How Conversational AI Chatbots Support and Reinforce Self-Regulated Language Learning

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Abstract

The integration of Artificial Intelligence (AI) into education has heralded new paradigms for language learning, with conversational AI chatbots emerging as potent tools for fostering learner autonomy. Therefore, this article explores how conversational AI chatbots support and reinforce Self-Regulated Learning (SRL) in language acquisition. It examines how conversational AI chatbots scaffold self-regulated language learning (SRLL) through personalised, adaptive, and metacognitive support, drawing on Zimmerman's cyclic model of self-regulated learning (SRL) and Winne and Hadwin's COPES framework. It synthesises empirical insights, particularly from Abdallah (2024) on developing EFL student teachers' skills via an AI-chatbot SRL model, with established SRL theoretical frameworks (e.g., Zimmerman, Winne & Hadwin) and recent literature. It also examines mechanisms by which chatbots enhance key SRL cyclical phases—forethought (goal-setting, planning), performance (monitoring, strategy use), and self-reflection (evaluation, adaptation)—through features like immediate personalised feedback, adaptive scaffolding, and opportunities for metacognitive engagement. Pedagogical implications of Abdallah's (2024) four-phase model for designing effective chatbot-

assisted language learning are highlighted, focusing on fostering motivation, engagement, and learner autonomy. It proposes five principles for effective chatbot implementation: strategic prompting, metacognitive scaffolding, affective-aware feedback, data-driven personalisation, and ethical transparency. Hence, the article contributes a conceptual roadmap for employing AI to transform language education into a student-centred, lifelong learning paradigm. The transformative potential of AI chatbots is discussed alongside challenges in ethical design, contextual adaptability, and avenues for future research to optimise their role in cultivating self-regulated language learners.

Keywords Chatbots, Conversational AI, Educational Technology, Feedback, Language Education, Language Learning, Learner Autonomy, Metacognition, Pedagogical Models, Personalisation, Self-Regulated Learning (SRL), Zimmerman's model

1. Introduction

The field of language education is undergoing a significant transformation, largely driven by advancements in Artificial Intelligence (AI). Among these innovations, conversational AI chatbots have garnered considerable attention for their potential to create interactive, personalised, and accessible learning experiences (Chiu et al., 2023). A critical aspect of successful language acquisition is the learner's ability to manage and direct their own learning journey, a concept known as Self-Regulated Learning (SRL). SRL encompasses the cognitive, metacognitive, motivational, and behavioural processes that learners employ to achieve their educational goals (Zimmerman, 2002; Panadero, 2017). This article aims to explore the multifaceted ways in which conversational AI chatbots can support and reinforce self-regulated language learning.

Despite its proven benefits for academic achievement and lifelong proficiency (Zimmerman, 2002), SRLL remains challenging due to learners' difficulties in effective goal setting, resource identification, and progress monitoring (Bjork et al., 2013; Winne, 2018). This article specifically addresses two key questions:

1. How do conversational AI chatbots align with established SRL frameworks to reinforce language acquisition?
2. What design principles can maximise their efficacy in promoting learner autonomy and effective SRLL?

Drawing substantially on the comprehensive research conducted by Abdallah (2024), which demonstrated the positive impact of an AI chatbot-supported SRL pedagogical model on EFL student teachers' self-expression and reflective writing skills, this article will delve into the theoretical underpinnings and practical applications of this synergy. The study highlighted how chatbots like ChatGPT and Google Bard, when integrated into a structured learning framework, can significantly enhance learners' skills by promoting autonomy and metacognitive awareness. This article will build upon these findings, integrating them with recent scholarly works to provide a robust understanding of how chatbots foster SRL in language learners.

2. Theoretical Foundations: Self-Regulated Learning in Language Acquisition

Self-Regulated Learning (SRL) refers to the active and constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behaviour, guided and constrained by their goals and the contextual features of the environment (Pintrich, 2004; Zimmerman, 2000). In the context of language learning, SRL is crucial as it empowers students to become autonomous learners capable of identifying their strengths

and weaknesses, setting appropriate learning objectives, selecting and applying effective learning strategies, monitoring their comprehension and production, and evaluating their learning outcomes (Abdallah, 2024; Dizon et al., 2025).

Zimmerman's (2000) influential model describes SRL as a cyclical process involving three key phases, which Abdallah (2024) also emphasizes:

- ***Forethought:*** This phase includes goal setting, strategic planning, and building self-motivation beliefs.
- ***Performance:*** This phase involves the implementation of chosen strategies and active self-monitoring of progress against set goals.
- ***Self-Reflection:*** This phase encompasses self-evaluation of performance, making causal attributions for successes and failures, and deriving adaptive inferences to guide future learning efforts.

Conversational AI chatbots can directly reinforce this cycle. For example, they can facilitate guided goal setting during forethought (e.g., by prompting users with questions like, *"What vocabulary targets will you achieve this week?"*), offer real-time strategy adjustments during the performance phase (e.g., suggesting paraphrasing techniques during writing exercises), and provide post-task reflection prompts in the self-reflection phase (e.g., *"How did your pronunciation practice align with your goals?"*).

Winne and Hadwin's (1998) COPES (Conditions, Operations, Products, Evaluations, Standards) model further details the metacognitive processes involved in SRL, where learners define tasks (Conditions),

apply cognitive strategies (Operations), generate outcomes (Products), judge these outcomes (Evaluations) against criteria (Standards). Chatbots can potentially support each of these facets by, for example, helping to define learning conditions (e.g., curating resources), supporting cognitive operations (e.g., vocabulary drills), evaluating learning products (e.g., essays submitted for feedback), and aligning these outcomes with established standards (e.g., CEFR benchmarks). The alignment of chatbot functions with these SRL frameworks is further illustrated in Table 1.

Table 1: Alignment of Chatbot Functions with SRL Frameworks

SRL Phase	Chatbot Support Mechanisms	Theoretical Basis
Forethought/Planning	Prompt engineering for goal setting; resource recommendations	Zimmerman (2000); Winne (2018)
Performance/Monitoring	Speech recognition for fluency feedback; strategy suggestions during tasks	Azevedo (2018); Chang et al. (2023)
Reflection/Adaptation	Analytics-driven progress reports; adaptive recommendations for future tasks	Panadero (2017); Winne & Hadwin (1998)

Effective language learners are often highly self-regulated, continuously adjusting their approaches to meet the demands of language tasks and improve their proficiency. The development of SRL skills is particularly vital in technology-enhanced learning environments

where learners often have more control over the pace and direction of their studies (Abdallah, 2024; Guan et al., 2025).

Furthermore, Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD) is highly relevant. From a social constructivist perspective, chatbots can act as 'more knowledgeable others,' providing scaffolding that helps learners bridge the gap between their current abilities and their potential. By engaging learners in contextualised conversations (e.g., debating topics like climate change in the target language), chatbots can simulate social interactions that facilitate the internalisation of linguistic rules and cultural pragmatics (Vygotsky, 1986). This can also serve to mitigate language learning anxiety—often a key barrier to L2 speaking—by providing low-stakes practice environments (Huang et al., 2023).

3. The Emergence of Conversational AI Chatbots in Education

Conversational AI chatbots are computer programmes designed to simulate human-like conversations through natural language processing and machine learning techniques (Abdallah, 2024; Chiu et al., 2023). In educational settings, particularly language learning, AI chatbots offer unique affordances. They can provide learners with opportunities for interaction, practice, and feedback in a non-threatening environment (Abdallah, 2024; Klimova & Ibna Seraj, 2023). As highlighted by Abdallah (2024), AI-assisted language learning tools can offer adaptive feedback, suggestions, and alternatives to improve skills such as grammar, vocabulary, reading, writing, and speaking. Recent advancements, particularly with large language models (LLMs) like those powering ChatGPT, have significantly enhanced the capabilities of these chatbots, making them more versatile and effective learning companions (Dizon et al., 2025).

4. Mechanisms of Support: How AI Chatbots Foster Self-Regulated Language Learning

AI chatbots can support and reinforce SRL in language learning through various mechanisms, many of which are empirically supported by the study of Abdallah (2024) and other recent research.

4.1 Goal Setting and Planning

Effective SRL begins with clear goal setting (Zimmerman, 2000). AI chatbots can guide learners in establishing specific, measurable, achievable, relevant, and time-bound (SMART) goals for their language learning tasks (Abdallah, 2024). For instance, chatbots can prompt students to define what they want to achieve in a writing task or a conversational practice session (e.g., *"What vocabulary targets will you achieve this week?"*). Strategic prompting by chatbots can help learners articulate abstract objectives into concrete plans. Some chatbots can also help learners break down larger goals into manageable sub-goals and suggest learning paths or resources, thus aiding in the planning (forethought) phase of SRL (Guan et al., 2025).

Effective prompting can guide learners to establish SMART (Specific, Measurable, Achievable, Relevant, Time-bound) goals. For instance, a chatbot might provide feedback and a goal like: '*Your essay draft used 15 passive constructions. Target reducing these by 20% in your next revision using active voice exercises I'll generate*.' This type of interaction externalises abstract objectives into concrete plans, aligning directly with Zimmerman's forethought phase.

4.2 Monitoring Progress and Performance

Self-monitoring during the performance phase is a cornerstone of SRL. Chatbots can provide immediate and ongoing feedback on various

aspects of language use, such as pronunciation, grammar, vocabulary, fluency, and coherence (Abdallah, 2024; Kim et al., 2021, as cited in Klimova & Ibna Seraj, 2023). This allows learners to track their performance in real-time, identify errors, and understand areas needing improvement. Abdallah (2024) notes that this continuous feedback loop is crucial for learners to adjust their strategies and monitor their progress towards their goals. Chatbots can also prompt self-assessment during tasks (e.g., "*How confident are you in using these transitional phrases? Rate 1–5*").

Recent studies demonstrate chatbots' efficacy across domains: for example, AI tools like Duolingo have been shown to improve fluency (effect size d = 0.72) and pronunciation (d = 0.68) through speech recognition and corrective feedback (Huang et al., 2023). Similarly, in writing, chatbots can scaffold the drafting and revision process via sentence-structuring prompts and grammar correction, reportedly enhancing coherence by up to 40% (Divekar et al., 2022). For vocabulary acquisition, chatbots incorporating spaced repetition algorithms have been found to boost retention rates by 55% compared to static flashcards (Li et al., 2023).

4.3 Personalised Feedback and Scaffolding

One of the significant strengths of AI chatbots is their ability to provide personalised learning experiences (Abdallah, 2024; Vy & Pham, 2024). They can adapt to individual learners' proficiency levels, learning styles, and preferences, offering tailored feedback and scaffolding. As demonstrated in Abdallah's (2024) research, chatbots can provide prompts, hints, examples, and questions to scaffold the learning process, particularly in complex tasks like writing. This individualised support helps learners overcome challenges and build confidence, key components of SRL. For instance, chatbots can offer data-driven

personalisation by recommending resources matching learners' interests or adapting task difficulty based on error patterns. Recent studies also confirm that personalised feedback from chatbots enhances learner motivation and engagement (Silitonga et al., 2023; Mohamed, 2024). Affective-aware feedback, where chatbots might detect frustration and adjust their approach, is an emerging area with promise (Xiao et al., 2024).

This data-driven personalisation can manifest in various ways, such as recommending resources that match learners' declared interests (e.g., suggesting climate-related texts for environmental science majors learning English) or dynamically adapting task difficulty based on observed error patterns (e.g., simplifying dialogue structures if comprehension rates fall below a certain threshold).

4.4 Enhancing Motivation and Engagement

Motivation is a critical driver of SRL. AI chatbots can enhance learner motivation by offering an interactive, engaging, and non-judgemental learning environment (Abdallah, 2024; Petrović & Jovanović, 2021, as cited in Klimova & Ibna Seraj, 2023). The novelty of conversing with an AI, the gamified elements in some chatbots, and the reduction of communication apprehension (fear of making mistakes in front of human interlocutors) can make language practice more enjoyable and less stressful (Abdallah, 2024; Klimova & Ibna Seraj, 2023). Dizon et al. (2025) found that ChatGPT had significant positive effects on students' motivation in L2 writing. This sustained engagement is vital for learners to persist in their learning efforts, a hallmark of self-regulated learners.

This sustained engagement is vital for learners to persist in their learning efforts, a hallmark of self-regulated learners. Indeed, a 2023

Randomized Controlled Trial involving 93 Chinese EFL learners revealed that AI-based instruction significantly elevated self-regulation scores by 32%, partly through the use of reflective journaling prompts, and increased intrinsic motivation by fostering learner autonomy via personalised learning pathways (Huang et al., 2023).

4.5 Facilitating Reflection and Self-Evaluation

The self-reflection phase of SRL involves evaluating one's performance and learning processes. AI chatbots can promote reflection by encouraging learners to think critically about their responses and the feedback received. As seen in Abdallah's (2024) study, chatbots were used to prompt EFL student teachers to reflect on their teaching experiences and writing, thereby enhancing their reflective writing skills. Journaling with prompts provided by chatbots can further stimulate metacognitive awareness and self-evaluation. For example, a chatbot might ask, "*Compare your first and latest recordings. Where did pronunciation improve?*" Teng (2024) highlighted that students with high metacognitive awareness could more effectively utilise ChatGPT for improving their writing, underscoring the link between chatbots, self-regulation, and metacognition.

Metacognitive scaffolding, such as the use of 'reverse prompting' where chatbots ask evaluative questions, can significantly strengthen these reflective skills. For instance, a chatbot might ask: '*You paused frequently during this conversation. Which vocabulary gaps caused this? Let's review those terms.*' Table 2 provides further examples of chatbot prompts designed to foster different phases of SRL.

Table 2: Chatbot Prompts for SRL Phases

SRL Phase	Chatbot Prompt	Function
Planning	"What resources will you use to prepare for your presentation?"	Resource identification
Monitoring	"How confident are you in using these transitional phrases? Rate 1–5."	Self-assessment
Evaluation	"Compare your first and latest recordings. Where did pronunciation improve?"	Progress tracking
Adaptation	"Based on today's errors, should we focus on prepositions or articles next?"	Strategy adjustment

5. Empirical Evidence and Pedagogical Models: The Case of Abdallah (2024)

The study by Abdallah (2024) provides significant empirical evidence for the efficacy of AI chatbots in supporting SRL and enhancing specific language skills. The research employed a pre-post quasi-experimental design with 50 EFL student teachers, using AI chatbots (Bing, ChatGPT, and Google Bard) within a pedagogical model grounded in SRL and situated language learning principles. The results indicated statistically significant improvements in both self-expression and reflective writing skills post-intervention. Specifically, improvements

were noted in vocabulary use, grammatical accuracy, fluency, critical thinking, self-evaluation, and clarity of ideas (Abdallah, 2024).

The pedagogical model proposed by Abdallah (2024) offers a structured, four-phase approach for integrating AI chatbots to foster SRL:

- ***Preparation Phase:*** Involves selecting appropriate chatbots, introducing them to students, explaining their features and benefits, providing demonstrations, and establishing clear guidelines for their use in self-regulated learning.
- ***Implementation Phase:*** Focuses on engaging students with the chatbots through assigned tasks and real-time conversations. It includes self-assessment activities and encourages students to use the chatbot's direct input and feedback features to improve language accuracy and fluency.
- ***Reflection Phase:*** Aims to foster self-expression and reflective writing skills by prompting students to write about their experiences with the chatbot and their learning outcomes. This phase includes peer review and encourages revision based on feedback.
- ***Evaluation Phase:*** Involves evaluating students' progress and learning outcomes using AI analytics and feedback integration. Post-test activities assess language proficiency and SRL skills.

This model underscores the importance of a systematic and theoretically grounded approach to chatbot integration, rather than ad-hoc usage, to maximise benefits for self-regulated language learning. The findings align with a growing body of research suggesting that AI-mediated instruction can positively impact learning achievement, L2 motivation, and SRL (Wei, 2023; Dizon et al., 2025).

6. Key Design Principles for SRLL-Supportive Chatbots

6.1 Strategic Prompting for Goal Setting:

A foundational design principle for SRLL-supportive chatbots is the incorporation of strategic prompting to facilitate robust goal setting. While the capacity of chatbots to guide learners in establishing clear objectives, such as SMART goals, has been noted (Abdallah, 2024; Zimmerman, 2000), a deliberate design emphasis on how these prompts are delivered can significantly enhance their efficacy. Instead of generic encouragement, this principle advocates for context-sensitive prompts that emerge from the learner's ongoing interaction or specific performance data.

For example, a well-designed chatbot implementing this principle would move beyond simple questions like *"What are your goals?"* to offering specific, actionable suggestions based on identified learning needs: *"Analysis of your recent conversational practice shows frequent hesitation with past tense irregular verbs. For our next session, would you like to set a target of correctly using 10 different irregular past tense verbs in context?"* This approach not only aids in transforming abstract learning desires into concrete, manageable targets but also ensures that goals are personalised and directly relevant to the learner's immediate developmental needs. By systematically embedding such tailored prompting mechanisms, chatbots can more effectively externalise the challenging internal process of goal formulation, thereby robustly scaffolding the crucial forethought phase of self-regulated learning (Guan et al., 2025).

6.2 Metacognitive Scaffolding:

Beyond guiding goal establishment, a crucial design tenet for SRLL-enhancing chatbots is the systematic provision of metacognitive scaffolding. This principle involves designing chatbot interactions that

actively prompt learners to engage in higher-order thinking about their learning processes, encompassing planning, monitoring, evaluation, and regulation (Winne & Hadwin, 1998; Zimmerman, 2000). Rather than passively providing information, a chatbot engineered with this principle in mind would proactively interject questions and cues designed to stimulate self-awareness and strategic thinking throughout the learning task.

For example, during a complex grammar exercise, it might pause to ask, *"What strategy are you currently using to identify the correct tense, and how effective do you feel it is for this particular sentence type?"* Or, following a series of errors, it might prompt, *"Let's take a moment. Can you identify a pattern in the mistakes you've just made, and what might you adjust in your approach for the next set of questions?"* The objective is to make implicit cognitive processes more explicit and to cultivate the learner's ability to self-interrogate and adapt their strategies dynamically. Integrating such metacognitive triggers systematically into the chatbot's dialogue flow, perhaps even adapting the level of scaffolding based on learner responses, can transform the tool from a mere practice utility into a genuine partner in developing self-regulatory skills.

6.3 Affective-Aware Feedback:

Beyond cognitive and metacognitive support, addressing the affective domain is crucial. Chatbots that can detect learner frustration (e.g., through analysis of repeated errors, hesitation markers, or sentiment in typed input) could deploy motivational scaffolding. For example, a chatbot might respond with: *'This grammar topic is challenging! Let's try a role-play scenario instead to practice it differently.'* While emotion recognition in NLP is still an emerging field, its development holds

promise for sustaining engagement and providing more empathetic learning support (Xiao et al., 2024).

6.4 Data-Driven Personalisation:

A cornerstone of effective AI-assisted SRLL is the principle of data-driven personalisation, which involves designing chatbots to dynamically tailor learning experiences based on the continuous analysis of individual learner data. This goes beyond static customisation options, envisioning systems that intelligently adapt content, pacing, and support mechanisms in response to a learner's evolving proficiency, specific error patterns, interaction history, and even stated preferences (Abdallah, 2024; Vy & Pham, 2024).

For instance, a chatbot embodying this principle might analyse a learner's persistent difficulty with a particular grammatical structure across multiple activities and then proactively adjust the subsequent learning pathway to include more targeted micro-lessons or varied practice modalities for that specific concept before progressing. Similarly, if a learner consistently demonstrates rapid mastery in vocabulary acquisition tasks but struggles with conversational fluency, the system could recalibrate the balance of activities, prioritising interactive dialogues over lexical drills. The power of this design principle lies in its capacity to create a truly individualised learning trajectory, ensuring that instructional support is always optimally matched to the learner's current needs and Zone of Proximal Development (Vygotsky, 1978), thereby fostering sustained engagement and more efficient progress within the self-regulated learning cycle.

6.5 Ethical Transparency:

Given the data generated during learner-chatbot interactions, ethical transparency is paramount. To address data privacy and build trust, chatbots should ideally anonymise user data where possible and provide clarity on how responses are generated or why certain learning paths are suggested (e.g., *'I suggested this verb tense based on your error log from previous exercises'*) (Abdallah, 2024; Xiao et al., 2024).

7. Challenges and Future Directions

Despite the promising potential, several challenges and considerations remain in employing AI chatbots for SRL in language learning.

7.1 Current Limitations and Over-reliance:

Learners might become overly dependent on chatbots for corrections or generating content, potentially hindering their independent problem-solving skills and critical thinking (Abdallah, 2024; Dizon et al., 2025). Concerns also persist regarding the accuracy and contextual appropriateness of responses from some chatbots, particularly with natural language or complex discourse (Tai, 2024, as cited in Chiu et al., 2023). Furthermore, current chatbots often exhibit limitations in emotional intelligence, struggling to interpret sarcasm, humour, or subtle cultural nuances, which can lead to misinterpretations or stilted interactions. Many platforms also lack the contextual depth required to support complex discourse analysis necessary for advanced academic writing or nuanced argumentation.

7.2 Technical Limitations, Access and Ethical Concerns:

Issues such as chatbots failing to understand complex expressions, limited emotional intelligence or affective awareness, and the digital divide affecting access to these technologies need to be addressed

(Chiu et al., 2023; Xiao et al., 2024). Privacy, data security, and the potential for bias in AI algorithms are significant ethical considerations. Transparency in how chatbots generate responses and use learner data is crucial (Abdallah, 2024; Xiao et al., 2024).

7.3 Pedagogical Integration and Future Research Priorities:

Effectively integrating chatbots into language curricula requires careful planning, teacher training, and the development of sound pedagogical models, as exemplified by Abdallah (2024). The role of teachers remains crucial in guiding students to use these tools critically and effectively (Chiu et al., 2023).

Future research should continue to explore the long-term effects of chatbot use on SRL and language proficiency (Silitonga et al., 2023). Key research priorities include the development of multimodal chatbots that might incorporate gesture recognition or other modalities for more holistic pragmatic and communicative competence training. There is also a need to investigate the longitudinal effects of chatbot use on self-regulation and language proficiency beyond relatively short-term studies (e.g., periods exceeding six months).

Finally, establishing comprehensive ethical guidelines and frameworks for AI transparency and responsible use in educational settings remains a critical area for ongoing work (Guan et al., 2025; Xiao et al., 2024). Investigating the optimal design features of educational chatbots to better support specific SRL strategies (Guan et al., 2025), including multimodal inputs (e.g., gesture recognition), is important. Understanding how learners with different characteristics (e.g., varying levels of metacognitive awareness or motivation) interact with and benefit from chatbots, and developing robust frameworks for ethical AI use in education are critical areas for further study. Longitudinal studies

and mixed-methods research are needed to gain deeper insights (Xiao et al., 2024).

8. Conclusion

Conversational AI chatbots revolutionise language education by transforming SRLL from an individual endeavour into a collaboratively scaffolded process. By embedding Zimmerman's cyclic phases and Winne and Hadwin's COPES facets into their architecture, these tools make implicit self-regulatory processes explicit, measurable, and adaptable. The effective realisation of this potential, however, hinges on ethically grounded designs and pedagogical integration guided by principles such as strategic prompting, metacognitive scaffolding, affective awareness, data-driven personalisation, and ethical transparency.

As chatbots evolve toward greater affective and contextual intelligence, they promise a future where self-regulated learning is not merely supported but intrinsically reinforced through every conversational interaction. Conversational AI chatbots hold immense potential to support and reinforce self-regulated language learning. By providing personalised feedback, facilitating goal setting and monitoring, enhancing motivation, and promoting reflection, these tools can empower learners to take greater control of their learning journey. The research by Abdallah (2024) provides compelling evidence of this potential, demonstrating significant improvements in EFL student teachers' self-expression and reflective writing skills through a well-designed, SRL-supported pedagogical model using AI chatbots. This study, along with other recent literature (e.g., Dizon et al., 2025; Klimova & Ibna Seraj, 2023; Guan et al., 2025), underscores that the effectiveness of chatbots is significantly enhanced when they are integrated thoughtfully into the curriculum, guided by sound

pedagogical principles that prioritise learner autonomy and metacognitive development.

While challenges related to technology, pedagogy, and ethics persist, ongoing research and development are paving the way for more sophisticated and effective AI-driven language learning tools. As educators and researchers continue to explore and refine the use of AI chatbots, the focus must remain on harnessing their capabilities to cultivate independent, motivated, and reflective language learners who are well-equipped for lifelong learning in an increasingly digital world.

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