Review

The Impact of Artificial Intelligence on Self-Regulated Language Learning in Higher Education: A Systematic Review (2022–2025)

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Systematic Review

The Impact of Artificial Intelligence on Self-Regulated Language Learning in Higher Education: A Systematic Review (2022–2025)

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Abstract

This PRISMA-guided systematic review synthesizes evidence (Web of Science & Scopus; searches closed 31 Aug 2025) on how Artificial Intelligence (AI) influences self-regulated language learning (SRLL) in higher education. Twenty-three studies (56.5% published in 2025; 47.8% conducted in China; 56.5% mixed-methods) met the criteria (2022–2025; university EFL/FL). Across nine AI-vs-traditional comparisons, eight (88.9%) reported statistically significant SRL gains favouring AI. Thematic synthesis indicates that GenAI scaffolds cognitive/metacognitive regulation (planning, monitoring, reflection), enhances motivation and reduces anxiety, while challenges include over-reliance, uneven feedback quality, and the need for teacher guidance and governance. Experimental evidence also shows positive effects on writing, speaking, reading, vocabulary, and grammar. We argue that sustainable impact depends on socio-technical alignment—pedagogical design, assessment integrity, and privacy-aware analytics at course and institutional levels. We outline a research agenda for richer qualitative inquiry, harmonised SRL measurement, and transparent reporting to enable future meta-analysis..

Keywords: generative AI; self-regulated learning; foreign language education; higher education; systematic review

1. Introduction

Once merely an indispensable element of science fiction scenarios, artificial intelligence (AI) now stands before us as an influential factor reshaping many areas, including education. With the emergence of different models one after another since late 2022, AI has been widely embraced by society and has spread to large audiences. It is possible to say that many sectors, including education, were caught unprepared by this sudden development and actually experienced a temporary shock. Indeed, a study conducted prior to this rapid development showed that 85% of industry leaders believed in the advantages AI would bring, but only 20% had taken concrete steps to prepare for this transformation [1].

However, it should be noted that various initiatives on how AI could be integrated into education had begun long before this sudden development. For example, the International Artificial Intelligence in Education Society, which aims to support AI-related developments in education, was founded on January 1, 1997 [2]. On the other hand, EDUCAUSE, a pioneering global organization that encourages the strategic use of technology in higher education and conducts research in this field, with over 100,000 members from more than 2,100 institutions, was founded in 1998 [3].

The "Horizon Report," published annually by this organization, is a study that evaluates new technologies and trends that could impact the future of higher education. In the 2017 report, artificial intelligence (AI) was identified as one of the technologies expected to have the greatest impact on education; it was predicted that AI would be widely adopted in this field within four to five years. The report also emphasizes that AI will reshape the field of education by offering more personalized

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and adaptable learning experiences tailored to students' needs [4]. Academic studies on the subject also underscore that AI will have a significant impact on education and teaching [5] and will be one of the most important topics in the field of educational technology over the next 20 years [6].

With the widespread adoption of artificial intelligence, there has naturally been a significant increase in the number of academic studies on the subject. Numerous systematic reviews (SRs) and meta-analyses (MAs) conducted in recent years, which are evidence-based approaches with high evidence value, confirm this remarkable rise. For example, in a review of the impact of artificial intelligence on education, 250 articles published between 2010 and 2019 were examined, and it was noted that 70% of these studies were conducted in 2015 or later [5]. In another review focusing on AI studies in higher education, it was reported that half of the studies examined between 2007 and 2018 were conducted in the three years after 2015 [6].

These studies clearly and explicitly demonstrate the positive contributions of AI in the field of education. For example, the results of the study by Tlili [7] showed that AI has a significant and substantial effect on learning success. This effect is achieved through AI-provided support such as homework and study assistance, offering a personalized learning experience, and developing various skills [8]. AI offers great pedagogical opportunities to support student learning through environments such as personalized education, adaptive learning platforms, and smart learning assistants [5,6].

Furthermore, findings from review studies highlight the positive effects of AI, particularly in language education. Sharadgah and Sa'di [9] noted that AI yielded positive results in optimizing language skills and attitudes. Alhusaiyan [10] demonstrated that AI showed potential for improving language learning, particularly in areas such as writing quality and student participation. Ekizer [11] reports that AI has a statistically significant and substantial overall effect on language learning, significantly improving learning outcomes in terms of writing accuracy, speaking fluency, and student motivation.

However, whether the opportunities offered by AI will translate into truly sustainable success in foreign language learning is largely linked to the student factor. Foreign language learning is recognized as a complex and long-term process that transcends the boundaries of classroom education [13,14]. In this process, students should be active individuals who not only access information but also set their own goals, monitor their progress, and adapt their strategies [15,17]. It is precisely at this point that the concept of Self-Regulated Learning (SRL), which provides a framework for students to effectively manage their cognitive, metacognitive, affective, and behavioral processes, takes on critical importance [12]. This is because AI is not merely a source of information content; it also helps students develop these SRL skills and can guide them on what, when, and how to study [19,20]. Although studies investigating the impact of AI on language learning have increased in the literature, there is a need for current and comprehensive synthesis studies focusing specifically on the impact of AI on SRL. This study aims to fill this highlighted gap.

1.1. Literature Review and Rationale for the Research

With the widespread adoption of AI in education, the number of studies on this topic has rapidly increased. This is particularly evident in the number of studies examining the effects of AI on the SRL process. Parallel to the increase in the number of published studies, the number of SR studies evaluating the intensifying literature in terms of general trends has also increased. Table 1 lists SRs examining the effects of AI in SRL environments. The studies were published in 2024 and 2025, confirming the rapid increase in the number of publications in recent years. However, there are significant limitations in terms of scope and purpose in the existing SR studies.

Table 1. SRs and MAs Examining the Impact of AI on SRL.

Author(s)	Year	n	Time interval	Field of study
Banihashem et al.	2025	84	2018-2024	Multidisciplinary
Chang and Sun	2024	22	2000-2022	Language

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Guan et al.	2025	27	2012-2023	Multidisciplinary
Guan et al.	2024	15	2021-2023	Language
Lan and Zhou	2025	14	2012-2024	Multidisciplinary
Mohebbi	2025	18	2009-2024	Language
Ren et al.	2025	27	2004-2024	Multidisciplinary
Saftari et al.	2025	22	2022-2025	Multidisciplinary
Sardi et al.	2025	38	2022-2024	Multidisciplinary

Existing reviews have generally focused on the general education context, while SRs specifically focused on language education are quite limited [21,22,24]. These studies, however, have investigated the effects of AI on language proficiency in detail. However, they have only superficially addressed the cognitive, metacognitive, and motivational dimensions of SRL. For example, the MA conducted by Guan et al. [222] focused on language proficiency and motivation. Findings regarding SRL were obtained from only four studies. Similarly, Mohebbi [24] also prioritized language skills and examined SRL processes to a limited extent. This creates a significant gap when considering the critical role of SRL in language learning. SRL encompasses not only cognitive and metacognitive processes but also motivational and affective dimensions, which directly impact learning success [16]. Therefore, the neglect of these dimensions in existing studies makes it difficult to understand the holistic impact of AI on SRL.

AI examples that have emerged one after another since 2022 have created new opportunities in the field of education and especially for SRL. As a natural consequence of this development, there has been a noticeable upward trend in the number of new studies investigating the impact of AI on SRL. This situation is also evident from the clustering of review studies in the last two years, as shown in Table 1. Naturally, the relevance of previous studies is fading more rapidly. The problem of relevance is particularly evident in studies on AI's impact on SRL. This situation highlights the need for new SRs to examine the current literature.

When evaluating the studies included in the existing reviews, differences are observed, in Table 2. The most recent studies included in the reviews are from 2024. None of the reviews contain studies from 2025. However, more than half of the studies included in this current review consist of studies conducted in 2025. The studies included in the reviews go back as far as the 2000s, which confirms the issue of currency. In addition, because they span different time periods, very different studies have been included in the reviews. This has led to a very limited overlap between the studies in the existing reviews. This poses a problem in terms of comparability. This situation clearly demonstrates that the SR conducted provides a positive contribution to the literature with a new and up-to-date dataset.

Table 2. Matrix of Common Studies Included in SRs.

	Chang and Sun, 2024	**Guan, Li, and Gu, 2024**	**Mohebbi, 2025**	**Current study**
Chang and Sun, 2024	22	2	0	1
Guan, Li, and Gu, 2024	2	15	1	3
Mohebbi, 2025	0	1	18	0
Current study	1	3	0	23

1.2. Purpose of the Study and Research Questions

This study aims to reveal the effects of AI-supported learning environments on SRLL through a SR. The scarcity of language-focused studies, the superficial treatment of SRL, and the lack of studies focusing on current technologies are noteworthy in existing literature. Our study aims to fill these gaps and offer theoretical and practical contributions to the field.

For this purpose, the following research questions were sought:

(1) RQ1: What are the general trends in studies included in the research?

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(2) RQ2: What is the impact of AI on SRLL?
(3) RQ3: What is the impact of AI on learning outcomes in SRLL environments?

2. Materials and Methods

2.1. Research Design

This SR was conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) reporting guideline [28].

2.2. Eligibility Criteria

The PICO (Population, Intervention, Comparison, and Outcome) framework, which is considered the "gold standard" for SRs and MAs [29], was used as a basis for selecting appropriate studies. The PICOTS (Population, Intervention, Comparison, Outcome, Time, Study Design) model, which is considered an extended version of the PICO framework in the literature [30], was used as a basis. Details of the determined selection criteria are presented in Table 3.

Table 3. Search Combinations by Databases.

	Coverage Criteria	Exclusion Criteria
P (Population)	Language Learners (University level students)	Teachers, Administrators, high school, middle school and primary school students
I (Intervention)	AI-Powered Language Learning Tools	AI applications in fields such as Medicine/Healthcare, Engineering, etc.
C (Comparison)	Comparative studies reporting the impact of AI on SRLL	Non-comparative, purely descriptive or review studies
O (Result)	Self-Regulated Learning (SRL) Skills/Strategies/Levels or Language Skill Development	Only technical issues or infrastructure assessment. Outputs not directly related to SRL
Time	Articles published in 2022 and beyond (to reflect the impact of recent AI technologies)	Studies published before 2022 focus on older AI technologies.
Study (Study Type)	Articles	Conference Abstracts, Book Reviews, Editorials
Language	English only	Non-English studies.

2.3. Data Sources and Search Strategy

Searches were conducted in two comprehensive electronic databases (Web of Science-WoS and Scopus) in September 2025. Search was limited to articles published up to 31 August 2025.

The search was conducted with a combination of keywords to cover the outputs "AI-assisted Language Learning" and "Self-Regulated Learning." The key keywords were: " Artificial Intelligence," "AI," "Self- Regulation," "SRL," "Language." Detailed search combinations are listed in Table 4.

Table 4. Search Combinations by Databases.

Database	Search Combination of Keywords
Web of Science	TS =(("Artificial Intelligence*" OR "AI") AND ("Self- Regulat*" OR "SRL") AND ("Language*"))
Scopus	TITLE-ABS- KEY(("Artificial Intelligence*" OR "AI") AND ("Self-Regulat*" OR "SRL") AND ("Language*"))

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2.4. Study Selection and Data Extraction

The study selection and data extraction process was carried out by two independent raters (MT and BC) in three stages:

1. Title and Abstract Screening: The studies were screened according to eligibility criteria.
2. Full Text Review: The full texts of the studies that passed the initial screening were examined in detail according to the specified criteria.
3. Data Extraction: A previously prepared data extraction form was used for studies that were deemed appropriate.

Cohen's Kappa (κ) coefficient was calculated for both stages [31]. Kappa = 0.89 for title and abstract screening and Kappa = 0.94 for full-text review. These results indicate “strong” (0.89) and “almost perfect” (0.94) agreement according to the Cohen's kappa coefficient (κ) classification proposed by McHugh [31]. All disagreements between the raters (MT and BC) were resolved through discussion. The prepared data extraction form is presented in Appendix 1(see Supplementary Material 1.docx).

2.5. Quality Assessment (Risk of Bias)

Bias of the included studies was assessed by two researchers (MT and BC). In this process, the Mixed Methods Assessment Tool (MMAT), which is a suitable tool for evaluating different research methods (quantitative, qualitative, mixed), was used. The MMAT [32] was used for appraisal. Inter-rater disagreements were resolved through consensus. Additionally, Cohen's kappa coefficient (κ) was calculated to ensure inter-rater reliability [31]. These coefficients were used to interpret the reliability of the study findings.

2.6. Data Analysis and Synthesis

To synthesize the findings, an approach was adopted according to the methodological nature of the studies included (quantitative, qualitative, mixed).

2.6.1. Qualitative Data Synthesis

" Thematic Synthesis" for data obtained from qualitative studies and qualitative parts of mixed method studies The Synthesis approach [33] was adopted. Two researchers (MT and BC) analyzed the data using open coding, thematic networking, and theme interpretation, and derived common themes.

2.6.2. Quantitative Data Synthesis

Findings from experimental and quasi-experimental studies were not suitable for MA due to statistical heterogeneity (different measurement tools and interventions used) and insufficient statistical data reported in the articles. Therefore, quantitative findings were summarized through a narrative synthesis, with the effects of the interventions and their statistical significance reported in the text.

3. Results

3.1. Study Selection Process

The findings of this SR are presented according to the research questions (RQs). The study selection process was conducted according to the PRISMA 2020 guidelines, as shown in Figure 1. Comprehensive research in two major databases (Web of Science and Scopus) was completed on September 10, 2025, and a total of 220 studies were identified (WoS: n = 91; Scopus: n = 129). After removing 84 duplicate studies, 136 records remained for the title and abstract screening stage. Following a detailed review based on the criteria defined for the review, a total of 101 records were

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excluded from the review (66 studies were not related to language teaching, 23 studies did not address SRL, and 12 studies were MAs or SRs). Thirty-five studies remained for full-text assessment. In this final review stage, 12 more studies were excluded for various reasons (1 study was published in a non-English language, 8 studies were irrelevant to the topic, and 3 studies were not at the university level). These excluded studies and the reasons for their exclusion are provided in Appendix 2. As a result, 23 studies that met all inclusion criteria were included in the review process. These studies included in the review are listed in the reference list.

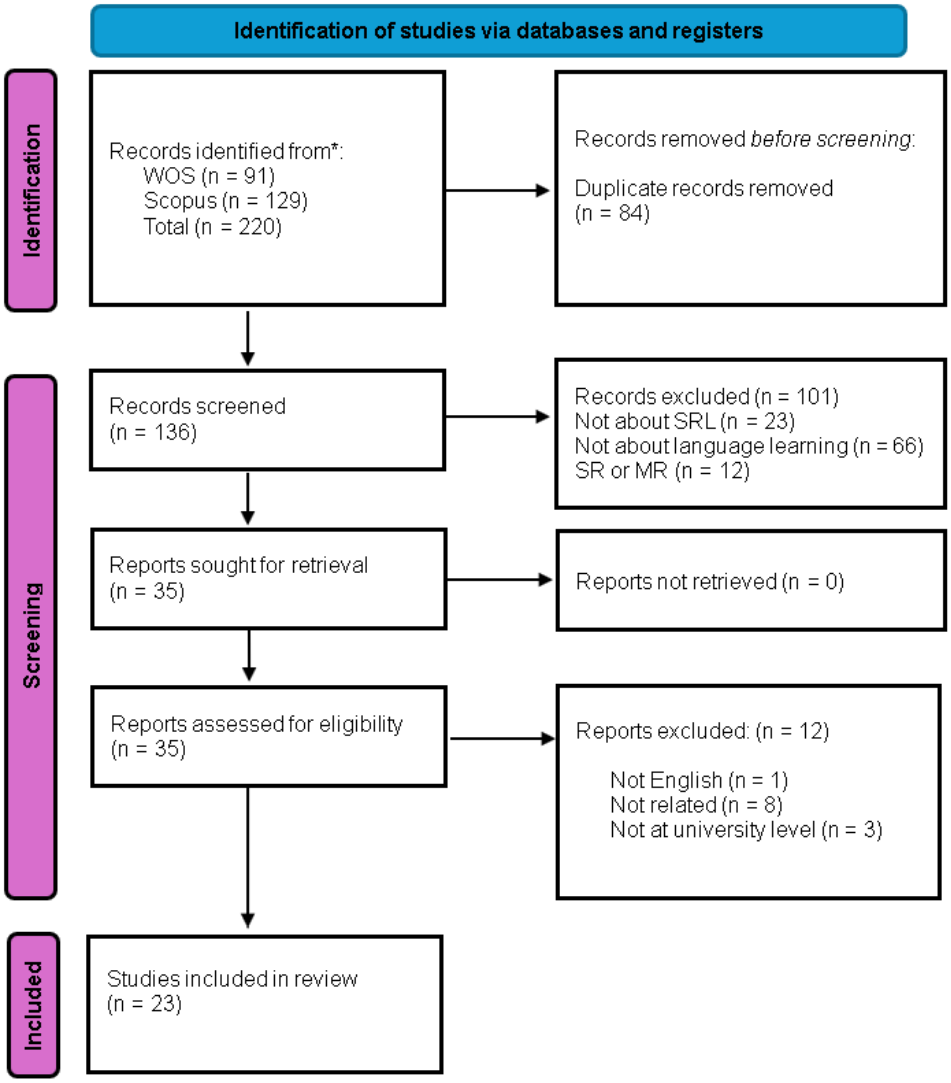

Figure 1. PRISMA flow diagram.

3.2. Quality Assessment (Risk of Bias) Results

All articles of different types (quantitative, qualitative, and mixed) included in the SR were evaluated separately according to their respective categories within the MMAT. The articles were rated between 60% and 100%. Nineteen studies were deemed high-quality, and one study was deemed good quality. The remaining three studies were identified as medium quality (Appendix 3). No studies were excluded according to the quality assessment. The agreement rate between the two evaluators regarding the quality assessment was 81%, indicating a good level of agreement according to Cohen's kappa coefficient (κ) classification [31].

3.3. RQ1: What Are the General Characteristics of the Studies Included in the Research?

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Some basic characteristics of the studies evaluated are presented in Table 5. This information includes details such as the year of publication, the country in which the studies were conducted, and the target foreign language in which they were conducted.

Table 5. Characteristics of Studies.

		n	%			n	%
Year	2022	1	4.35	Country	Australia	1	4.35
	2023	3	13.04		China	11	47.83
	2024	6	26.09		Indonesia	1	4.35
	2025	13	56.52		South Korea	1	4.35
Language	Chinese	1	4.35		India	1	4.35
	French	1	4.35		Iranian	2	8.70
	English	21	91.30		Japan	2	8.70
Design	Mixed method	13	56.52		Taiwan	1	4.35
	Quantitative	5	21.74		Türkiye	1	4.35
	Qualitative	5	21.74		Jordan	1	4.35
	Experimental	13	56.52		Vietnamese	1	4.35

More than half of the 23 included studies, 56.52% (n=13), were published in 2025. China stands out with 47.83% (n=11) in the country distribution. The target foreign language was predominantly English (91.30%; n=21), with studies also in Chinese (n=1) and French (n=1). A large portion of the studies (56.52%) used mixed methods. Quantitative and qualitative methods were used in five studies (21.74%) each. In addition, 13 of the studies (56.52%) include experimental applications investigating the effects of AI on SRL or language learning. These experimental data have been evaluated under separate headings.

3.4. RQ2: What Is the Impact of AI on SRLL?

3.4.1. Experimental Findings

In the SR, the data from 13 studies containing experimental findings were evaluated separately. Two of these 13 studies were not evaluated here because they did not contain data on the effect of AI on SRL. The study by Hao et al. [34] does not present data related to intergroup comparisons. The study by Ebadi et al. [35] did not measure SRL with a quantitative scale. These two studies were not evaluated in terms of experimental findings. Furthermore, in two of the experimental studies included in the review, comparisons were made between groups using different AI applications. Kim, Kim, and Cha [36] investigated the role of teacher support in the SRL process. The findings of the study show that cognitive support and autonomy support are important in terms of teacher support, but emotional support alone is ineffective. However, there is no significant difference in the intergroup comparison. Consequently, the type of teacher support did not create a significant difference in SRL. Liu et al. [37] compared an AI-supported approach that encourages reflective thinking with AI-supported instruction alone. The research results show that the AI-supported approach that encourages reflective thinking significantly improved students' SRL skills compared to AI-supported instruction alone.

Of the remaining nine studies comparing AI and traditional teaching methods, eight found statistically significant differences (88.9%). One study [38] reported no significant difference. However, this study observed greater improvement in scores in the group receiving AI-supported instruction. In conclusion, the findings indicate that AI-supported instruction has a statistically significant and positive effect on SRL compared to traditional methods. Details are provided in Appendix 4.

3.4.2. Thematic Synthesis of Findings

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Other findings indicate that AI addresses the limitations of traditional classroom learning by offering personalized and immediate support during the SRL process. These findings can be categorized into three main themes.

1. Supporting Cognitive and Metacognitive Strategies

Sun et al. [39] demonstrate that AI significantly enhances all three stages of Zimmerman's [15] cyclical SRL model by providing cognitive and metacognitive support to students. AI aids the pre-thinking stage by assisting with tasks such as brainstorming, topic selection, and creating personalized study plans [39–42]. It also supports the performance stage through speaking practice, error analysis, and instant feedback [34,43]. By helping students track and evaluate their progress and offering personalized feedback, AI contributes to the self-reflection phase [37,41].

2. Affective Support

AI boosts motivation and autonomy by making the learning process more engaging through personalized and immediate support [44,45], while also enhancing students' perceptions of self-efficacy and increasing their resilience to challenges [38,39]. Additionally, AI alleviates foreign language anxiety by providing non-judgmental feedback and flexible access opportunities [35,44].

3. Challenges and Limitations

AI positively influences the SRL process by activating cognitive and metacognitive strategies and offering emotional support, such as boosting motivation and reducing anxiety. However, excessive dependence, variable feedback quality, lack of teacher guidance, and ethical and technical challenges are among the issues reported in the studies. Developing an "over-reliance" on AI is the most frequently expressed concern in studies [46,47]. Another challenge is that AI-provided feedback can sometimes be incorrect, superficial, or mechanical [43,44]. AI's inability to capture subtle nuances such as accent or intonation results in feedback being perceived as "mechanical" [44,48]. Furthermore, AI's inability to fully replicate the support that teachers offer, such as empathy and understanding cultural differences, is cited as another limitation [49]. Some technical and ethical challenges, such as access issues, data privacy, and plagiarism risks, are also mentioned in the studies [39].

3.5. RQ3: What Is the Impact of AI on Learning Outcomes in SRLL Environments?

3.5.1. Experimental Findings

Of the 13 experimental studies included in the SR, 12 (excluding Zhang [50]) reported findings on language learning outcomes. These reported data indicate that AI-assisted instruction has significant and positive effects on learning outcomes across language proficiency domains, including speaking, reading, writing, vocabulary, and grammar. These findings are presented in detail in Appendix 5.

Research findings indicate that AI has a significant and positive impact on the fundamental components of language learning: speaking [35,41,51,52], writing [37,38], reading [42,53], vocabulary [34,36,54] and grammar [36,54] knowledge. The results of the study conducted by Wei [45] determined that AI has positive and significant effects on general language achievement, including grammar, vocabulary, reading and writing components (Appendix 5).

3.5.2. Thematic Synthesis of Findings

AI is reshaping the ways language learning supports core competency areas (writing, speaking, reading, vocabulary, and grammar). Studies based on student perceptions and qualitative data suggest that both these tools offer distinct advantages [45].

1. Writing Skills

AI is used by language learners at every stage of the writing process, from idea generation to final editing. Students report that instant feedback is particularly useful for improving their writing skills [39,55].

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2. Speaking Skills and Pronunciation

AI significantly reduces speech anxiety by providing a non-judgmental practice environment (Ebadi et al., 2025; Nhan et al., 2025). Students can practice pronunciation with AI-based applications (ELSA Speak or Orai) [48,51] or gain fluency through conversations with chatbots [47].

3. Reading Skills

In terms of reading, AI is primarily used as a support tool for understanding and summarizing complex texts [47]. Additionally, there is evidence that AI-based language learning platforms help students use metacognitive reading strategies such as “using contextual clues” and increase their reading motivation [56].

4. Vocabulary and Grammar

AI supports students' vocabulary learning process by presenting words in context and suggesting their synonyms [43]. In the grammar learning process, AI is widely used for real-time error detection and correction [38].

4. Discussion

This SR examined the effects of AI on SRLL. The findings are presented within the framework of the research questions. In this section, the findings related to each research question are interpreted and compared with the existing literature.

4.1. RQ1: What Are the General Characteristics of the Studies Included in the Research?

When the distribution of articles by year is considered, the results of the review show that the number of studies focusing on the effect of AI on SRLL is increasing exponentially every year. Studies conducted in 2025 alone account for more than half of the total number. This is consistent with the findings of other SRs in the literature. For example, Sardi et al. [27] included 38 studies in their study covering the years 2022, 2023, and 2024. 30 of the included studies were conducted in 2024. Similarly, in the study covering 22 studies by Saftari et al. [26], 11 studies were conducted in the latest year, 2025. Ren et al. [25] underline this situation and state that there has been an explosion in the last three years. In this study, it is seen that approximately 74% of the 27 studies were conducted in the last three years, and 12 studies were conducted in 2024, the last year included. Pan et, al. [42] also found that 70% of the research conducted over a 13-year period was conducted in the last four years. This result can certainly be attributed to the widespread availability and widespread adoption of ChatGPT and similar AI tools in 2022 and beyond. Furthermore, the accelerated digitalization following the pandemic could be considered another factor. However, the implications of this trend for research quality, methodological diversity, and pedagogical integration constitute a critical area of discussion for future studies.

When evaluated according to the countries in which they were conducted, studies from 11 different countries were included in the review. It is seen that almost half of the studies, i.e. 11 studies, originated from China (47.83%). This country is followed by Iran (8.70%) and Japan (8.70%) with two studies each. When the findings of other studies in the literature are examined, there are differences in the distribution by country. The countries with the most publications are listed as Taiwan (21.1%), China (17.5%), and Iran (14.3%) by Pan et al. (2025). Sardi et al. (2025) listed the countries with the most publications as Hong Kong (15.8%), Taiwan (7.9%), and While China (7.9%) is the most popular research area, Banihashem et al. [20] ranks it as the United States of America (42.9%), China (15.5%), Canada (9.5%), and Taiwan (8.3%). These differences may be due to the aims of the reviews, the time periods covered, the databases, and the inclusion criteria. However, it is noteworthy that China is among the countries with the most publications in all studies. This can be explained by China's strategic investments in artificial intelligence and language learning, the national priority of English language learning, and its extensive research ecosystem [57].

Considering the distribution of studies included in the study as the target foreign language, it is seen that the target foreign language in the majority of the studies is English (91.30%). In addition,

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Chinese [39] and French [38] were taken as the target foreign language in one study (4.35%) each. When the literature is evaluated, all three studies on the effect of AI on the SRLL process include studies in which only English was taught as a foreign language [21,22,24]. However, this finding supports the idea that English is a global "lingua franca" position [58]. Another factor may be that AI tools have been trained largely with English data. However, this situation highlights a research gap regarding the effects of AI technologies on SRLL in other foreign language teaching (Chinese, French, Arabic, etc.).

Our findings indicate that the predominant research approach preferred in the studies included in the SR was mixed methods. However, similar studies differ in this regard. The preferred research methods appear to be predominantly quantitative [20,23,25,27]. Therefore, it is emphasized that qualitative methods are significantly inadequate and that greater focus should be placed on the use of qualitative research methods, and recommendations are offered in this direction [20,25,27]. The dominance of mixed methods in the studies included in the review highlights a trend toward a hybrid approach that provides a balance between quantitative and qualitative methods in this field. Indeed, mixed method research enables the production of rich information and more robust results that cannot be obtained through a single method alone.

4.2. RQ2: The impact of AI on SRL

One of the clearest findings obtained in this review is that AI has a strong and positive effect on SRL. Experimental studies comparing AI with traditional teaching have largely (88.9%) reported a statistically significant difference in favor of AI. This finding is consistent with the results of other literature reviews confirming the positive effect of AI on SRL [25–27]. A thematic synthesis of other findings shows that AI enhances the SRL cycle by supporting cognitive and metacognitive strategies. Among current SRs, the study by Chang and Sun [21] emphasizes the importance of cognitive and metacognitive factors in language learning, while other reviews also highlight the significance of these factors in multidisciplinary studies [20,26]. It is observed that studies examining AI's impact on the SRL process emphasize the importance of cognitive and metacognitive support, and most of these studies have focused on improving these dimensions [20,21,26]. The study also highlights the importance of affective support in addition to cognitive and metacognitive support provided by AI in the SRL process. In fact, affective supports such as motivation and anxiety are considered fundamental components of SRL, just like cognitive and metacognitive supports [16]. However, SRs in the literature reveal that while cognitive and metacognitive support are the main focus of research, emotional components such as motivation and anxiety are not sufficiently addressed [20,26]. This point has been identified as a literature gap that needs to be explored in future studies. On the other hand, research findings indicate that, alongside the positive effects of AI on the SRL process, certain challenges and limitations must be considered. Similarly, recent reviews also point to the possibility of over-reliance on AI, excessive dependence on feedback [23,27], the possibility of overlooking some nuances inherent to human nature in the AI interaction process [24], and the importance of teacher guidance and pedagogical integration [23,27].

4.3. RQ3: What Is the Impact of AI on Learning Outcomes in SRLL Environments?

In this SR, experimental findings demonstrate that artificial intelligence has significant and positive effects on the core components of language learning, such as speaking, writing, reading, vocabulary, and grammar. This finding is consistent with the results of other review studies in literature. For example, [22] reported in their MA that AI has significant and positive effects on overall language achievement as well as on sub-dimensions of language learning such as vocabulary, speaking, and writing. The review by Mohebbi [24] revealed that AI provides significant support, particularly in writing and grammar, and is also effective in public speaking and speaking practice.

5. Conclusions

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This SR comprehensively evaluated the effects of artificial intelligence on SRLL in higher education and revealed significant findings. Conducted in accordance with PRISMA guidelines, this study included 23 articles published in 2022 and thereafter. The rapid proliferation of AI-related developments, especially after 2022, played an important role in setting this date. More than half of the studies examined in the review consist of articles published in 2025. China is observed to be the country with the highest number of publications. In almost all the studies, the target language is English. The most preferred research method is the mixed method.

When the findings are evaluated as a whole, the most important result obtained is that AI has significant and positive effects on SRLL. In 88.9% of the experimental studies comparing traditional instruction, it was concluded that AI has a positive effect on SRLL. Another result is that, in addition to providing cognitive and metacognitive support during the SRLL process, AI also offers important affective support such as motivation and reducing anxiety. However, alongside the positive contributions of AI to the SRLL process, excessive dependence on AI, issues with the quality of feedback, lack of human interaction, and technical and ethical problems have been identified as some of the challenges and limitations. Furthermore, the findings reveal that AI has significant and positive effects on the main components of language learning—speaking, writing, reading, vocabulary, and grammar.

Despite all the advantages it offers, overdependence, feedback issues, lack of human interaction, technical and ethical challenges that limit the effectiveness of AI in SRLL processes must be addressed in future studies to ensure a comprehensive understanding of the subject. This study examined the effectiveness of AI in SRLL processes with a focus on higher education. This topic should be examined at different levels of education. Furthermore, more emphasis should be placed on qualitative research, and the balance between quantitative and qualitative methods should be maintained.

Supplementary Materials: The following supporting information can be downloaded at the website of this paper posted on Preprints.org, Supplementary Material 1.docx.

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Abbreviations

The following abbreviations are used in this manuscript:

AI	Artificial Intelligence
SRL	Self-Regulated Learning
SRLL	Self-Regulated Language Learning
SR	Systematic Review
MA	Meta-Analysis
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses

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(*): The asterisk indicates inclusion of the article in the corpus analyzed for this review.

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