The Possibility of ICT Tools Facilitating Self-Regulated Language Learning: A Literature Review

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***Abstract* –Many studies have revealed that learners engaged in self-regulated learning (SRL) practices tend to perform better academically in second language (L2) and foreign language contexts. Currently, technology is a potential tool to increase language performance. Thus, reviewing previous studies exploring the implementation of Information and Communication Technologies (ICT) tools that support self-regulated language learning (SRLL) in L2 and foreign language contexts would be advantageous. This study reviewed the scientific publications from SSCI-indexed journals between 2013 and 2023 to provide a complete understanding of what types and how ICT tools can be implemented to facilitate SRLL in higher education. Findings show that most of the reviewed articles indicate favorable outcomes from using ICT tools in language learning contexts. These outcomes include improved language proficiency, increased motivation, enhanced learning experiences, and more effective learning strategies. Important implications for pedagogical practices are drawn for further studies.**

***Keywords* – ICT tools, second and foreign language, self-regulated language learning, self-regulated learning, technology.**

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1. Introduction

A myriad of empirical evidence has revealed that the implementation of self-regulated learning (SRL) strategies can be facilitated through technology efficiently [1]. Research has figured out that technology interventions could stimulate learners' SRL to enhance meta-cognitive and cognitive strategies, foster intrinsic and extrinsic motivation, reinforce learning values, and improve time management. A recent study also demonstrated that Artificial Intelligence (AI) systems have pivotal roles in developing SRL skills [2]. One of the studies has demonstrated that the use of a free software tool called ARTOO to create computer-assisted argument maps could support SRL and problem-solving skills [3]. Additionally, "ReaLabs" project which integrated technology intervention has been found to improve learners' SRL in which students and teachers are facilitated during laboratory experiment projects [4]. This online platform enables students-teachers to monitor the class, provide guidance and learning materials, including texts, images, and videos. Moreover, a recent systematic review also showed that using a "recommender" system in e-learning could promote SRL [5].

In second and foreign language learning contexts, digital technology can play a significant role in order to foster SRL. The growth of ICT tools that are used in higher education has prompted researchers to investigate the additional value of numerous digital tools to increase the quality of the pedagogical process in second or foreign language acquisition contexts [6]. In the digital era, technology could enhance self-regulated language learning (SRLL) by enabling learners to adopt and/or adapt effective learning strategies that become significant factor in obtaining better proficiency in language learning [7]. For example, using of YouTube as English learning resource could develop self-regulation in terms of motivation and sociocultural knowledge [8].

Further, some empirical evidence also revealed that that the implementation of ICT, such as Google Classroom, encourage learners to be more responsible toward their own learning [9]. In short, digital technology assists learners in managing and regulating their language learning more easily.

The advent of digital technology has transformed the way language teachers optimize language learners' self-regulated language learning (SRLL). ICT offers great pedagogical potential for language learners and is broadly known to provide a crucial place for autonomous learning in language acquisition [10]. Learners can improve, modify, and expand their strategies for self-directed language learning when using digital tools such as e-portfolios, blogs, online language labs, personal learning spaces, e-logs, online editors, and learning systems shows that technology can support autonomous language learning [11]. In the same vein, a previous study [12] conducted a comprehensive review of the extant research on self-directed and autonomous language learning supported by technology. They found that these methods were effective in improving L2 speaking, listening, reading, collaborative writing, language structure, and online interaction through technology support such as multiuser virtual environments, wikis, podcasts, text-scaffolding software, blogs, online writing sites, concordances, chatbots, and multiplayer games [12]. Furthermore, ICT has been widely implemented to develop SRLL over the years. A previous study conducted a review of the growth of technology-supported autonomous language learning in the preceding 20 years [13]. They reported that technology-supported autonomous language learning was becoming more aligned, resulting in less formal learning environments and giving learners more control over their learning experience. The evolution of technology is offering learners new resources and possibilities that are accessible to their daily lives [13].

SRL from the perspective of second and foreign language acquisition has been observed by several researchers. SRL constructs have been included by certain scholars in current classifications of language acquisition techniques [14]. The self-regulation approach to language acquisition is used to support learners in managing and regulating their language learning is reconceptualized by Oxford [14]. She classified the "strategies" of language learning into three elements: sociocultural, affective, and cognitive, and included "meta-strategies": meta-social, meta-affective, and meta-cognitive in the SRL strategies model. In terms of language learning, prior research has documented the SRL position in L2 pedagogical milieus from primary to higher education.

For instance, teaching SRL strategies could enhance SRL and L2 learning achievements, from a meta-analysis of 39 research [15]. Additionally, a previous review study of 58 SSCI articles, noted that SRL strategies could improve L2 language acquisition concerning academic and affective dimensions [16].

Even though many review research on technology use and SRL have been conducted, some research areas have not been adequately addressed. First, some researchers have conducted review studies on the topic of technology and SRL with specific digital tools and nonspecific subject areas without giving any focus on the education level [17], [18]. Only one previous study reviewed digital technology used in formal education to support SRL, which is focused on children [19]. However, few review studies have focused on the specific education level and subject area. Second, review studies of technology and SRLL are rare, particularly in L2 and foreign language learning contexts, especially in higher education. Adult learners at the university level have superior cognitive abilities to enhance their self-regulated learning than younger learners [20]. Commonly, SRL behaviours follow the development of growth, and learners who are more mature and older have a greater ability to control their learning behaviours, and increase self-instruction to manage their self-regulated learning [15]. Thus, a review study with a focus on higher education is needed. The previous review study was concerned only with speaking skills of "MALL" (Mobile-Assisted Language Learning) application to foster SRL from primary to university education [21]. However, a recent review only focused on SRL strategies in L2 contexts at all levels of education [16]. Given the rapid advancement of technology-enhanced language acquisition, some scholars have suggested conducting further studies to obtain a more comprehensive understanding by investigating various types and technologies implemented in SRLL [16]. Therefore, the researchers argue that a thorough review of ICT tools and SRLL is necessarily conducted to gain a deep understanding of technology applications to facilitate SRLL in L2 and foreign language learning in higher education contexts.

Furthermore, technology environments to enhance language learning are useful for learners to enhance motivation, efficiency, and flexibility in learning style [7]. However, the empirical evidence is still presented separately; thus, a literature review is needed to offer a more comprehensive knowledge on the roles of digital technology toward SRLL. Thus, a body of empirical research has shown that digital technology is a potential tool to facilitate SRL for language learners.

Therefore, it is significant to understand how learners use ICT tools. These tools help them regulate their experience in learning a target language. This study, then, reviews articles on the use of ICT that mediate SRLL published between 2013 and 2023. The two research questions guiding this review are:

1. *What types of ICT tools can facilitate SRLL strategies at the University level?*
2. *How do ICT tools support SRLL at the University level?*

These two research questions are proposed to increase a deep understanding of what types of digital tools influence SRLL, and how ICT tools support SRLL in L2 and foreign language contexts in higher education. Both digital tools and SRL can be significant factors in gaining better language acquisition. This present review study provides insight into promoting SRLL with an emphasis on the types and benefits of digital tools to be implemented by teachers and researchers to increase the quality of language learning. Additionally, the role of teacher-centered should be shifted to learner-centered in higher education so that learning can be modified and dealt with learners' needs and interests in learning.

2. Methodology

This review study was modified from a previous research which involves a three-step process (i.e., planning, implementing, and reporting) [22]. The planning step is to identify the significance of this review, establish the research questions, and formulate a review methodology. Implementation step: Choose the source of data, extract, and synthesize it. The last step is reporting, in which to report the findings and disseminate them among the community of research.

2.1. Planning

The planning phase of this current study involved several activities. First, the researchers identify the need for a literature review on SRLL in technology-mediated contexts by examining gaps within the existed research as well as considering recent developments in ICT-based language learning. This step aims to ensure that the review would address a relevant and timely research area. Second, researchers developed questions that guide the review process.

Finally, a review protocol was developed to ensure that the method applied was rigorous and transparent. The details of each activity would be explained in the following part.

2.1.1. Identifying the Need for SRLL

There are very few previous literature reviews on the topics of ICT and SRLL. This review study was conducted to provide insight into how SRLL can be facilitated through the use of technology assistance at the university level. Most review studies with relevant topics of ICT and SRLL did not focus on a certain education level. Some literature reviews on the topic of technology and SRL are concerned only with specific digital tools and nonspecific subject areas [17],[18]. While previous research conducted a review on children with no specific subject area [19]. Another previous review was concerned only on speaking skills using "MALL" in SRL [21]. Furthermore, a previous review study was only concerned with SRL strategies in L2 contexts [16]. Unfortunately, a review study of ICT and SRLL in L2 and foreign language contexts in higher education has not yet been initiated. As well, scholars suggested conducting further studies to investigate various types and technologies implemented in SRLL [16].

2.1.2. Developing Research Questions

Research questions play a vital role in research to address a specific problem that this study aims to resolve. A well-organized set of research questions serves as a roadmap for defining objectives, selecting methodology, and drawing conclusive findings. Table 1 presents the questions and objectives of the research.

Table 1. Research questions and objectives

Research questions	Objectives
1. What types of ICT tools can facilitate SRLL strategies at the university level?	The objective of this question is to summarize the digital platforms used in SRLL. It will assist other researchers to implement the available platforms in higher education.
2. How do ICT tools support SRLL at the university level?	This question is divided into two aspects (language skills and components, and affective aspect). It will help educators and researchers to know the advantages of ICT to SRLL.

2.1.3. Developing the Review Protocol

A protocol for review is a set of methodologies employed as a framework for conducting literature reviews. It encompasses details about keywords, data sources, queries, the criteria of inclusion and exclusion, explores the strategies, extracts the data, and synthesizes.

Typically, research teams develop protocols to ensure that researchers maintain a structured approach and prevent bias.

Furthermore, the protocol serves as a documented reference that can be accessed whenever necessary. Figure 1 displays the selection processes of the reviewed articles.

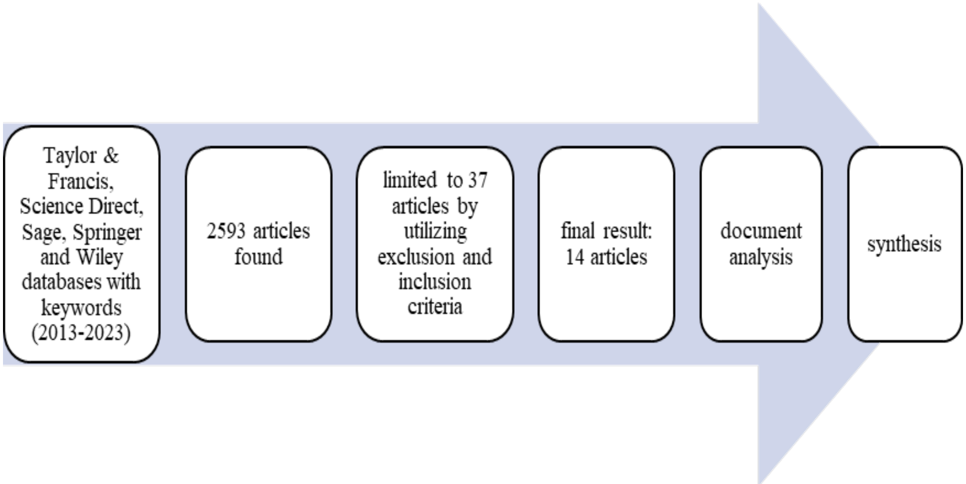

Figure 1. Selection processes

2.1.4. Inclusion and Exclusion Criteria

The 37 chosen articles were narrowed down by establishing criteria for inclusion and exclusion. The process of selecting the necessary articles was significantly influenced by the criteria of inclusion and exclusion.

The list of criteria can be seen in Table 2. After reviewing the articles, the final selection identified 14 articles that met the inclusion and exclusion criteria. The list of reviewed articles is presented in Table 3.

Table 2. The inclusion and exclusion criteria

Inclusion Criteria	**Exclusion Criteria**
• the scientific articles that only discussed any relationship of digital tech and SRL concerning language learning were considered. • the articles either had to directly relate to the central topic or mention self-regulated learning in connection with technology or ICT tools that focus on language acquisition. • the articles used quantitative, qualitative, and mixed methods research design. • only articles that studies focus on L2 or foreign language learning. • close access journal • only articles in higher education contexts.	• only articles that mention technology/ ICT tools or SRL. • the reviews of the book chapter. • proceeding articles • reviews articles • articles with no full-text • non-English articles • open access journal • articles not in higher education contexts.

Table 3. The result of 14 reviewed articles

Reference number	**Authors**	**Title**	**Country Context**	**Source**
[34]	Gustavo García Botero, Margarita Alexandra Botero Restrepo, Chang Zhu & Frederik Questier	Complementing in-class language learning with voluntary out-of-class MALL. Does training in self-regulation and scaffolding make a difference?	Colombia	Computer Assisted Language Learning
[32]	Chun Lai, Mark Shum & Yan Tian	Enhancing learners' self-directed use of technology for language learning: the effectiveness of an online training platform	China	Computer Assisted Language Learning
[8]	Hung-chun Wang & Cheryl Wei-yu Chen	Learning English from YouTubers: English L2 learners' self-regulated language learning on YouTube	Taiwan	Innovation in Language Learning and Teaching
[33]	You Su, Yanyan Li, Jyh-Chong Liang & Chin-Chung Tsai	Moving literature circles into wiki-based environment: the role of online self-regulation in EFL learners' attitude toward collaborative learning	China	Computer Assisted Language Learning
[24]	Gustavo García Botero, Frederik Questier & Chang Zhu	Self-directed language learning in a mobile assisted, out-of-class context: do learners walk the talk?	Colombia	Computer Assisted Language Learning
[25]	Christopher D. Hromalik & Tiffany A. Koszalka	Self-regulation of the use of digital resources in an online language learning course improves learning outcomes	U.S.A	Distance Education
[41]	Chin-Wen Chien	Taiwanese EFL undergraduates' self-regulated learning with and without technology	Taiwan	Innovation in Language Learning and Teaching
[27]	Chunping Zheng, Jyh-Chong Liang, Yu-Fang Yang, Chin-Chung Tsai	The relationship between Chinese university students' conceptions of language learning and their online self-regulation	China	System
[28]	Freddie Gay	Investigating the effects of technology-enhanced vocabulary learning strategy instruction on supporting mixed-ability EMI learners studying a journalism and communication major: An action research project at a university in China	China	Journal of English for Academic Purposes
[26]	Zheng Chunping, Liang Jyh-Chong, Li Mang, Tsai Chin-Chung	The relationship between English language learners' motivation and online self-regulation: A structural equation modelling approach	China	System
[29]	Mark Feng Teng	Interactive-whiteboard-technology-supported collaborative writing: Writing achievement, metacognitive activities, and co-regulation patterns	China	System
[35]	Zhonggen Yu, Wei Xu, & Paisan Sukjairungwattana	Motivation, Learning Strategies, and Outcomes in Mobile English Language Learning.	China	Asia-Pacific Education Researcher
[42]	Xinjian Hu, Zhenlei Huang, & Mengyan Yang	Profiles of EFL Learners' Online Self-regulation and Their Relationship with Dimensions of Self-determination Motivation in Mainland China.	China	Asia-Pacific Education Researcher
[30]	Abdelhalim, S. M.	An investigation into English majors' self-regulated writing strategies in an online learning context.	Saudi Arabia	Language Teaching Research

2.1.5. Data Extraction and Synthesis

Extracting the data is needed to collect information regarding research questions. This is significant because not all the data required is explained in the articles. The extraction involved reading the title and abstract altogether, the year of publication, theme, and country in which English was used as an L2/foreign language. Next, the researchers started the process of content analysis related to the research questions, then highlighted significant sections in each article in Mendeley, and an Excel spreadsheet was employed to compile these sections. The researchers thoroughly read the complete article and identified the crucial elements. Then, all the highlighted information was transferred into an Excel spreadsheet.

To answer research questions, data analysis is required, and the articles were coded regarding the two dimensions. First, to analyze the types of ICT tools, researchers used some categories that were adapted from a previous study, namely, mobile devices, personal computers, wearable devices, mixed/varied or not-specified, and digital boards [17]. Next, to analyze how ICT tools benefited self-regulated language learning, the researchers used three codes adapted from a previous study [16]. The first code focused on the aspects of the application of technology or ICT tools, and L2 or foreign language learning, including language skills and components (reading, writing, speaking, listening, grammar, vocabulary, etc.), and affective aspects, including interest, motivation, attitudes, self-efficacy, etc. Next code focused on the articles' outcomes on the implementation of technology or ICT tools in SRL on L2 or foreign language learning, with mixed, neutral, negative, and positive categories. The last code refers to the scholars' descriptions of how various uses of technology or ICT tools affected self-regulated learning in L2 or foreign language learning.

2.1.6. Data Synthesis

The purpose of data synthesis in this review is to identify the findings and integrate them from the studies that enable researchers to have meaningful interpretation and application. This data synthesis process includes pattern examination, gap identification, as well as evidence-based conclusions dealing with research questions that have been formulated. This helps the researchers to highlight the implications of the reviewed studies for practice and policy, as well as to provide directions for future research.

2.2. Reporting

This review encompasses every step of the literature review process that has been conducted, from planning and conducting the search to synthesizing. It holds significant worth in terms of disseminating research. Through systematic examination on the role of ICT tools in facilitating SRLL, the review results offer a solid reference for further researchers in terms of academic inquiry and provide pedagogical practice for practitioners who are interested in similar topics. It presents a valuable reference for future researchers to explore a similar topic.

3. Results

This section presents the main findings of the review, organized according to the research questions and thematic categories identified during the synthesis process. The findings are organized into key aspects of research questions throughout the reviewed studies. Data is gathered from several previous studies to present recurring concepts and distinctive contributions.

3.1. Types of Technology Integration

This present study investigated the types of ICT tools that can facilitate self-regulated language learning (SRLL) in an L2/ foreign language context. Table 4 shows that half of the learners used personal computers in their learning (50.00%), which indicates that most of the L2 learners used their personal computers to be integrated into SRLL in an online environment. It is then followed by mobile devices and with the mixed/varied or not-specified technology with a percentage of 21.43% and digital/interactive whiteboards with a percentage of 7.14%. Then, it is found 0% for wearable devices. In summary, the findings in this section are four types of technologies used to facilitate SRLL.

Table 4. Percentage types of technologies used for L2/foreign language learning

Types of technologies (*N*=14)	***N***	**Percentages**
Personal computer	7	50.00%
Mobile devices	3	21.43%
Wearable devices	-	-
Mixed/varied or not-specified	3	21.43%
Digital board	1	7.14%

Based on the review, the researchers uncover many types of ICT tools that are used in self-regulated language learning (SRLL). In the digital era, technology has been used as a crucial tool to support SRLL strategies for L2 acquisition [7]. This review study found that the most common type of technology used to facilitate SRLL is personal computers, including laptops or PC. Personal computers, especially laptops, have become very crucial to facilitate students' learning. It enables students to access various apps, websites, and various features to support language learning in a more comfortable user-interface (UI) and user-experience (UX). Besides, students use mobile devices (handphones, tablets, etc) and/or mixed/varied or not specified technologies. These technologies are popular for language learners as mobile devices give flexibility and convenience to be accessed by learners. The studies used mixed/varied or did not specify the main technologies, indicating that the researchers use more than one type of ICT tool to support SRLL. As it is known that some will use personal computers and mobile devices at the same time. This finding contrasts with a previous study that found mixed/varied or unspecified devices were the most frequently used to enhance SRL in online education contexts [17]. Digitally/interactive whiteboard has a low percentage as it is used for public use, usually belongs to the institution's facility to support the learning process at the campus/school. In addition, studies revealed that students did not use any wearable devices (i.e., smart watches, smart jewellery, head-mounted displays, etc) in their research. This is probably due to the tendency to use them as accessories instead of learning support. Some of them were also not compatible as well as comfortable due to their size to read pdf, open the web, or do other activities that support autonomous language learning.

3.2. The Benefits of Technology or ICT Tools to SRLL

This subsection examines the advantages of technology and ICT tools toward self-regulated language learning (SRLL), as reported in the reviewed studies. This section also highlights the ways in which technology can actively support learners in planning, monitoring, and evaluating their language learning processes.

3.2.1. The Benefits of Technology or ICT Tools to SRLL Include Language Skills and Components

The review showed that the use of ICT or technology in SRL has various results on L2/foreign language learning. Most of the studies showed positive results on the use of ICT for language skills and knowledge in classroom settings or outside the classroom.

There are 4 items of language skills and knowledge found in the studies (i.e., writing, vocabulary, pronunciation, and integrated language skills and knowledge). As seen in Table 5, 2 studies investigated SRLL to improve writing proficiency through ICT tools with positive results; 1 study investigated vocabulary knowledge with positive results; 1 study investigated pronunciation knowledge with negative results; 10 studies investigated integrated language skills and knowledge, of which 6 reported positive results, 1 study [8] reported negative results, and 3 reported mixed (positive and negative) results. Numerous studies have examined more than one language skill and component. The use of ICT tools can contribute to SRLL development with various results.

Table 5. Results of ICT tools used in SRLL on various L2/foreign language skills and components

Language skills and components (*N* =14)	***N***				**Percentages**
	Positive results	**Negative results**	**Neutral results**	**Mixed results**	
Writing proficiency	2	-	-	-	14.28%
Reading proficiency	-	-	-	-	-
Listening proficiency	-	-	-	-	-
Speaking proficiency	-	-	-	-	-
Vocabulary knowledge	1	-	-	-	7.14%
Grammar knowledge	-	-	-	-	-
Pronunciation knowledge	-	1	-	-	7.14%
Integrated language skills and knowledge	6	1	-	3	71.43%

3.2.2. The Benefits of Technology or ICT Tools to SRLL on Affective Aspects

The use of technology or ICT tools can attract learners to learn the language and control their learning process.

Learners will be more interested and motivated to learn if the digital platforms are interesting. As a scholar noted that learners' self-regulation is influenced by affective states [23]. Table 6 shows the results of the affective aspects of technology used in SRLL.

The review reported that 2 studies investigated self-efficacy with 2 positive results; 10 studies investigated motivation with 7 positive results, and 3 with negative results [24], [25], [26]; 2 studies investigated learning attitudes with positive results; 1 study investigated anxiety with positive results; 1 study investigated maturity with positive results; 5 studies investigated interest with 4 positive results, and 1 negative result [8]; 3 studies investigated learners' conceptions or beliefs with 2 positive results and 1 negative result [27]; 4 studies investigated confidence with positive results.

Table 6. *Effects of technology/ICT tools used on affective aspects of SRLL*

Affective aspects (*N*= 14)	***N*** **Positive results**	**Negative results**	**Percentages**
Self-efficacy	**2**	**-**	**14.28%**
Motivation	**7**	**3**	**71.42%**
Learning attitudes	**2**	**-**	**14.28%**
Anxiety	**1**	**-**	**7.14%**
Maturity	**1**	**-**	**7.14%**
Interest	**4**	**1**	**35.71%**
Learners' conceptions/ beliefs	**2**	**1**	**21.42%**
Confidence	**4**	**-**	**28.57%**

4. Discussion

This section provides an in-depth interpretation of the findings in the area of SRLL and ICT integration resulting from the review in relation to existing literature, drawing connections between the evidence and broader theoretical and pedagogical implications.

4.1. The Benefits of Technology or ICT Tools to SRLL Include Language Skills and Components

This review showed that the use of ICT tools can improve vocabulary acquisition as it gives more exposure toward the target language. The use of ICT tools such as Moodle and Mesmerize could improve learners' vocabulary [28] and learners shift to be self-regulated in applying resources and strategies through technology support. The instruction that incorporated technology assisted learners in utilizing resources and strategies in different regulated behaviors, helped to stimulate learners' SRL [28]. The ability to employ resources and strategies through technology contributed to the metacognitive strategies that allow learners to adapt their learning methods effectively. Learners who often engaged in metacognitive strategies (i.e., self-monitoring) could identify learning errors, regulate their learning methods more frequently, and increase language proficiency [16].

SRL strategies of writing can also be improved and facilitated by utilizing ICT tools. For example, the implementation of an interactive whiteboard (IW) had a good result on writing achievement, and learners showed more metacognitive activities and co-regulation forms [29]. It is due to IW potential to facilitate students to have more engaging learning by having features the conventional whiteboards do not. Additionally, high-proficiency learners have significant improvement in individual self-regulation in the use of planning and setting goals, organizing the essay, and revising strategies by using e-learning [30]. These techniques involve the higher-order, directive, and practical abilities that learners possess to manage and allow learners to exercise conscious control over their writing process, which are commonly known as metacognitive and cognitive strategies [31].

Some studies are exploring the intervention of SRLL in an online setting showed improvement in integrating language skills and components. For example, an online training program effectively enhanced the frequency of using self-directed technology for language acquisition, improving learners' readiness in implementing technology, and enhancing their skills and knowledge [32]. Additionally, the forethought phase is part of the SRL cyclical process, which involves guided self-assessment of learners' challenges, realignment of the learning processes and goals, and discussions of pedagogical strategies, along with the introduction of tools and resources during the performance phase, leading to not only increased self-efficacy in using technology but also improved SRLL [32]. This is in line with a statement that outcome expectations, self-efficacy, goal orientation, and intrinsic interest are the key to self-motivational beliefs in the forethought process [23]. Self-efficacy is one's trust in the capacity to learn or execute a task effectively, while outcome expectations relate to beliefs about the eventual consequences of performance. The self-regulation process of goal orientation is called learning, which enhances motivation, achievement, and performance efficiently than goal orientation results [23].

In addition, using wiki-based collaborative learning for EFL in an e-learning setting revealed the beneficial impact of learners' goal setting and self-assessment toward technology instructions and has several benefits (increased engagement in reading and comprehending the text, improved English language skills, and expanded English vocabulary) [33].

Moreover, e-learning can help learners improve vocabulary, grammar, and pronunciation, and is positively associated with their use of time management and task strategies, as well as their tendency to engage in self-evaluation as part of digital self-regulation, and viewing the process of learning English as a means to enhance communication skills to engage in SRL online [27]. Goal setting and self-evaluation are part of metacognitive strategies that relate to high-order skills [16]. Self-evaluation as the self-reflection phase of the SRL cyclical process that often includes reflecting on how well one has met certain criteria or expectations, such as memorizing a formula or grammar rules, and solving the problem [23]. Online environments could make learners engage with technology more often in the learning practice, without or with a teacher. The learners could address difficulties by asking their friends and looking for the answer on the Internet. They also engaged in peer assessment and self-evaluation to improve and revise their assignments. All of these activities affected the individuals' performance of learning.

Mobile apps can also facilitate SRLL effectively to integrate language skills and components. A previous study examined the Duolingo application as an informal outside-the-classroom language learning resource [24]. They reported that Duolingo has the potential to enhance language skills in terms of metacognitive proficiency. Duolingo can significantly enhance learners' vocabulary, listening, writing, and grammar, while speaking and reading also improve, although to a lesser degree [24]. In another year, some researchers investigated the implementation of Duolingo with SRL training and revealed that the combination of SRL training and temporary scaffolding could improve writing [34]. Furthermore, those who possessed strong SRL skills tended to prefer online learning over traditional methods and were more likely to access digital English learning materials frequently [35]. The use of mobile platforms can increase opportunities to practice a variety of English language skills such as writing, reading, listening, speaking, and translating [35]. Learners who utilized mobile applications as part of their learning process tended to seek out more assistance, set more learning goals, complete more assignments, and assess their English language skills more often than those who used conventional learning methods, resulting in higher learning outcomes [35]. Mobile learning positively resulted to cognitive strategies that involve the ability to achieve learning tasks using cognitive skills [36], [37].

The improvement of language skills and components relates positively to the frequency of digital device utilization.

The use of mobile apps. allows learners to memorize the materials through practice and repetition, recall and reread the learning materials, and make a production of knowledge which includes cognitive strategies. In terms of metacognitive strategies, learners frequently engage with mobile apps to learn several languages outside classrooms, complete tasks, and evaluate their learning progress. The principle of self-regulation is fit for mobile learning that provides independent learning as a flexible tool to deliver materials, foster motivation, and enhance engagement [38].

In sum, the present study found that in the context of L2 and foreign language learning, technology or ICT tools could enhance learners' SRL, which benefits to language achievement. This is consistent with two previous studies that found technology was effective in enhancing self-regulated language learning (SRLL) [7], [16]. This review revealed that technology integration in L2 and foreign language learning encompasses SRL strategies (i.e., motivational, metacognitive, and cognitive strategies). This study found that learners could use ICT tools to monitor, memorize, set goals, self-evaluate, determine effective strategies, find help, improve the occurrence of self-directed use of digital technologies, and show positive learning achievements, which is similar to a previous study [17].

ICT tools and online environments support authentic learning for L2 and foreign language learning, and gain self-regulation for learners. The use of digital tech could facilitate the process of SRL, supporting high achievers in choosing suitable strategies that fit with their own abilities to reach their learning goals and become effective self-regulated learners [39]. Despite diverse kinds of ICT tools, nevertheless, the application of SRLL was not always positive. Only learners who have a high frequency of using digital resources will have high SRL and language performance. Technology intervention in language learning can boost learners' self-regulation. Technology brings autonomy so that learners can manage and regulate their own learning. Learners are not merely passively absorbing information, but engage actively to construct their own understanding, learning strategies, and goals [40].

4.2. The Benefits of Technology or ICT Tools to SRLL on Affective Aspects

The use of mobile apps can improve learners' motivation in SRLL. For instance, mobile apps. improved high levels of intrinsic and extrinsic motivation among proficient learners, which could cultivate their enthusiasm in acquiring English and promote the development of autonomous learning, self-directed learning, and self-regulation, including cognitive and meta-cognitive strategies [35]. As English language learning outcomes improve, it also facilitates the learners to use different learning strategies and makes them more motivated. The use of mobile apps. Duolingo also enhanced learners' motivation and provided resources based on what learners need and their preferences [24]. However, a previous study found negative statements of learners' motivation regarding self-awareness and self-regulation [24]. The motivation of learners for using Duolingo in out-of-class contexts was affected by challenges in self-management and self-monitoring because they could not contribute enough time to Duolingo due to the demands of their formal assignments. This suggests that although Duolingo can be a useful supplementary tool, formal education requirements often take priority, reducing the time students can spend on the app.

The use of online platforms could benefit several affective aspects of SRLL. For instance, online training programs increased willingness to engage with technology, strengthened knowledge and skills in English language acquisition, boosted learners' confidence and interest, enhanced learners' competence and awareness of using technology to learn a language, transformed their approaches, strategies, and processes, and increased enjoyment and motivation for English language learning [32]. Increasing the enjoyment and motivation of learning English with technology can reduce learners' anxiety [41]. Wiki-based collaboration in e-learning enhanced the capability to seek help and improved confidence, self-efficacy, and enthusiasm in learning English [33]. High motivation results in higher performance in language learning [28],[25]. Similarly, high motivation will result in a high online level of the SRL profile that relates learners to accomplish the assignments [42]. Improved self-efficacy and maturity in online cooperative writing tasks [30].

Some studies have investigated learners' conceptions/beliefs about the digital application of self-regulated language learning (SRLL). Learners with positive beliefs of language learning in the future demonstrate intrinsic interest in English culture, and they are motivated to exhibit stronger self-regulatory abilities within online learning settings [26].

Learners who engage in English language learning with the primary goal of avoiding negative academic outcomes may demonstrate a lower motivation to take part in online SRL. A prior study explored the connection between learners' conceptions and online self-regulation, revealed that learners who perceive English as "understanding" and "memorizing", and see English as a "latest method", spent more time in online self-regulation [27]. In contrast, learners may develop unfavorable perceptions of their experiences with online SRL if they see English as "testing" [27]. Positive and negative perceptions of English learning will affect learners' attitudes and engagement in online self-regulation.

In brief, the articles that researchers have been reviewed investigated the use of ICT tools to support SRLL from affective aspects and reported mostly positive effects of motivation. Technology intervention benefits language learning and develops self-regulated strategies. If the digital platforms are interesting, they will motivate the learners to learn the language. Thus, learners have more interaction and engage in language learning through ICT. They can regulate their own learning in their self-pace and control. Consequently, high SRL resulted in high language achievement.

The utilization of ICT tools could enhance learners' SRLL and their affective aspects, which is related to SRL model [40]. In addition, technology could provide a fruitful learning environment that can change learners' feelings, cognition, and behaviours to achieve personal goals in SRLL, as noted in SRL Triadic Model [23]. The ICT tools provide more chances to explore information and social engagement that can assist learners in utilizing technology to learn more efficiently and improve their emotional performance. In short, technology integration in language learning influences learners' affective factors that can change their performance to reach higher language proficiency.

ICT tools stimulate learners to interact and become active in the learning process, and they also show a higher positive attitude toward language learning. This statement is similar to a previous study [10]. Technology also improves self-efficacy in language learning [17]. In addition to motivational strategies, learners have positive motivation to use digital tools and online platforms. A study found that if learners have high motivation, then they will automatically have high SRL to complete the assignments. The integration of technology and learning strategies can increase learners' motivation to engage in SRL [43].

5. Conclusion

It can be concluded that most of the studies revealed that technology had positive impacts on pedagogical purposes, particularly for improving SRLL in terms of language skills and components, and affective aspects. Digital technology has positive potential for pedagogical purposes. Therefore, teachers as facilitators of learning should guide their learners to use more valuable technological tools than traditional methods. Nevertheless, the types of ICT tools do not influence SRLL. Studies also found that learners' conceptions or beliefs toward digital tools for language learning may contribute to influencing their language achievement. Additionally, a study figured out that using many varieties of digital platforms in one activity was not effective.

For further study, researchers are recommended to explore the impact of technology on various levels of learners' proficiency in SRLL. In addition, this review identified that most studies are conducted in universities. Thus, more exploration is needed of whether digital technology is effective for children's SRLL in L2 and foreign language contexts. In addition, as teachers must be competent in implementing technology in the classroom, training teachers to integrate ICT tools and SRLL is needed. Thus, it is crucial to conduct further research on the effectiveness of teacher instruction in implementing digital tools for SRLL.

However, there are some limitations to this current study. First, the source articles are limited to original articles from five databases of SSCI journals, so the exploration of ICT tools and SRLL might be inadequate. Second, this review is not a meta-analysis study, as the information was merely taken from the findings/results from the researchers' descriptions, which may be subjective. The findings may not be accurately reported because more than one language skill and component were studied with mixed/varied categories, so it was difficult to identify which skill/component was affected by the technology intervention. Further studies should review the articles by conducting a meta-analysis to find a statistical relationship between each article accurately and objectively.

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