



# A Bibliometric Analysis on Trends and Patterns in Self-Regulated Language Learning in Mobile-Assisted Learning Environments

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## ABSTRACT

This study analysed 498 articles published between 2005 and 2023 on Self-regulated Language Learning (SRL) indexed in the core collection of the Web of Science database, using a bibliometric methodology based on scientific mapping, co-occurrence and burstness analysis. Results show China is the most influential contributor to SRL research, with the largest number of total publications and citations. According to the keyword co-occurrence and burstness analysis, mobile-learning, higher education, learning context, learner strategies stand out in this field. It is also shown that listening as a significant linguistic skill is less explored in the SRL field. It is proven that learners' language skills could be improved through mobile-assisted collaborative learning in informal settings. By identifying the developmental patterns in SRL research, this paper can guide future researchers to explore in-depth the significant issues in this field and bring insight for further SRL studies in terms of themes, pedagogy and methodologies.

## KEYWORDS

Bibliometric Analysis, Language Acquisition, Mobile-Assisted Learning, Self-Regulated Learning

Self-regulated learning (SRL) can be defined as a set of cognitive, affective, and behavioral processes that are intentionally engaged by learners towards the achievement of their personal goals (Zimmerman & Schunk, 2011). Over the past few decades, a significant amount of research has been conducted on SRL, demonstrating its crucial contribution to enhancing students' academic performance and nurturing proactive learners across various educational and psychological settings (Zimmerman, 2013). SRL has grown in popularity as a theory that helps to explain students' achievement, because it takes into account a variety of learner-related factors, including goal orientation, task-related strategies and meta-cognitive strategies for achieving learning objectives (Panadero et al., 2017), and it is viewed as a key feature of successful learners (Zhang & Zhang, 2019).

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The concept of “self-regulation” was first introduced to the field of second language acquisition (SLA) by Dörnyei (2005) to replace “learning strategies,” because the former refers to more “dynamic and process-oriented” learning skills proactively adopted by second language (L2) learners to attain academic goals (p. 195). According to Dörnyei (2005), self-regulation denotes the extent to which individuals are engaged in their personal learning process. It is a multifaceted notion, surpassing the realm of learning strategy by underlining the learners’ proactive endeavors to administer their own accomplishments through distinct beliefs and procedures. This assertion brings to light the transition of a focus from “what is learned” to “how a language is acquired” (Dörnyei, 2005; Teng & Zhang, 2022).

In recent years, SRL has been found to play a positive role in the context of learning English as a Second Language (ESL) or as a Foreign Language (EFL), such as in L2 writing (Yang et al., 2022), speaking (Kang, 2022), and reading (Alreshoud & Abdelhalim, 2022; Qiao et al., 2022). Recent studies have focused on the implication of game-based self-regulated language learning (SRLL) (Zhang et al., 2020), the effectiveness of self-regulation and the role of technology in SRLL (Yang et al., 2023). However, this field still lacks a scientific overview of the most frequently investigated SRLL-related topics and their developmental patterns since its emergence.

Bibliometrics is a commonly used approach in many academic domains that involves the use of statistical and mathematical methods to examine scientific publications, such as books, journals, articles, and other materials, that are sourced from various databases (Pritchard, 1969; Talan & Demirbilek, 2023). A significant focus in bibliometric analysis is placed on data that is large-scale (typically in the hundreds or even thousands) and objective; this data may include important indicators like citation and publication counts, as well as subject and keyword frequencies. Through the meticulous interpretation of large amounts of unstructured data, this methodology proves useful in uncovering and documenting the cumulative scientific knowledge and evolutionary intricacies of established domains (Donthu et al., 2021). In essence, bibliometric analysis is a research methodology employing bibliographic data to investigate the prevailing research patterns pertaining to a designated field or nation (Lin & Lei, 2020; Lei & Liao, 2017). Despite its extensive application in different domains of research (Punnakitikashem & Hallinger, 2019; Zhang, 2020), bibliometric analysis, commonly referred to as science mapping, has only recently gained attention in the field of educational research (Moreno-Guerrero et al., 2020; Yang et al., 2017).

In this regard, this paper explores the research trends and patterns in SRLL studies and intends to identify thematic clusters that emerge from these studies. More specifically, the following questions are addressed:

- (1) What is the status of research in the SRLL field?
- (2) What are the research trends in SRLL?

The status of SRLL research is addressed by analyzing the overall publication trends in the examined period from 2005 to 2023, including the major publication sources, the contributions of countries/regions and the most highly cited articles and references. The research trends are explored by examining the frequency and burstiness of SRLL-related topics across the examined years.

## METHODOLOGY

In this study, the literature dataset of SRLL on Web of Science (WoS) was established through automatic and manual screening processes. Computer programs were used to analyze the data to address the research questions.

**Table 1. Search Strings and PRISMA Framework Protocol**

Search strings	“self-regulated learning” OR “self-directed learning” OR “autonomous learning” OR “independent learning” OR “self-regulation” OR “self-guided learning” (TOPIC) AND “language learning” OR “language teaching” OR “language acquisition” (TOPIC)
Database	Core Collections of WoS (SSCI, SCI-E, A&HCI)
Time Span	2005 to 2023
Document Type	Articles
Language	English
Identification	1044 Publications
Screening	automatic screening to exclude irrelevant publications (n=508) and review articles (n=14)
	manual screening to exclude irrelevant publications (n=24)
Included	a total of 498 publications

## Data Collection

In this study, academic literature regarding “self-regulated language learning” was retrieved on the WoS database, a globally recognized search engine that offers access to scholarly databases and peer-reviewed journals. Specifically, the Core Collection of WoS was selected, which includes multiple indexes of journals of superior quality, including the Social Sciences Citation Index, Science Citation Index Expanded, Arts and Humanities Citation Index. To build a research dataset, SRL-related search strings used were as follows: “self-regulated learning” OR “self-directed learning” OR “autonomous learning” OR “independent learning” OR “self-regulation” OR “self-guided learning” (TOPIC) AND “language learning” OR “language teaching” OR “language acquisition” (TOPIC), with “2005-2023” for the time span, “English” as the language, and “article” for the required document type, as shown in Table 1 (Page et al., 2021).

The results were filtered by selecting related research domains to centralize the results on the studies of self-regulated language learning, including “education and educational research,” “linguistics,” “language and linguistics,” “psychology educational,” “computer science interdisciplinary applications,” “psychology experimental,” “education special,” and “education scientific disciplines.” Furthermore, this study solely comprises publications that are available through library services or open access.

In order to ensure the relevance of the articles considered in the present study, the researchers carefully reviewed the titles and abstracts of the articles. After a thorough evaluation process, a total of 498 articles were selected for subsequent analysis based on explicit criteria: (a) the article should focus on the subject of language teaching and learning, as opposed to topics such as “medication,” “rehabilitation,” or “public health,” and (b) the article should be directly related to the development or implementation of SRL in the context of language acquisition; or (c) the article should contain at least one pertinent self-regulatory factor (such as goal-setting, time management, learning strategies, self-efficacy, self-reflection, or self-assessment).

## Data Analysis

First, the number and citation counts of articles published in each year were calculated and the simple linear regression analysis was used to examine the trend of publications on the subject.

Second, VOSviewer 1.6.19 and CiteSpace 6.2.R2 were used for visualization and citation network analyses. VOSviewer could generate the visualization maps of countries/regions, articles, references, and keywords based on the interrelations of these items. In order to provide representative results

on this topic, the top 10 prolific countries/regions were presented and analyzed. Specifically, the identification of highly cited articles entails the utilization of both normalized and raw citations in order to overcome the potential bias favoring earlier publications due to their greater likelihood of receiving citations (Lei & Liao, 2017). The process of determining the normalized citation count involved the division of the citation count of each individual article by the overall citation count received by all articles published within the same year (Qin & Lei, 2022). For example, the raw citation count of Duncan and McKeachie (2005) was 446, and the total citation count of all the five articles published in 2005 was 649. Therefore, the normalized citation count of Duncan and McKeachie (2005) was 0.6872 ( $446/649 = 0.6872$ ). The present study provides a comprehensive list of the top 20 highly cited articles, based on both normalized and raw citation counts. This approach is expected to provide a more comprehensive understanding of the prominent publications in the field. The top 20 highly cited references were identified and reported according to the total citations they received.

Last, to present a fuller picture of the research trends in SRL studies, the keyword items selected were screened and those that were irrelevant were removed. The terms retained were calculated to generate an author keyword co-occurrence map, along with a burstiness detection analysis through CiteSpace.

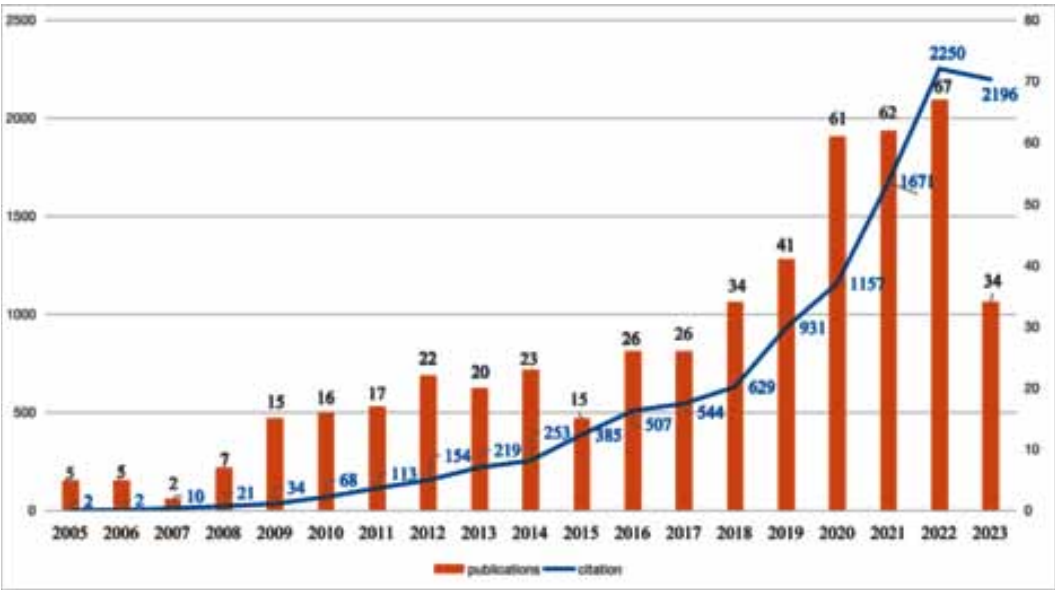
## RESULTS

This section includes a discussion of the findings with regard to the research questions – the publication trend, important publication sources, the most prolific countries/regions, the most highly cited articles and highly cited references, the most frequently co-occurring author keywords, and keyword burstiness across time.

### Distribution of Publication Trends

To begin, the distribution of articles on SRL in the WoS database by year was examined. The results are shown in Figure 1.

Figure 1. Number of Publications by Year



**Table 2. Top 10 Publication Sources**

Journals	No. of Publications	Total Citations
<i>System</i>	47	1153
<i>Computer Assisted Language Learning</i>	45	1074
<i>Language Teaching Research</i>	23	326
<i>Language Learning &amp; Technology</i>	17	660
<i>Interactive Learning Environments</i>	16	90
<i>ReCALL</i>	13	424
<i>Foreign Language Annals</i>	13	215
<i>Computers &amp; Education</i>	11	544
<i>Modern Language Journal</i>	11	400
<i>Educational Technology &amp; Society</i>	11	193

Since the study of SRL started in 2005 when the concept of SRL was first introduced in the field of SLA, the scope of publication year included in this study ranges from 2005 to 2023. As shown in Figure 1, despite the slight drop of the number of publications in 2007, 2013 and 2015, the number and citation count of the publications increase by year, each reaching the peak at 67 (number) and 2250 (citation count) in 2022. This trend is consistent with the results of the simple linear regression, which showed that the number of SRL articles across the examined years had significantly increased ( $F(1,17)=56.397$ ,  $P<.001$ ) with a large effect size ( $R=0.768$ , Adjusted  $R^2=0.755$ ) and the number of citations also had increased significantly ( $F(1,17)=58.241$ ,  $P<.001$ ) with considerable effect size ( $R=0.774$ , Adjusted  $R^2=0.761$ ). In addition, the number of articles published in the last five years constitutes 53.21% of the total publications. However, 2023 witnessed a decrease in both the number and citation counts of the publications. This is probably because not all literature from this year are yet indexed in WoS.

### Distribution of Publication Sources

Within the scope of the study, the citations of the journals that published the most articles on SRL were analyzed. The top 10 journals, each with a minimum of 10 relevant articles published, are presented in Table 2.

The two journals with the most articles are *System* and *Computer Assisted Language Learning*. It is worth mentioning that all of the journals are high-impact journals indexed in the Social Science Citation Index (SSCI) database under the categories “education,” “linguistics,” or “language and linguistics,” which demonstrates that SRL has been widely accepted as an approach to teaching and learning a second language (L2) or foreign language (FL). Upon examining the number of citations per article, it is noticeable that the journals *Computer Assisted Language Learning*, *Language Learning & Technology*, *Computers and Education*, and *ReCALL* exhibit prominence, showing that self-regulated L2/FL learning is monitored, implemented, and improved by SLA researchers through the use of contemporary technology and computer methodologies.

### Distribution of Most Prolific Countries/Regions

The selected articles were published by researchers in 56 countries/regions and the top 10 countries/regions that contribute to the publications on SRL are presented in Table 3.

These 10 countries have published 439 papers, accounting for 88.1% of the total number of publications. The leading country is China, which contributed 27.9% ( $n = 139$ ) of the total 498

Table 3. Top 10 Countries Contributing to the Total Publications

Country	Total Publications	Percentage
China	139	27.9%
USA	110	22.1%
England	45	9.0%
Australia	27	5.4%
New Zealand	26	5.2%
Japan	25	5.0%
Iran	24	4.8%
Canada	16	3.2%
Spain	14	2.8%
South Korea	13	2.6%

selected articles, with Hong Kong (n=71), Taiwan (n=42), and Macao (n=14) regions contributing 91.4% of the total publications in China. The next two largest contributors are the United States and England, which respectively accounted for 22.1% (n=110) and 9.0% (n=45) of the total publications.

### Distributions of Most Highly Cited Articles and References

The 20 most highly cited articles in terms of both raw citations and normalized citations are listed in Table 4.

The three most highly cited articles regard measurement of learners' self-motivated learning strategies (Duncan & McKeachie, 2005), establishment of a self-motivated learning model (Tseng & Schmitt, 2008), and comparison of different models on SRL (Hadwin & Oshige, 2011), laying theoretical foundations for investigating other specific issues in the field of SRL. In addition, many other listed articles are related to the influence of individual differences on learning proficiency, learning outcomes, and learning behaviors. For instance, in a meta-analysis study, Li (2016) reported the correlation between individual difference variables and L2 achievement. Specifically, Vandergrift (2005) identified that two critical self-regulatory factors – learners' motivation and meta-cognitive awareness – were strong predictors and facilitators of language learning proficiency. This assertion is further elaborated by Falout et al. (2009), who found that learners' academic interests, experiences, and proficiency exert an impact on their affective states and self-regulate learning capacity, thus influencing their learning behaviors (Kormos & Csizér, 2014; Teimouri, 2017) and overall learning performances (Dörnyei, 2019).

The rest of the articles listed in Table 4 are empirical studies investigating the effectiveness of technology-enhanced language learning on learning performance (Suh et al., 2010; Zhang et al., 2011; Latham et al., 2012; Oztok et al., 2013) and development of SRL skills or strategies (Meyer et al., 2010; Kondo, 2012; Shyr & Chen, 2018), as well as learners' attitudes towards such instructional pedagogy (Kondo et al., 2012; Cohen, 2013). Moreover, the validity of multidimensional models of SRL strategies is examined by Teng and Zhang (2016). The positive connection between self-regulation or SRL strategies and language performance is confirmed by Lai and Gu (2011) and Teng and Zhang (2018).

The 20 most highly cited references extracted from the references of the selected 498 publications under study are presented in Table 5.

It is observed that, along with journal articles, half of these highly cited references are iconic books on language learning strategies (Oxford, 1990; Oxford, 2016; O'Malley & Chamot, 1990), SLA (Taguchi,

**Table 4. Top 20 Most Highly Cited Articles**

Author	Title	Raw Citation	Normalised Citation
Duncan & McKeachie (2005)	The making of the motivated strategies for learning questionnaire	446	0.6872
Tseng & Schmitt (2008)	Toward a model of motivated vocabulary learning: A structural equation modeling approach	109	0.5989
Hadwin & Oshige (2011)	Self-regulation, co-regulation and socially shared regulation: exploring the perspectives of social in self-regulated learning theory	219	0.3046
Vandergrift (2005)	Relationships among motivation orientations, meta-cognitive awareness and proficiency in L2 listening	175	0.2696
Falout et al. (2009)	Demotivation: affective states and learning outcomes	98	0.2227
Lai & Gu (2011)	Self-regulated out-of-class language learning with technology	151	0.2100
Suh et al. (2010)	Effectiveness of MMORPG-based instruction in elementary English education in Korea	112	0.2025
Kormos & Csizér (2014)	The interaction of motivation, self-regulatory strategies, and autonomous learning behavior in different learner groups	111	0.1910
Meyer et al. (2010)	Improving literacy and meta-cognition with electronic portfolios: teaching and learning with ePEARL	88	0.1591
Teimouri (2017)	L2 selves, emotions, and motivated behaviors	105	0.1563
Chen (2013)	Tablets for informal language learning: student usage and attitudes	88	0.1541
Dörnyei (2019)	Towards a better understanding of the L2 learning experience, the Cinderella of the L2 motivational self system	91	0.1475
Latham et al. (2012)	A conversational intelligent tutoring system to automatically predict learning styles	84	0.1424
Oztok et al. (2013)	Exploring asynchronous and synchronous tool use in online courses	77	0.1349
Kondo et al. (2012)	Mobile assisted language learning in university EFL courses in Japan: developing attitudes and skills for self-regulated learning	79	0.1339
Zhang et al. (2011)	Reexamining the effectiveness of vocabulary learning via mobile phones	84	0.1168
Teng & Zhang (2018)	Effects of motivational regulation strategies on writing performance: a mediation model of self-regulated learning of writing in English as a second/foreign language	94	0.1155
Teng & Zhang (2016)	A Questionnaire-based validation of multidimensional models of self-regulated learning strategies	111	0.1062
Shyr & Chen (2018)	Designing a technology-enhanced flipped learning system to facilitate students' self-regulation and performance	79	0.0971
Li (2016)	The construct validity of language aptitude	91	0.0870

2009), SRL (Zimmerman, 2000; Zimmerman & Schunk, 2001; 2011), learner psychology (Vygotsky, 1978) and individual differences in language learning (Dörnyei, 2005; Dörnyei & Ushioda, 2009).

For instance, Dörnyei (2005) expounds upon individual differences in the context of language learning by incorporating learner variables from the psychological and sociological domains. Such variables encompass personality traits, linguistic aptitude, motivation, cognitive or learning styles, and learning strategies, along with their interrelation to the SRL process. Moreover, Oxford (1990; 2011) and O'Malley & Chamot (1990) emphasize the significance of learning strategies in self-regulated language learning. With regard to methodological issues, measurement instruments from different perspectives of SRL (Zimmerman, 2000), the measurement of motivated learning strategies (Pintrich et al., 1993), the conceptual framework for evaluating motivation and SRL in the context of higher education (Pintrich, 2004), the novel online measurement of self-regulatory processes and motivational factors in relation to learning in real-life scenarios, and the analysis of statistical power

**Table 5. Top 20 Most Highly Cited References**

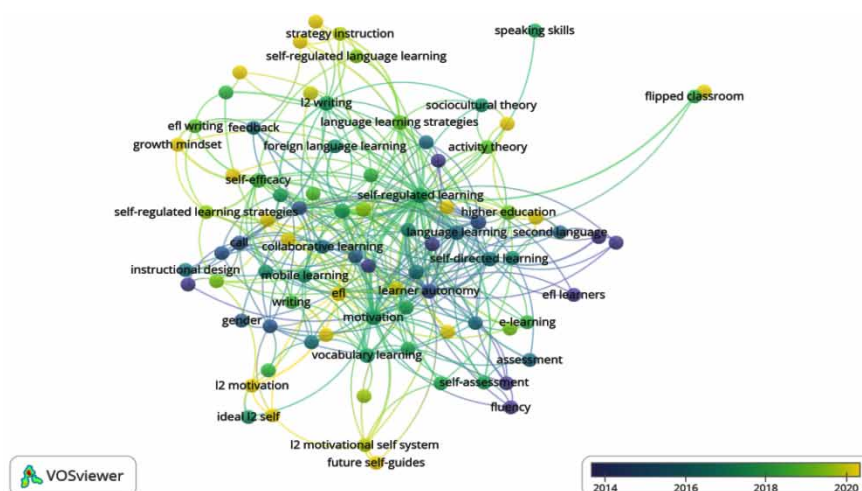
Work	Title	Citation
Dörnyei (2005)	The psychology of the language learner: individual differences in second language acquisition	51
Oxford (1990)	Language learning strategies: what every teacher should know	47
Vygotsky (1978)	Mind in Society: Development of Higher Psychological Processes	39
Zimmerman (2000)	Handbook of Self-regulation	39
Tseng et al. (2006)	A new approach to assessing strategic learning: the case of self-regulation in vocabulary acquisition	31
Pintrich & De Groot (1990)	Motivational and self-regulated learning components of classroom academic performance	31
Zimmerman (2008)	Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects	30
Lai & Gu (2011)	Self-regulated out-of-class language learning with technology	28
Gardner et al. (1985)	The role of attitudes and motivation in second language learning: correlational and experimental considerations	27
Dörnyei & Ushioda (2009)	Motivation, language identity and the L2 self	26
Teng & Zhang (2016)	A questionnaire-based validation of multidimensional models of self-regulated learning strategies	25
Zimmerman (2002)	Becoming a self-regulated learner: An overview	25
Cohen (1988)	Statistical power analysis for the behavioral sciences	24
Zimmerman & Schunk (2001)	Self-regulated learning and academic achievement: Theoretical perspectives	24
Oxford (2016)	Teaching and researching language learning strategies: self-regulation in context	23
Pintrich (2004)	A conceptual framework for assessing motivation and self-regulated learning in college students	22
Zimmerman & Schunk (2011)	Handbook of Self-regulation of Learning and Performance	22
Pintrich et al. (1993)	Reliability and predictive validity of the motivated strategies for learning questionnaires (MSLQ)	21
O'Malley & Chamot (1990)	Learning strategies in second language acquisition	21
Taguchi (2009)	Pragmatic competence	21

(Cohen, 1988), are all highly cited references, which have raised intriguing inquiries for further examination and study. For instance, Pintrich and De Groot (1990) analyzed the association between motivational orientation, SRL, and academic performance in classroom settings. They observed the impact of personal discrepancies in motivational orientation on cognitive engagement and self-regulation within the classroom environment.

It is also noteworthy that the work of Lai and Gu (2011) and that of Teng and Zhang (2016) are both highly cited articles and references. The article by Lai and Gu (2011) is related to technology-assisted SRL beyond the formal instructional environment, while Teng and Zhang (2016) analyzed the validity of the models of SRL strategies, implying that SRL researchers have shifted their



Figure 2. Co-occurrence of Author Keywords Network



interest in what strategies language learners use to regulate their own learning process in informal settings with the assistance of modern technology.

### Distributions of Most Frequently Co-Occurring Author Keywords

In this section, the co-occurrence of author keywords was used to analyze the text because they represent key concepts of the publications (Vošner et al., 2016). Through this analysis, a network was created to demonstrate the interrelations among the keywords identified between 2014 and 2020, as shown in Figure 2.

After automatic removal of the thesaurus, a total of 85 author keywords were obtained and grouped into 11 clusters by their interconnections. Eight clusters including 77 keyword items, which account for 90.6% of the total, are displayed in Table 6.

Each of these eight clusters consists of more than five keyword items. The other three clusters are omitted because they are relatively small, less frequently occurring, and might not reflect academic interests in this field (Lin & Yu, 2023). Each color is representative of one specific cluster. The keyword items with high occurrences in each cluster are listed in Table 6. Cluster one contains 14 items (16.5% of the total 85) and the representative keywords are “self-directed learning,” “learner autonomy,” “language learning,” “higher education,” and “technology,” indicating researchers put

Table 6. Clusters of Author Keywords

Cluster No.	Color	Items (Percentage)	Representative Keyword Items with High Occurrences
1	Red	14 (16.5%)	self-directed learning, learner autonomy, language learning, higher education, technology
2	Green	12 (14.1%)	vocabulary learning, writing, reading, L2 motivation
3	Blue	12 (14.1%)	MALL, CALL, mobile learning, collaborative learning
4	Yellow	10 (11.76%)	self-efficacy, individual differences, self-regulated learning strategies, independent learning
5	Purple	9 (10.59%)	meta-cognitive strategies, language learning strategies, L2 writing, strategy instruction
6	Cyan	8 (9.41%)	motivation, self-regulation, self-assessment, anxiety
7	Orange	7 (8.24%)	EFL, online learning, learning strategies, perceptions
8	Brown	5 (5.88%)	self-regulated learning, activity theory, socio-cultural theory

their interest in enhancing autonomous learning through technology-enhanced SRLL in the context of higher education (Hawkins, 2018; Shen et al., 2020). In cluster two, “vocabulary learning,” “writing,” “reading,” and “L2 motivation” are the highly used keywords, which implies that SRL is applied more for the learning of vocabulary (Chen et al., 2019) and development of L2 motivation in both productive and receptive skills like writing (Papi et al., 2019) and reading (Li et al., 2021). As in cluster 3, the abbreviation for mobile-assisted language learning (MALL), the abbreviation for computer-assisted language learning (CALL), “mobile learning,” and “collaborative learning” are connected with each other, meaning that modern technology is used to foster SRL through collaboration with peers (Liu et al., 2014). Taken together, the representative keywords in clusters four and six show a focus on individual differences such as self-efficacy (Sun & Wang, 2020), motivation (Kormos & Csizér, 2014; Teimouri, 2017), self-assessment (Xiang et al., 2021) and learning strategy use (Teng, 2021) in self-regulated learning, L2 writing in particular, as well as what self-regulatory strategies learners use to deal with foreign language anxiety (Guo et al., 2018). This tendency is parallel to that of cluster five, as the highly-occurred keywords are “meta-cognitive strategies,” “language learning strategies,” “L2 writing,” and “strategy instruction.” According to the keywords listed in cluster seven, students’ perceptions of enhancing autonomous language learning with technology outside the classroom attracts researchers’ attention (Lai et al., 2016). Cluster eight displays a shift of theoretical guidance from socio-cultural theory to activity theory in SRLL studies (Lin et al., 2020; Min, 2023).

The larger the node size, the more heatedly discussed the topic. The nodes in yellow stand for the topics that have drawn attention of researchers in more recent years. It is observed that many keywords such as “self-regulated learning,” “motivation,” “self-directed learning,” “learner autonomy,” “EFL,” “meta-cognitive strategies,” and “MALL” are frequently discussed according to the frequency of occurrence, as listed in Table 7.

It is noteworthy that the two terms with highest average normalised citations are collaborative learning (32) and mobile learning (31.22), followed by SRL strategies (28.43), self-regulation (27.77) and MALL (27.56). This reflects scholars’ interest in learners’ use of SRL strategies in mobile-assisted collaborative learning settings. This mirrors the findings of author keyword analysis.

The current study employs the methodology of burstiness analysis to investigate the dynamic trends in research focuses pertaining to SRLL through the examination of author keywords. By this means, the strength and beginning and ending years of each author’s keyword within the scope of SRLL research are derived. The top 20 keywords with the strongest citation bursts are shown in Table 8.

It can be seen that the majority of them emerge and burst in the last five years. The keywords closest to present (2023) in terms of strength are “EFL learners,” “higher education,” “mobile-assisted language learning,” “language learners,” “strategy instruction,” “vocabulary learning,” “mobile learning,” and “L2 motivation,” which indicates that the selected publications of SRLL under scrutiny adhere closely to cutting-edge issues and top trending subjects. The tabulated data elucidates the identified keywords as the focal areas of investigation in the field of SRLL spanning the time period from 2005 to 2023, with particular emphasis on the time frame between 2012 and 2023. Consequently, researchers with interest in this field may commence from the aforementioned research topics.

## DISCUSSION

This study represents a bibliometric approach to the development of SRLL-related research from 2005 to 2023, involving a total of 498 publications that met the proposed inclusion and exclusion criteria. Research findings related to the (1) publication status and (2) publication trends are discussed to answer the two research questions.

### Status of Publications

This study indicates that the number and citation counts of SRLL-related studies increased generally since 2005 and has undergone a sharp increase since 2020. This is possibly a subset of the COVID-19

Table 7. Top 20 Terms That Appeared Most Frequently in Title and Abstract of Articles

Terms	Occurrences	Total link strength	Average published year	Average Normalised citation
self-regulated learning	73	46	2017	23.12
motivation	36	39	2017	20.64
self-directed learning	23	23	2015	16.91
learner autonomy	21	19	2014	25.91
English as a foreign language	17	13	2020	8.18
MALL	16	14	2019	27.56
meta-cognitive strategies	15	23	2017	13.47
higher education	15	5	2018	7.13
self-regulation	13	16	2014	27.77
self-efficacy	13	14	2018	16.85
language learning strategies	13	11	2018	7.31
vocabulary learning	13	8	2017	12.77
L2 writing	13	7	2017	16.31
learning strategies	10	15	2016	22.5
mobile learning	9	7	2017	31.22
online learning	9	7	2017	19.44
second language acquisition	9	5	2019	12.33
collaborative learning	8	9	2015	32
individual differences	8	7	2017	19.5
self-regulated learning strategies	7	9	2019	28.43

Table 8. Top 20 Keywords with Strongest Citation Bursts

Keyword	Strength	Begin	End	2005-2023
acquisition	4.51	2012	2015	
students	2.72	2018	2018	
feedback	2.6	2018	2021	
L2 motivational self system	2.11	2018	2019	
teachers	2.02	2018	2019	
performance	1.99	2018	2018	
community	1.78	2018	2019	
perspective	2.28	2019	2021	
context	1.91	2019	2021	
beliefs	2.03	2020	2020	
L2 motivation	2.49	2020	2021	
self-regulated learning strategies	2.08	2020	2021	
learners	2.02	2020	2021	
higher education	2.31	2020	2023	
EFL learners	2.65	2021	2023	
mobile-assisted language learning	2.28	2022	2023	
strategy instruction	2.1	2022	2023	
language learners	2.1	2022	2023	
vocabulary learning	1.75	2022	2023	
mobile learning	1.75	2022	2023	

pandemic, which triggers the incorporation of mobile technology with both formal and informal learning (Kamasak et al., 2021; Wang et al., 2022) inside and outside classroom activities (Peng et al., 2021). However, this result contradicts Yang et al. (2023), who systematically reviewed technology-enhanced SRL studies from 2011 to 2020 and reported a decline of publications between 2018 and 2020. According to the co-occurrence analysis, China is the country that contributes most to the SRL-related publications; however, only a small number of articles are published by researchers from mainland China. One possible reason is that although SRL is gaining on popularity in the educational field, it is still a novel dimension in language learning strategies (LLS) research of L2 learning (Thomas & Rose, 2019), especially for EFL learning in China's mainland (Bai et al., 2020). Therefore, future SRL-related studies could focus on EFL learning in Chinese mainland.

## Publication Trends

### *Frequently-Used Key Words*

According to the keyword analysis and burst analysis, key words such as “self-directed learning,” “mobile-assisted language learning,” “second language learning,” “online learning,” and “mobile learning” frequently occurred in the publications during the examined time period. This result echoes previous findings that SRL and MALL were interrelated in that learners' SRL could be improved by mobile learning, and learners' SRL also contributed to m-learning (Palalas & Wark, 2020). The high frequency of these key words may be due to the increasing popularity and convenience of MALL (Wrigglesworth, 2020; Khan & Gupta, 2022), through which learners have easy access to various online resources and should develop skills to self-direct and personalize their learning plans and monitor their own learning processes. In addition, previous research has proven that mobile technology can enhance students' L2 acquisition both in formal and informal settings (Kukulska-Hulme & Viberg, 2018).

“Higher education” is also a frequently-used key word, while learners at other educational levels are less explored. These results correspond with previous findings that studies on technology-assisted language learning were mostly conducted in tertiary contexts (Yang et al, 2023; Chang & Hung, 2019). This is mainly because college students have easier and more convenient access to a laptop or smartphone, leading to an increasing use of mobile devices for academic learning (Seilhamer et al., 2018). Additionally, college learners have relatively higher levels of expertise and thus are given more opportunities to regulate and manage their own learning both in and out of class according to the diversified course designs and learning activities. However, empirical research has indicated that preschoolers have already started to develop an ability for SRL (Dignath et al., 2008). Therefore, it is necessary for future studies to investigate how learners below university level regulate their learning of L1 or L2.

“Learning context” is another frequently-occurring key word between 2021-2023. This is probably because what takes place in the classroom and what students do outside of it both contribute to the success of language learning (Richard, 2015). Additionally, educational researchers currently agree that classroom instruction can only offer limited learning opportunities and thus shift their attention to learners' autonomous language learning outside the classroom (Rasheed et al., 2020). This result accords with the findings of previous studies (Sung et al., 2015; Chen et al., 2020), which claimed the stronger facilitative impact of mobile-assisted L2 learning in informal/outdoor setting than in formal/classroom setting. In out-of-class mobile-assisted learning settings, learners were required to take charge of their own learning by regulating and modifying learning activities independent of teachers. Therefore, how learners self-regulate their language learning outside of class warrants our attention.

SRL is described as the use of specific meta-strategies, cognitive strategies, and tactics that help learners take control of their own learning process towards the learning goals (Oxford, 2011). In so doing, learners are able to acquire a new language more efficiently and effectively, including in terms of the amount of time and effort they devote to achieving these goals (Viberg & Kukulska-Hulme, 2021). Additionally, the implementation of these strategies is especially important for students

to manage and control the technology-assisted outside-of-class language learning activities (García Botero et al., 2021). Therefore, “metacognitive strategy instruction” and “learners’ use of SRL strategies” have drawn the attention of language researchers and educators in recent years.

The cluster of the selected literature demonstrates a preference for studies on more visible linguistic skills such as vocabulary, reading, and writing over listening, while listening as an important language skill is under-explored in the field of SRL (Teng & Zhang, 2022). This echoes previous findings that L2 listening as a critical language dimension was undervalued in the field of MALL (Newton & Nation, 2020; Abdolrezaei & Ghanbari, 2021). This research trend may result from the innate nature of listening comprehension that goes beyond the simple concept of auditory reception, representing a dynamic and complex process of meaning formation (Al-Khresheh & Alruwaili, 2024). Moreover, learning to understand and interpret the discourse of others while listening in a second or foreign language is a “dynamic complex cognitive process” that involves learners’ adoption of both linguistic and non-linguistic knowledge as well as the interaction of different learner factors (Zhang & Shen, 2023, p. 3), making listening the most difficult of the four language skills to teach and learn (Vandergrift, 2007). Therefore, future studies should focus more on how learners self-regulate their learning of L2 listening, so as to shed light on L2 listening development in the field of SLA.

### *Theoretical Advancement*

According to the burst analysis of frequently-used key words, “self-efficacy” has come to the fore, indicating that it is receiving increasing attention in the SRL field. This result parallels previous finding that self-efficacy could explain about 12% of learners’ English language proficiency (Wang & Sun, 2020). This is because self-efficacy is one motivational aspect of the SRL cycle (Zimmerman & Molyan, 2009), which serves as a key factor that influences learners’ academic learning in general and language learning in specific and it also impacts learners use of SRL strategies (Quoc Tran et al., 2023). Despite the positive effect of self-efficacy on learners’ use of self-regulate strategies (Lee et al., 2021), the impact of strategy instruction on the development of self-efficacy is inconclusive. For example, Boroumand et al. (2021) found strategy-based instruction could increase learners’ self-efficacy, while Fathi et al. (2020), and Pei et al. (2023) all reported strategy training had no significant influence on learners’ self-efficacy beliefs. Therefore, it is necessary to carry out further research in this regard to provide more empirical evidence on the relationship between self-efficacy and self-regulated strategy instruction.

According to the result of key author keyword analysis, there is a shift of theoretical guidance from socio-cultural theory to activity theory in SRL studies. Similarly, Lin et al. (2020) also reported a shift to activity theory in their review study on mobile-assisted L2 reading development. Within the umbrella of Vygotsky’s socio-cultural theory, activity theory also posits that learning transpires within a social milieu wherein learners engage in either self-initiated or organized learning by means of mobile devices or collaborate with fellow learners by utilizing these tools in the learning environment to attain educational goals. This viewpoint underscores the importance of examining both independent and collaborative learning of SRL in mobile learning environment and provides valuable insight for future studies in this regard.

## **CONCLUSION**

### **Major Findings**

This bibliometric study has presented a holistic picture of the research related to SRL by citation network analysis and visualization analysis. The results of this bibliometric analysis have achieved the objectives of this study, which could provide a more complete view of the significant issues in SRL and bring insight for future SRL research in terms of themes, pedagogy, and methodologies. Overall, publications on SRL have been growing since the introduction of the term “self-regulation” into

the ESL/EFL context in 2005 and will continue to grow in terms of the number of publications and total citation counts in the near future. In addition, the main sources of publications, most productive countries/regions contributing to the SRL research, and the most frequently explored SRL-related author keywords and the developmental patterns of these topics have been identified and analyzed. It is believed that “strategy instruction” and “SRL in out-of-class settings” should be the focuses of future SLA research in accordance with the current trends observed in the field of SRL. What’s more, current studies have shown a preference to investigate learners’ SRL of vocabulary, reading, and writing over listening. Another research trend is that current studies welcome the integration of educational technology, which indicates that learners could personalize and optimize their own learning with the help of modern technology such as mobile applications, artificial intelligence (AI), and virtual reality (VR). In addition, activity theory has drawn attention of researchers in the SRL field.

## **LIMITATIONS AND IMPLICATIONS**

Despite the noticeable findings, this study has its limitations. First, since the research data of this bibliometric analysis were solely retrieved from the core collections of WoS database, there is a possibility that a number of articles available only in non-WoS database might not have been included in this research. Second, this study analyses articles published in English due to the limitation of the authors’ linguistic knowledge; thus, publications in other languages are not included in this study. Further, this study only investigates articles related to SRL, which may miss some emerging topics. Future studies may analyze texts of other genres such as book sections in order to provide a fuller picture of research in the SRL field. More practically, future studies should focus on how language learners self-regulate their learning for L2/FL listening. SRL may also be investigated at other educational levels apart from the tertiary level, extending classroom instruction to out-of-class learning with strategy training from teachers, and learners’ motivational factors such self-efficacy as well as learners’ metacognitive awareness should also be taken into account. In addition, future studies could use different research methods such as systematic review or meta-analysis to conduct more specific and in-depth analysis on this subject.

## **CONFLICTS OF INTEREST**

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