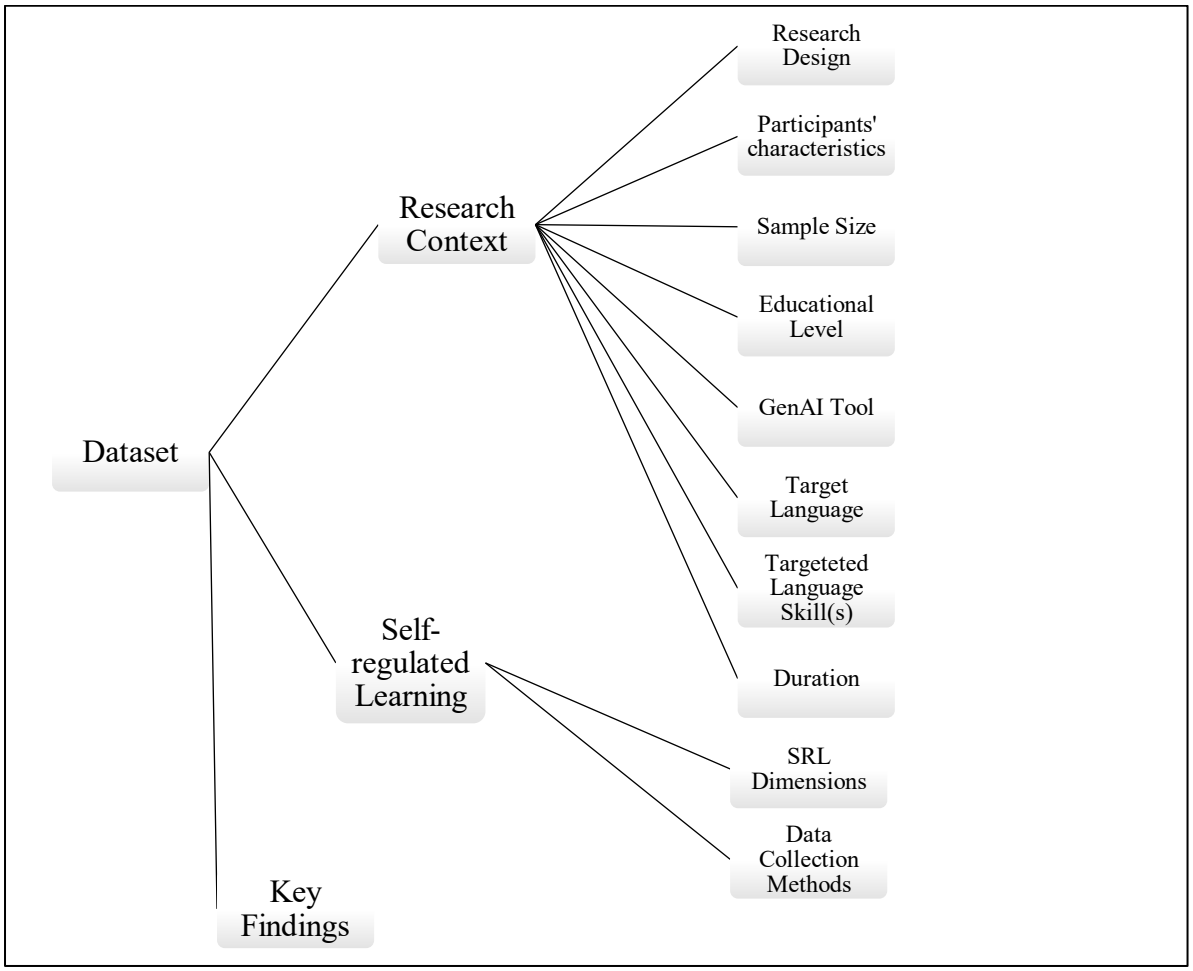
* These articles could not be accessed.

Coding

To address the research questions, a coding scheme (Figure 2) with three main categories and ten subcategories was developed. The first main category is research context and contains eight subcategories, such as research design, participants' characteristics, sample size, educational level, GenAI tool, target language, targeted language skill(s), and duration. The next category is related to SRL, comprising SRL and the CAMM processes and their corresponding data collection methods represented in the selected studies. The last category involves presenting the key findings that have been reported in the involved studies regarding the influence of GenAI tools on language learners' SRL. For the last two categories, the CAMM framework was adopted to create an analytical lens. Accordingly, the cognitive dimension refers to critical thinking and processing strategies, while the affective dimension encompasses emotions. The motivational dimension is related to goal-setting and persistence in achieving it, and lastly, the metacognitive dimension refers to autonomy.

Figure 2

Coding Scheme



Two-cycle methods, encompassing initial coding and focused coding and based on grounded theory (Charmaz, 2014), were used so as to avoid subjective bias while coding the data and reporting the findings, as adopted in Shen and Chong (2023). Accordingly, in the initial coding phase, words and/or phrases that yielded relevant findings in the included studies were directly borrowed. Then, in the focused coding phase, these borrowed words/phrases were coded under related subcategories and then main categories to present the findings analytically. By doing so, the PICO framework, which provides a checklist with items associated with population, intervention, comparison, and outcome to help reviewers for data extraction, was also taken into consideration (Chong & Plonsky, 2021). That framework guided the predetermined subcategories and research questions. To minimize potential bias and ensure consistency, the author conducted two rounds of coding for each study, with a three-week interval between them. During the second round, all coding decisions were cross-checked against those from the first round, and any discrepancies were thoroughly reviewed.

Results

Research Context

The first research question aims to yield the research contexts of the included studies, and the following table shows the relevant details. Accordingly, these five studies were published in different journals: Learning and Motivation, Computer Assisted Language Learning Electronic Journal, SAGE Open, Education and Information Technologies, and Journal of New Approaches in Educational Research. Three studies were conducted in China, and the most frequently investigated educational level was university (n=3). Four studies included EFL learners, and one study included all students enrolled at the University of Granada who were approached via the university

student mailing list, so the final sample is supposed to include EFL learners at that university as well. Sample sizes were diverse, ranging from 21 students to 400 students. As for the research design, experimental research design was commonly adopted, followed by mixed-methods research design and cross-sectional research design.

Table 3

Research Context of the Included Studies

Journal	Author(s)	Country	Research Design	Participant Characteristics	Sample Size	Educational Level
Learning and Motivation	Xu & Liu (2025)	China	True-experimental design (two experimental groups, Duolingo vs ChatGPT, and one control group)	Convenience sampling method, EFL learners in China, Intermediate group	244 EFL learners, 125 males and 119 females	English language institutes
Computer Assisted Language Learning Electronic Journal	Alsager (2024)	Saudi Arabia	Experimental group (ChatGPT) vs Control Group	EFL learners, Intermediate group	83 students, Males and Females	University
SAGE Open	Wang (2025)	China	Experimental design (Experimental group, ChatGPT-4 vs Control Group)	EFL learners, Intermediate Group, Undergraduate students at the Wuhan University of Engineering Science	68 students	University
Education and Information Technologies	Woo et al., (2024)	China	Mixed Methods Study	Convenience sampling, EFL learners	21 students, Females	Secondary School
Journal of New Approaches in Educational Research	Romero-Rodríguez et al., (2023)	Spain, Mexico	Cross-sectional design	Convenience Sampling	400 students, 110 males and 290 females	University

The most commonly utilized GenAI tool was ChatGPT (n=4, see Figure 3). Among these studies, one explicitly indicated the use of ChatGPT-4 for data collection, while the remaining studies did not specify the version of ChatGPT employed. Additionally, one study incorporated other GenAI tools, including Sage, GPT-4, Claude+, Claude Instant, and Google-PALM, alongside ChatGPT. Moreover, English (n=4) served as the primary target language in the articles reviewed (Figure 4).

Figure 3

GenAI Tools in the Included Studies

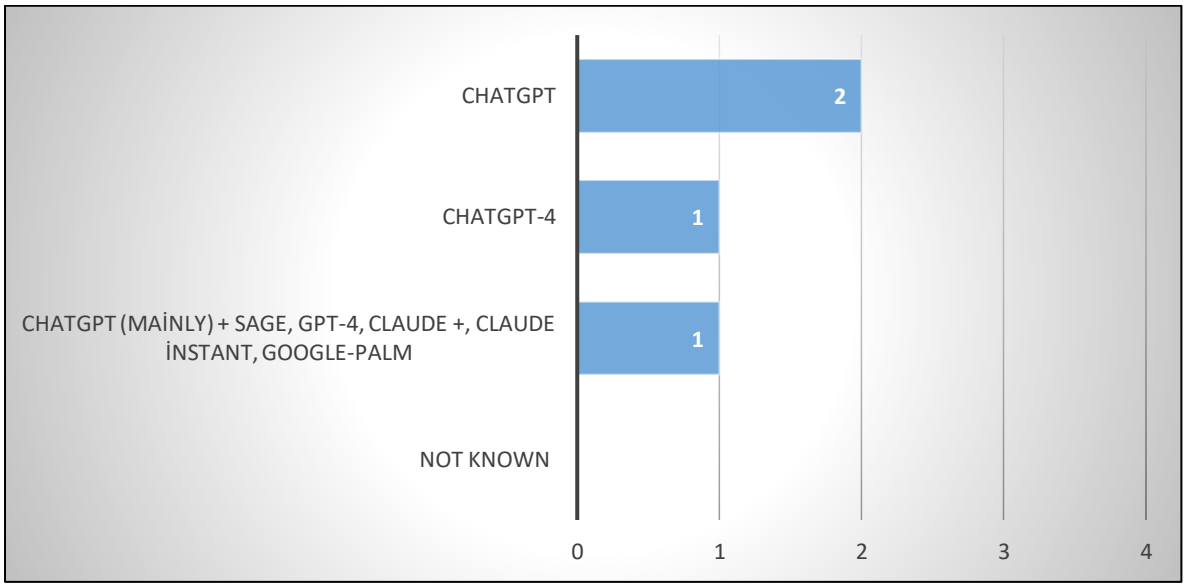
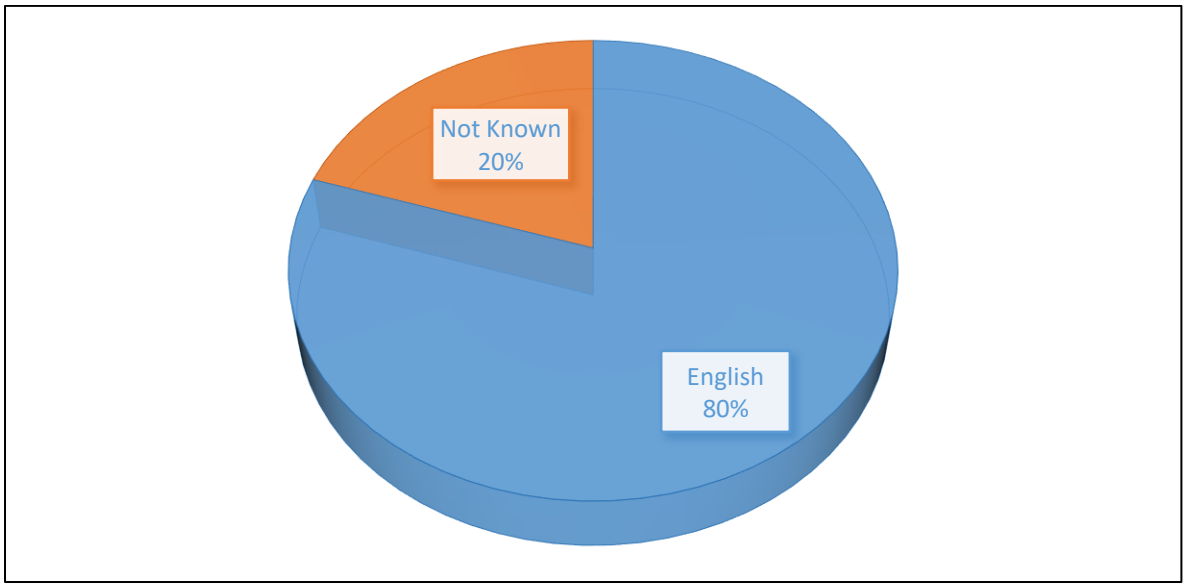


Figure 4

Target Language in the Included Studies



Regarding the target language skills and the duration of data collection, Table 4 provides a comprehensive overview: The primary focus was on productive skills, specifically speaking (n=2) and writing (n=1) while one study encompassed all language skills. With regard to the duration of interventions, the studies exhibited significant variability. One investigation incorporated 16 structured sessions, each lasting approximately one hour, thus offering a relatively standardized learning experience. Another study adopted a 12-week intervention. In contrast, a different study utilized only two human-AI creative writing workshops, suggesting a more condensed and potentially exploratory approach. Importantly, two studies did not disclose the duration of their interventions, which constrains the interpretability and replicability of their findings.

Table 4

Research Context of the Included Studies

Targeted Language Skill(s)	Duration
Vocabulary, grammar, listening, speaking, reading, and writing (Xu & Liu, 2025)	16 structured sessions
Feedback on speaking assignments (Alsager, 2024)	Not mentioned
Speaking, Communication (Y. Wang, 2025)	12 weeks
Writing (Woo et al., 2024)	2 Human-AI creative writing workshops
Not Known (Romero-Rodriguez et al., 2023)	Not mentioned

Self-regulated Language Learning

To present how the SRL was operationalized in the included studies, the data collection tools across CAMM (cognitive, affective, motivational, and metacognitive) processes were mapped. For instance, the study by Xu and Liu (2025) utilized an inclusive set of instruments, including the Foreign Language Enjoyment Scale, Motivation Scale, Autonomy Questionnaire, and Critical Thinking Scale. Accordingly, affective responses, such as foreign language enjoyment, were assessed through a scale. Furthermore, motivation and affective dimensions were partly intertwined, encompassing attitudes towards learning English, self-confidence, learners' perceived personal relevance, and goals, which were assessed through a motivation scale. An autonomy questionnaire and a critical thinking scale addressed the metacognitive aspect while cognition was explored through the critical thinking scale. Alsager (2024) primarily examined the affective and motivational dimensions of language learning by assessing language anxiety and demotivation using established scales. The students' commitment to language acquisition was considered both cognitive and metacognitive, assessed by an Autonomy Perception Scale.

Table 5

CAMM Processes and Data Collection Tools in the Included Studies

Author(s)	Data Collections Tools	SRL Dimensions
Xu &Liu (2025)	Foreign Language Enjoyment Scale	Foreign language enjoyment (Affective)
	Motivation Scale	Attitude toward learning English, self-confidence in language learning, personal use of English (Affective and motivation)
	Autonomy Questionnaire	Self-initiative, decision-making and self-regulation (Metacognition)
	Critical Thinking Scale	Critical openness, reflective skepticism (Metacognition)
Alsager (2024)	Foreign Language Classroom Anxiety Scale	Anxiety related to speaking in an L2 (Affective)
	Questionnaire	Demotivation (Motivation)
	Autonomy Perception Scale	Pupils' commitment to language acquisition (Cognitive) Pupils' commitment to language acquisition (Metacognition)
Y. Wang (2025)	Questionnaire / AI acceptance instrument	AI acceptance - perceived ease of use, perceived usefulness, attitude, and intention (Cognitive, affective, motivation)

Author(s)	Data Collections Tools	SRL Dimensions
Woo et al. (2024)	Questionnaire	Motivation to establish a baseline for students motivation to learn about ChatGPT before workshops and to retrospectively explore student motivation, cognitive load and satisfaction) (Motivation)
	Think-aloud protocols	Cognitive (To explore immediate cognitive load in situ and to supplement other cognitive load data) (Cognitive)
Romero-Rodríguez et al. (2023)	Self-reported questionnaire	University students' acceptance of ChatGPT (Performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, prica value, habit, behavioral intention, user behavior) (Cognitive, affective, motivation)

Y. Wang (2025), on the other hand, utilized merely one questionnaire to reveal learners' AI acceptance involving perceived ease of use, perceived usefulness, attitude, and intention. These subdimensions of the questionnaire revealed the participants' cognitive, affective, and motivational aspects. Similarly, Romero-Rodríguez et al. (2023) adopted a self-reported questionnaire to display university students' acceptance of ChatGPT.

Woo et al. (2024) followed a different path and used think-aloud-protocols in addition to a questionnaire. They aimed to unearth participants' motivation before and after AI-based workshops. Moreover, think-aloud protocols were employed to investigate the participants' immediate cognitive load in real-time.

Key Findings

Xu and Liu (2025) conducted a true-experimental study involving two experimental groups—one supported by Duolingo and the other by ChatGPT—as well as a control group. Their findings indicated that both experimental groups showed significantly higher motivation, enjoyment, and autonomy towards learning English than the control group. These improvements were assessed using validated instruments discussed in the previous section. However, no statistically significant differences were found between the Duolingo and ChatGPT groups across any of the measured dimensions. With a similar perspective, Alsager (2024) compared an experimental group (supported by ChatGPT) with a control group through employing an experimental research design. In contrast to the control group, the experimental group showed less public speaking anxiety, increased motivation, and autonomy, which is in line with Xu and Liu (2025).

Y. Wang (2025) reported the contribution of ChatGPT-4 to EFL learners' speaking skill, albeit with a nonsignificant difference. Yet, the learners' acceptance of ChatGPT changed drastically after being exposed to it. Similarly, Romero-Rodríguez et al. (2023) stated user experiences as the principal factor affecting users' acceptance of ChatGPT. Furthermore, facilitating conditions, habit, and behavioral intention were the factors that had an impact on users' behavior. Although users' acceptance and behaviors are not directly linked to SRL, they might be interpreted as indirectly related to cognitive, affective, and motivational processes of SRL.

With a mixed-methods study, Woo et al.'s (2024) study investigated secondary school students' writing experience (motivation and cognitive load) with GenAI tools (primarily ChatGPT and other GenAI tools). The results indicated a statistically nonsignificant difference in terms of the students' motivation towards writing with a GenAI tool. Also, the participants reported higher cognitive load while GenAI tools were assisting their writing process.

Discussion and Conclusion

This study examined five studies on the intersection of GenAI and self-regulated language learning so as to answer three research questions relying on research context, self-regulated learning and CAMM processes, and key findings. The five studies included in this systematic review exhibited a variety of research designs. Three studies

utilized experimental designs (e.g., Alsager, 2024; Y. Wang, 2025; Xu & Liu, 2025;) while one study adopted a mixed-methods approach (Woo et al., 2024) and another relied on a cross-sectional survey (Romero-Rodríguez et al., 2023). All participants were EFL learners, which aligns with Yang and Li's (2024) review, primarily at the intermediate level, with samples drawn from secondary schools to university settings and sizes ranging from 21 to 400. Although the majority of participants were university students, which is in accord with Lee et al. (2025), one study (Woo et al., 2024) included secondary students, indicating the growing use of GenAI tools across different educational stages. This may show a gradual shift toward adopting GenAI tools, such as ChatGPT, into earlier stages of language education.

Regarding the technological tools used in the included studies, ChatGPT was the primary tool, with its variants also utilized in one study. Yet, the limited range of tools might raise concerns about over-reliance on a single platform, potentially restricting the generalizability across various GenAI systems. The most common target language was English (80%), which was also reported in Lee et al. (2025), with one study not mentioning the target language. That focus on English as the primary target language presents an imbalance in research and potentially disregards other linguistic settings. As for targeted language skills, studies investigated mostly oral communication, leaving other language skills relatively underexplored. Regarding the duration of interventions, one study (Xu & Liu, 2025) conducted structured sessions over 16 weeks while another (Y. Wang, 2025) relied on data collected for 12 weeks. There was one study (Woo et al., 2024) that involved data gathered during two workshops, and one study did not report their duration at all. This inconsistency in reporting limits the comparability of the studies and highlights the need for greater methodological transparency in future studies.

Overall, the findings of RQ1 yield an increasing interest in GenAI tools for L2 education but also present significant gaps in research design diversity, linguistic and contextual scope, and transparent methodological reporting since the majority of the studies examined (80%) were in the context of learning EFL and they may not fully demonstrate the effectiveness of GenAI tools (e.g., ChatGPT) in other languages or in the English as a second language education (ESL) context. Therefore, it is necessary to examine various languages in the context of GenAI and self-regulated language learning in both foreign and second language teaching. In this regard, future studies might benefit from a broader comparison of GenAI tools, the inclusion of different languages and EFL and ESL settings for clearer reporting protocols to enhance replicability and facilitate meta-analytic synthesis.

The studies reviewed indicate that SRL largely focuses on affective and motivational processes while cognitive and metacognitive aspects receive limited attention. Affective constructs, such as enjoyment, anxiety, and attitudes, were commonly assessed using standardized tools like the Foreign Language Enjoyment Scale and the Foreign Language Classroom Anxiety Scale (Alsager, 2024; Xu & Liu, 2025). These instruments enabled researchers to examine learners' emotional engagement with GenAI tools, which is especially significant in technology-mediated environments where emotions play a vital regulatory role (Liu et al., 2023). Motivational components, on the other hand, were frequently examined, primarily using self-report questionnaires that assessed learners' demotivation, engagement, and perceptions of AI tools. Notably, studies indicate a growing interest in understanding how learners' motivational beliefs about GenAI affect their regulatory behaviors.

Cognitive dimensions, though less emphasized, were explored through different approaches. Xu and Liu (2025) utilized a Critical Thinking Scale to assess learners' reflective skepticism and openness, while Woo et al. (2024) made a notable contribution by employing think-aloud protocols to gauge cognitive load during GenAI-mediated writing tasks. These methods provided valuable real-time insights into cognitive engagement.

Metacognitive regulation was relatively underexplored across the studies. When addressed, it was typically inferred from constructs like learner autonomy or included in broader measures of critical thinking. This limitation highlights ongoing critiques in SRL research that warn against oversimplifying or indirectly measuring metacognitive processes, which is indeed a salient support to enhance learners' SRL while engaging with GenAI tools (Xu et al., 2025). Therefore, future studies should implement more robust and explicit operationalizations of metacognition to enhance our understanding of learners' planning, monitoring, and regulation strategies during GenAI use.

In summary, while the studies reviewed offer initial insights into the interaction between GenAI tools and SRL, the overemphasis on affective and motivational measures, coupled with the underrepresentation of cognitive and metacognitive processes, underscores the need for a more balanced and theoretically grounded approach in future research.

The results of the included reviewed studies displayed diverse yet informative findings in terms of the adoption of GenAI tools in language classes and their impact on the participants' SRL. Three experimental studies (Alsager, 2024; Y. Wang, 2025; Xu & Liu, 2025) consistently found that learners using AI-integrated methods outperformed those in control groups in terms of SRL. Xu and Liu (2025) reported that both Duolingo and ChatGPT significantly improved affective, cognitive, and motivational aspects compared to traditional instruction, although no notable differences were found between these two platforms. This might suggest that the key element to enhance SRL may rely on the adaptive and interactive feedback provision (Kasneci et al., 2023)

Similarly, Alsager (2024) showed that instruction supported by ChatGPT reduced anxiety and demotivation while enhancing learners' autonomy. Conversely, Y. Wang (2025) observed only a marginal and non-significant improvement in communication skills among ChatGPT-4 users in addition to the increased acceptance of AI after using it, suggesting that the effectiveness of the tool may vary depending on the context or type of task. These mixed results highlight the need for contextual sensitivity when incorporating GenAI into SRL interventions because GenAI has the potential to increase learning outcomes but requires guidance (Xu et al., 2025)

The acceptance of GenAI tools was another dimension that was addressed by Y. Wang (2025) and Romero-Rodríguez et al. (2023), and their findings relied on user experience as a key dimension because the participants displayed higher acceptance of GenAI tools after using it (Y. Wang, 2025), and the cross-sectional survey result analysis yielded user experience as a fundemantal determinant of acceptance of ChatGPT (Romero-Rodríguez et al., 2023). These results align with the results of a recent study by Mirriahi et al. (2025), who explored the relationship among users' Technology Acceptance Model (TAM), SRL, and GenAI use.

Lastly, integrating the think-aloud protocol in their studies, Woo et al. (2024) reported increased cognitive load while writing with a GenAI tool and a modest, non-significant increase in motivation, raising questions about the cognitive demands of AI-assisted writing. Despite the contributions of this study, the findings do not align with Xu et al.'s study (2025), particularly in terms of the cognitive load aspect. These diverse findings also warrant further investigation.

Overall, this systematic review differs from the previous ones (Lee et al., 2025; Mohebbi, 2025; Sardi et al., 2025; Yang & Li, 2024), particularly because it integrated GenAI tools and self-regulated language learning. Additionally, this study diverges from Chang and Sun's (2024) review since they included studies published between 2000 and 2022, which shows that they could not include GenAI-based studies because 2022 marked the year when the first GenAI tool, ChatGPT, was released. On the other hand, the findings align: Chang and Sun (2024) stated that mostly university-level intermediate EFL/ESL learners displayed increased learner autonomy through AI tools, which is also in line with this systematic review's findings.

The synthesis of findings from the included studies for this review highlights a dynamic interaction between GenAI tools and SRL. Particularly, GenAI technologies function not only as instructional interventions but also as mediating tools that enhance learners' motivational persistence, affective engagement, and cognitive processing. This relationship might suggest that the capabilities of GenAI, such as personalized and real-time feedback and adaptive responses (Barrot, 2023; Sardi et al., 2025), can enhance specific SRL processes, promoting a more autonomous and self-directed learning experience. Consequently, SRL in this review is viewed as a construct that is actively shaped by learners' interactions with GenAI-powered environments, rather than as an isolated concept. Yet, the limited number of included studies warrants further investigation.

On the other hand, while the findings of the included studies in this review generally affirm a positive impact of GenAI tools on various dimensions of SRL, the findings are inconsistent. The variability in outcomes suggests that instructional context, learner profiles, and the nature of engagement with the tool influence the effectiveness of GenAI. Future research should systematically investigate these mediating variables, potentially through longitudinal or mixed-methods designs, to better understand the dynamic interplay between GenAI use and SRL development.

The reviewed studies suggest the role of GenAI tools in L2 learning, with the potential to enhance self-regulated learning, yet with diverse results. While two studies (Alsager, 2024; Xu & Liu, 2025) reported positive trends in motivation, acceptance, and learner autonomy, the findings of Y. Wang (2025) and Woo et al. (2024) were not consistently significant. Moreover, Woo et al. (2024) displayed increased cognitive load for EFL writers while practicing writing through GenAI tools, which contradicts with the findings of Xu et al. (2025). This implies that while GenAI can support SRL processes in terms of cognitive, affective, and motivational processes, its

effectiveness might depend on factors such as task design, learner characteristics, tool usability, and instructional integration, which highlights the importance of integrating GenAI tools into language learning settings (Godwin-Jones et al., 2024).

The reviewed studies display implications for language educators who would like to integrate GenAI tools with their classes to enhance SRL. Integrating GenAI tools like ChatGPT may have the potential to trigger learners' motivation, autonomy, and engagement, which is in accord with the SRL and CAMM processes (Alsager, 2024; Xu & Liu, 2025). Therefore, teachers need to acquire GenAI literacy and SRL pedagogy to ensure responsible and equitable use of the GenAI tools (Pan et al., 2025). To achieve this goal, teacher training or professional development programs may focus on two key areas: Understanding the functionality, advantages, and limitations of GenAI tools and designing tasks that might trigger SRL processes, such as goal-setting, monitoring, and reflection (Pan et al., 2025). Additionally, these findings highlight the need for context-sensitive guidelines to effectively integrate GenAI into curricula, promoting learner agency, critical thinking, and ethical awareness (Godwin-Jones et al., 2024).

Despite promising insights, the current systematic review has several limitations. The number of studies that met the PICO criteria and were included in the study is minimal. One possible explanation for this minimal number could be the specificity of the search terms used. Although the search strategy was carefully crafted to identify studies at the intersection of self-regulated learning, generative artificial intelligence, and language learning, it omitted broader terms like "*large language models*, *LLMs*, *chatbots*, *EFL*, *ESL*, and *language acquisition"*. Consequently, some relevant studies may have been overlooked. Future reviews should consider expanding the search parameters to include these terms, ensuring a more comprehensive and inclusive representation of the literature in this rapidly evolving field. Also, the studies that were solely based on users' perceptions were excluded, and this choice inherently narrows the scope of the review, omitting valuable emerging insights, particularly in a field where research is still exploratory. Hence, future reviews may benefit from including perception-based studies to present a more comprehensive picture of the GenAI–SRL connection.

There is also very limited research on GenAI, SRL, and L2 education. In addition, English was predominantly studied as the target language, and EFL students at universities constituted the majority of the participants. In addition, China is the country where the studies were generally conducted. Based on these limitations, future studies should focus on different target languages, different levels of education, and different countries. Different research designs could be used to explore SRL perspectives in depth over a longer period. Moreover, ChatGPT was the major tool adopted in the included studies, which warrants further research to include other GenAI tools, potentially through comparable studies.

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Öz Düzenleme Becerileri ve Üretken Yapay Zeka: Sistematik Bir İnceleme

Öz

Bu sistematik inceleme, yabancı ve ikinci dil eğitim bağlamlarında üretken yapay zekâ araçlarının entegrasyonunu ve bunların öğrencilerin öz düzenlemeli öğrenmeleri üzerindeki etkisini araştırmayı amaçlamaktadır. PRISMA ve PICO protokollerine bağlı kalınarak, inceleme beş deneysel çalışmayı kapsamaktadır. Bu çalışmalar, iki döngülü bir kodlama yaklaşımı kullanılarak sistematik olarak kodlanmış ve analiz edilmiştir. Araştırma bağlamına ilişkin bulgular, dahil edilen çalışmaların çoğunun deneysel bir tasarım benimsediğini ve öncelikle üniversite düzeyindeki İngilizceyi Yabancı Dil Olarak Öğrenen öğrencileri içerdiğini göstermektedir. ChatGPT, en sık kullanılan üretken yapay zekâ aracı olarak ortaya çıkmış ve İngilizce baskın hedef dil olmuştur. Çalışmalar genelinde, öz düzenlemeli öğrenme bilişsel, duygusal, motivasyonel ve üstbilişsel süreçler aracılığıyla incelenmiştir. Temel sonuçlar arasında öğrencilerin üretken yapay zekâ araçlarını yüksek düzeyde kabul etmesi, ChatGPT kullanırken artan bilişsel yük raporları ve üretken yapay zekâ entegrasyonunun öz düzenlemeli öğrenme süreçleri üzerindeki genel olumlu etkileri yer almaktadır. Makale, eğitimciler için içgörüler sunarak ve gelecekteki araştırmalar için önerilerde bulunarak sona ermektedir.

Anahtar kelimeler: üretken yapay zeka, öz düzenlemeli dil öğrenimi, sistematik inceleme