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Informal Learning of English or English Learning Beyond the Classroom? A Systematic and Bibliometric Review (1998-2024)

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As digitization advances, English learning has gained prominence increasingly among language researchers. However, informal learning of English (ILE) or English learning beyond the classroom (ELBC) have struggled with conceptual ambiguity and a lack of systematic bibliometric reviews regarding their evolution in the context of higher education. This study addresses this gap through a comprehensive literature review employing both quantitative and qualitative methods to examine these concepts and identifies emerging trends. This study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-2020) framework, and 678 publications were selected between 1998 and 2024. Excels, VOSviewer, and CiteSpace were used to visualize data on publications, research collaboration, authorship, international collaborations and co-occurrence. The findings revealed significant shifts in the focus and scope of ILE/ELBC research, highlighting four phases: Emergence from 1998 to 2009, technology integration from 2010 to 2015, digital trend from 2016 to 2020, and current state 2021-2024. Besides, this study contributes to the literature by providing a comprehensive evolution of ILE/ELBC, and identifying four key drivers: learner autonomy, self-regulation, self-direction, and technology. These insights offer valuable implications for educators and researchers interested in the evolving dynamics of ILE/ELBC in higher education.

Keywords: informal learning of English, English learning beyond the classroom, systematic review, bibliometric review, English learning, informal learning

INTRODUCTION

Research indicates that 70% to 90% of knowledge acquisition occurs through informal learning, often described as the submerged part of an “iceberg” (Rogers, 2014; Johnson

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& Majewska, 2022). This metaphor underscores the often overlooked yet crucial role of informal learning. Informal learning is defined to "deny organisation and location" (Johnson & Majewska, 2022), and is viewed as an individual learning process aimed at enhancing knowledge and skills (Jeong et al., 2018). It can occur either incidentally or intentionally (Watkins & Marsick, 2020), and plays an pivotal role in socialisation and the development of social skills among learners (Chan, 2021; Abedini et al., 2021).

The rapid advancement of technology has greatly expanded access to informal learning, particular in the field of language acquisition (Lee, 2021). One notable trend is the increasing interest in informal learning of English (ILE), which has gained prominence in higher education institutions across countries such as China, South Korea, Malaysia, Indonesia, and Iran (Lee, 2021; Balouchi & Samad, 2021; Anggraini et al., 2022; Naghdipour, 2022; Liu et al., 2024). However, despite its growing importance, the literature on ILE presents a range of definitions that are often diverse and ambiguous (Zhao et al., 2023). These definitions extend beyond ILE to include concepts such as learning beyond the classroom (Lai, 2017), workplace learning (Chan, 2021), adult learning (Abedini et al., 2021), autonomous learning (Wiwat & Saovapa, 2017; Tareen et al., 2024), independent learning (Lau, 2017), and self-directed learning (Rini et al., 2022).

Similarly, English learning beyond the classroom (ELBC) often referred to as "out-of-class learning" has coexisted with ILE for years. Prior research has classified various concepts under ELBC, including "after-class, extracurricular, distance, naturalistic learning, non-instructed, autonomous learning, independent learning, self-directed learning, self-regulated, or informal learning" (Reinders & Benson, 2017). However, these concepts cannot be interchangeably used, as some have specific-general relationships with each other. For example, self-regulated learning has been identified as predictive of self-directed learning (Lai et al., 2023).

Despite the frequent discussion of ILE/ELBC in the literature, a comprehensive understanding of English learning beyond the formal educational setting remains elusive. One issue is that some reviews focus exclusively on the concept "informal learning", neglecting relevant synonyms and variations when retrieving articles. This narrow focus may result in an incomplete understanding of the broader informal learning landscape. For example, in a literature review by Kyung-Hee Park et al. (2021), all references were related to "informal learning". Similarly, although Lecat and his team (2020) explored informal learning using both "informal learning" and "workplace learning", their approach might miss articles that use other concepts such as "self-regulated learning", "self-directed learning" and the like. In another review, "informal learning" was the predominant concept among 85 references, with only two articles including "self-regulated learning" and "self-determined learning" (Almukhaylid et al., 2021).

Furthermore, ILE/ELBC is argued to be inherently multidimensional (Decius et al., 2024), with the current literature presenting various yet overlapping concepts such as self-directed learning (Lai, 2015; Song & Bonk, 2016), free-choice learning (Rosenthal, 2018), self-regulated learning (Wong et al., 2019; Yang et al., 2023), learning beyond

the classroom (Lai, 2017), learning in the digital wild (Sockett, 2023), and informal digital learning of English (Lee & Dressman, 2018; Lee, 2019). To some extent, it remains ambiguous whether these concepts can be regarded as synonymous with, a hyponym of, or substitute for one another.

Despite the concepts of ILE and ELBC have been prevalent for many years (Toffoli & Sockett, 2015; Lee et al., 2024; Nunan, 2015; Lai, 2017; Reinder, 2020), few literature reviews employ both bibliometric and systematic methods to explore the evolution of these concepts, their overlapping constructs, and their distinctions (Clark, 2016; Decius et al., 2023; Decius et al., 2024). Consequently, the primary objectives of this review are (i) to systematically identify and review published literature using both quantitative and qualitative methods, providing an overview of the evolution of these concepts; (ii) to offer scholars in language acquisition an overview of the current states of ILE/ELBC through a bibliometric analysis; (iii) to identify research gaps and emerging trends that need further exploration. Concretely, we stated the following research questions:

RQ 1: Which countries/regions, journals, and authors contributed the most to ILE/ ELBC research?

RQ 2: What is the distribution of the most-used keywords in ILE and ELBC research across different periods?

RQ 3: How have the concepts of ILE/ELBC evolved, and which is emerging as the dominant trend?

METHOD

Database and Selection strategy

A search for relevant publications was conducted on August 2024, using the Scopus database. The study was structured into two major stages: (a) bibliometric analyses and (b) thematic analysis. The aim is to investigate and analyse existing research on ILE using both quantitative (bibliometric analysis) and qualitative (systematic literature review) techniques. Bibliometric analysis can handle a large amount of literature, providing a one-stop overview (Vázquez-Cano et al, 2022). By relying on quantitative techniques, bias can be minimized when selecting documents (Donthu et al., 2021). Consequently, bibliometric analysis is used to present citation-and-publication-related metrics, such as the number of cited publications, *h*-index (*h*), *g*-index (*g*), *i*-index (*i*-10, *i*-100, *i*-200). To present the visualization, Excel, Citespace 6.3.R1, and VOS viewer 1.6.20 were used for the review process. Despite a visual analysis, a comprehensive research system cannot be presented (Zhou et al., 2024). Thus, the top ten documents in Q1 or Q2 with at least 100 citations from influential journals in the JCR (i.e. Q1, Q2) were analysed to address the RQ 3.

Table 1
Criteria for data selection

Criteria	Inclusion	Exclusion
Language	English	Articles other than English language
Time frame	1998-August 2024	Publications before 1998
Database	Scopus	Other databases
Citation	Articles with at least 20 citations	Lower than 20 citations
Research domain	Social Science, Computer Science	Other domains
Discipline	EFL/ESL contexts	Non EFL/ESL contexts
Publication type	Academic peer-reviewed journal article	Books, editorials, reviews, conference papers, dissertations

The initial step in the research design was to refine the keywords. This was performed using a combination of Boolean logic operators (AND, OR) and keywords (Zyoud & Fuchs-Hanusch, 2017). An asterisk (∗) was used as a wildcard character to include all possible forms of the specific terms (Liu & Abdullah, 2024). To address research questions, the following search strings was used: TITLE (language OR English OR ESL OR EFL OR L2) AND (informal OR self-direct* OR extramural OR "self-regulat*" OR "adult learning" OR "free-choice learning" OR "incidental learning" OR autonom* OR "self-determined learning" OR "independent learning" OR "outside the classroom" OR "beyond the classroom" OR "learning in the digital wild"). As the focus was on higher education, "workplace learning" was excluded.

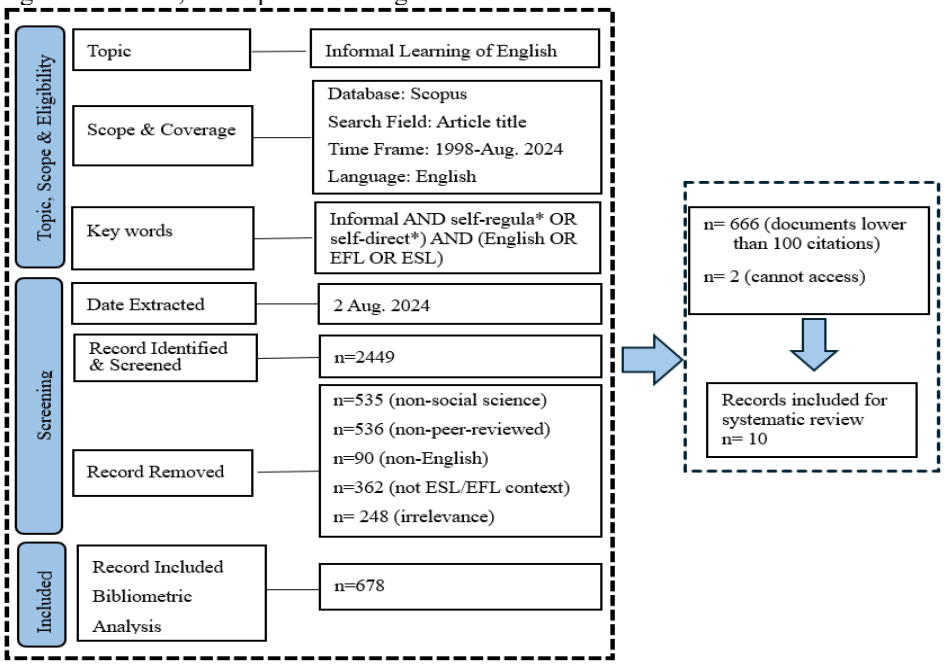

Figure 1
Flow diagram for bibliometric systematic research (adapted from Page et al., 2021).

Given the substantial rise in publications over recent decades, a systematic and bibliometric review was conducted from 1998 to 2024. This period was chosen because of its inclusion in the emergence of autonomous language learning among tertiary students, as initially documented by Lee and Morrison (1998) in the Scopus database. After curating the papers within this timeframe, documents in the domain of *Social Science*, including *Arts and Humanities* and *Psychology* were selected. Recognizing that ILE/ELBC is interdisciplinary and increasingly related to technology (Yang et al., 2022), we also included *Computer Science* publications. Articles from other subject areas were excluded to ensure relevance to English language learning. The remaining documents were filtered by document type ("Articles"), and only those written in English were considered. As a result, this search yielded a total of 2449 articles published from 1998 to 2024. Consequently, after removing irrelevant papers, the final count of relevant papers was 678 selected for the bibliometric analysis. The main data were divided into four subgroups representing four time periods: a) 1998-2009 (32 files), b) 2010-2015 (102 files), c) 2016-2020 (182 files), and e) 2021-2024 (362 files). To enhance the reliability of the analysis, the top ten articles with 100 or more citations were considered for systematic literature review.

VOSviewer (version 1.6.20) was used to visualize networks related to scientific publications, journals, researchers, countries, or keywords (Wang et al., 2022). In this study, the software was employed for three types of analyses: i) co-citation analysis, ii) co-authorship analysis, and iii) keyword co-occurrence analysis. Additionally, CiteSpace (version 6.3 R1) served as a key scientometric tool in this study for visualizing research collaboration, country networks, co-occurrence networks, and keyword time zone views (Geng et al., 2024). Microsoft Excel 2019 was also used to count publications, analyze citation frequencies, and calculate the average citations per country or author.

FINDINGS

Analysis of journals, publications, and authors

Analysis of Journals: VOSviewer 1.6.20 was used to identify journals with at least 10 publications per year in Q1 and Q2 quartiles. Table 2 lists the top eight highly cited journals that met these criteria. Citations per article indicate that *Computer Assisted Language Learning*, *System*, and *Language Teaching Research* are leading journals in this field. Among them, *Computer Assisted Language Learning* emerged as the journal with the highest number of citations. This suggests that researchers in EFL/ESL studies are increasingly focusing on ILE/ELBC using modern technologies and computer-based methods. Additionally, there is an emerging trend linking ILE/ELBC to psychology, as evidenced by publications in *Frontier in Psychology*. All these journals are high-impact publications indexed in the Social Science Citation Index (SSCI) under the categories of "education", "technology-assisted", or "language and linguistics".

Table 2
Top eight productive journals in Q1 and Q2 on ILE/ELBC

R	Source Title	P	C	JCR
1	Computer Assisted Language Learning	20	874	Q1
2	System	27	585	Q2
3	Language Teaching Research	12	330	Q1
4	Frontier in Psychology	32	300	Q2
5	Innovation in Language Learning and Teaching	15	240	Q1
6	Theory and Practice in Language Studies	20	146	Q2
7	Journal of Language Teaching and Research	18	90	Q2
8	Sage Open	10	89	Q2

R: Rank, P: Publication, C: Citation

Figure 2 shows a consistent increase in interest in EFL/ESL learning beyond the classroom. The lowest publication numbers were recorded from 1998 (n=1) to 2010 (n=8), while the period from 2011 to 2017 saw a relatively annual increase. From 2018 to 2024, the growth rate accelerated, peaking at 107 papers by 2023. During these seven years, 496 papers were published, averaging approximately 71 papers per year and accounting for 73% of the total publications. This indicates a substantial surge in research activities from 2018 to 2024. As of August 2024, there are already 85 articles on ILE/ELBC published in 2024, with the trend predicting approximately 120 articles by the end of the year.

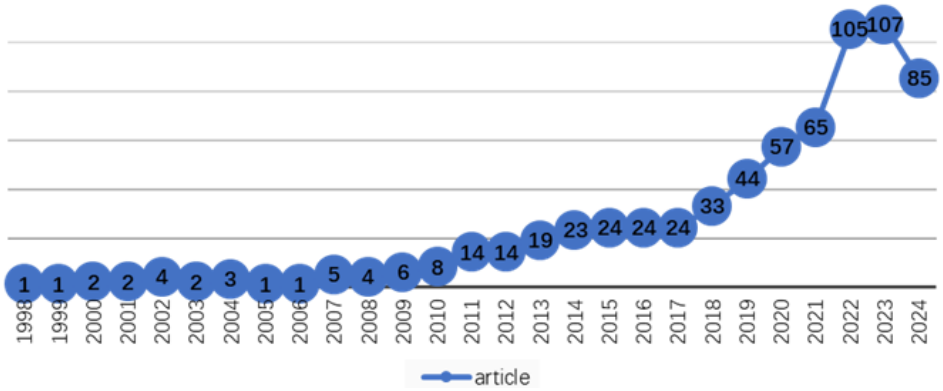

Figure 2
Number of publications in ILE/ELBC studies

Analysis of Publications: Articles with many citations significantly influence researchers and often indicate high quality in the field (Duyx et al., 2017). Among these 678 publications with at least 100 citations, the most cited document was "Fostering learner autonomy in English for science: A collaborative digital video project in a technological learning environment" by Hafner and Miller (2011), with 235 citations in *Language Learning and Technology*. In second place was "Gaming as extramural English L2 learning and L2 proficiency among young learners" by Sylvén & Sundqvist (2012), with 232 citations in *ReCALL*. As the titles of publications revealed in Table 3,

"technology" appears eight times, "learner autonomy" appears five times, "extramural", "out-of-class context", and "outside the classroom" each appears once.

Table 3
Mostly globally cited documents with a minimum of 100 citations

R	Documents	C	Author	Journal
1	Fostering learner autonomy in English for science: A collaborative digital video project in a technological learning environment	235	Hafner & Miller (2011)	*Language Learning and Technology*
2	Gaming as extramural English L2 learning and L2 proficiency among young learners	232	Sylvén & Sundqvist (2012)	*ReCALL*
3	Self-regulated out-of-class language learning with technology	218	Lai, C., & Gu, M. (2011).	*Computer assisted language learning*
4	Language games for autonomous robots	151	Steels (2001)	*IEEE Intelligent systems*
5	ESL writers and feedback: Giving more autonomy to students	141	Hyland (2000).	*Language Teaching Research*
6	Self-regulated mobile game-based English learning in a virtual reality environment	129	Chen & Hsu (2020)	*Computers & Education*
7	Digital gaming and language learning: autonomy and community	128	Chik Elice (2014)	*Language Learning and Technology*
8	Tablets for informal language learning: Student usage and attitudes	123	Chen (2013)	*Language Learning and Technology*
9	Modeling teachers' influence on learners' self-directed use of technology for language learning outside the classroom	109	Lai, C. (2015)	*Computers & education*
10	Self-directed language learning in a mobile-assisted, out-of-class context: do student walk the talk?	108	García et al., (2019)	*Computer Assisted Language Learning*
11	English majors' self-regulatory control strategy uses in academic writing and its relation to L2 motivation	108	Csizér & Tankó (2017)	*Applied Linguistics*
12	Mobile assisted language learning in university EFL courses in Japan: Developing attitudes and skills for self-regulated learning	108	Kondo et al. (2012)	*ReCALL*

R: Rank, C: Citation

Analysis of Authors: Bibliometric software was used to identify highly cited authors, who often play a pivotal role in shaping research trends and advancing significant theories (Elgendi, 2019). Thus, to comprehensively understand ~~of~~ those who contribute to the evolution of the discipline, the study chose 'Authors' as unit of analysis using VOS viewer. The threshold was set to a minimum of two publications with 200 citations. Table 4 lists six authors meeting the threshold: Chun Lai, Liang Jyh-chong, Tsai Chin-chung, Zheng Chunping, Fiona Hyland, and Lee Ju Seong. To specify, Lai's publications (2011, 2013, 2016, 2019, 2023, 2024) on English acquisition emphasize "beyond the classroom", "technology", and "self-directed learning". Liang Jyh-chong (2016, 2018, 2019) frequently uses "online self-regulation" in his studies of English language learning. Tsai Chin-chung, Zheng Chunping, and Liang Jyh-chong co-

authored works on "online self-regulation" in English learning in 2016, 2018, and 2019. Hyland (2000, 2004) focuses on "learner autonomy" in "out-of-class English learning". Lee (2019, 2020, 2023) has focused extensively on "informal digital learning of English" in EFL contexts. Although Lee's overall citation count is lower than that of other authors listed in Table 4, he ranks the second publication (n=8) just behind Lai (n=9).

Table 4
Most cited authors with the minimum of 200 citations

Author	Documents	Citations	Total link strength
Lai, Chun	9	611	87
Liang, Jyh-chong	4	258	79
Tsai, Chin-chung	4	258	79
Zheng, Chunping	3	226	69
Hyland, Fiona	2	215	6
Lee, Ju Seong	8	214	74

Co-cited Authors: Co-cited authors are those frequently cited together in various publications. Out of the 27,720 co-cited authors, eight were cited more than 200 times (See Figure 3). Zimmerman (n = 467) ranked first, followed by Benson (n=451), and Dornyei Z (n = 444). Among the remaining five authors, the works of Lai (n=256) and Lee (n=217), who are both authors and co-cited authors, also published highly cited publications in ILE/ELBC this review. Notably, Lai (2011, 2015) exclusively researched EFL/ESL beyond the classroom, while Lee (2018, 2019, 2020, 2021) focused on the informal digital learning of English.

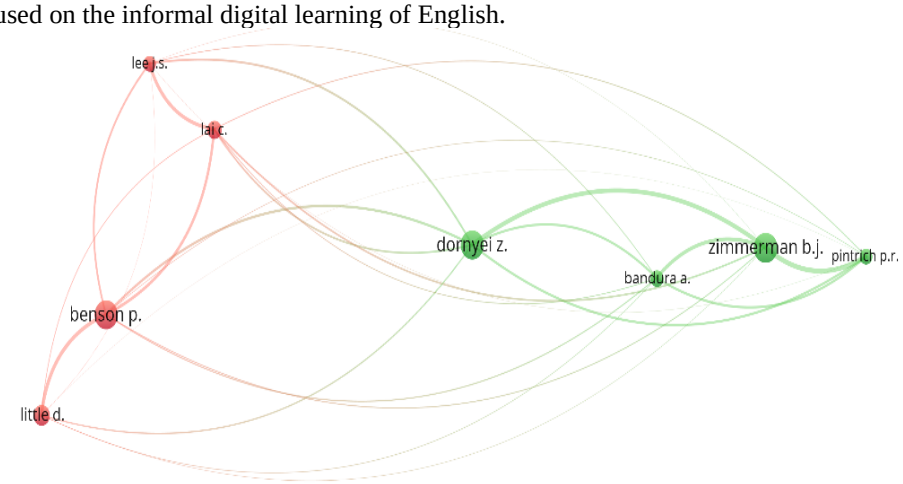

Figure 3
Co-cited Authors

Countries / regions and funding sponsors

Table 5 shows the trends in publications on ILE/ELBC across different EFL/ESL countries over the four distinct periods. Apparently, China consistently leads in research output, with a remarkable surge from nine publications in 1998-2009 to 106 in 2021-2024. Iran, Turkey, Indonesia, and Thailand have notably increased their contributions, reflecting their rising engagement in ILE/ELBC research. The dominance of Asian countries in ILE/ELBC research can be attributed to the region's growing emphasis on English proficiency for educational, cultural, and economic purposes.

Table 5
Top five productive countries (1998-2024) in ILE/ELBC

R	1998-2009		2010-2015		2016-2020		2021-2024	
	Country	*P*	*Country*	*P*	*Country*	*P*	*Country*	*P*
1	China	9	China	29	Iran	31	China	106
2	France	4	Iran	26	China	23	Iran	51
3	Singapore	4	Japan	8	Indonesia	20	Turkey	27
4	Spain	3	Malaysia	6	Turkey	14	Thailand	25
5	Japan	2	Turkey	6	Japan	10	Indonesia	24

R: Rank, P: Publication.

Research collaboration

Research collaboration is a common and effective method for exchanging and transferring knowledge between research institutions and researchers. The threshold for the minimum number of documents from a country is set at ten, resulting in the selection of ten countries. The size of the nodes corresponds to the number of collaborating countries, with more frequent cooperation resulting in larger nodes. The connections between the nodes represent the cooperative relationships between these countries. Figure 4 shows that in recent years, there has been frequent collaboration between China and other countries such as Indonesia, Iran, Malaysia, Japan, Saudi Arabia, and Thailand. Additionally, Asian countries have collaborated with each other more frequently than with countries from other regions.

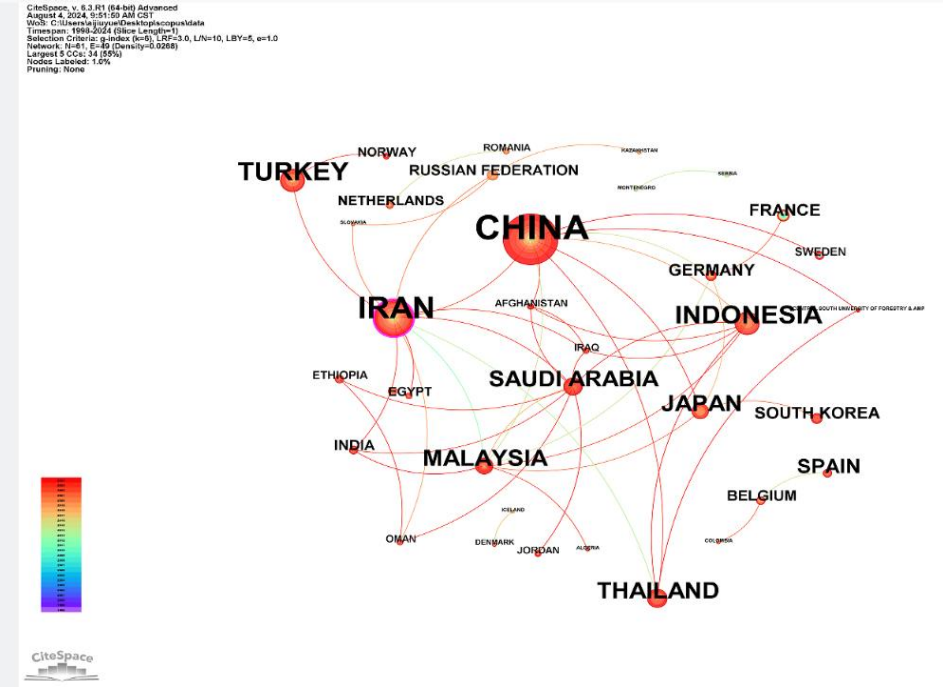

Figure 4
Co-country network map

Analysing the relationship between authors and their collaborations helps to identify key authors and research groups in ILE/ELBC. CiteSpace was used to process data from 1998 to 2024, focusing on the top ten authors for each year. The co-occurrence map shows collaborations, with the font size representing the number of articles published by each author. The connections between nodes represent collaborations. The selection criteria were based on the g-index (k=1), resulting in a map that displays 63 authors with 19 connections and a density of 0.0097. This indicates a relatively low level of collaboration. Notably, Razai and Soyoof have close collaborations, similar to the group comprising Hamphreys, Chan, and Spratt. Additionally, Liang and Tsai, as well as Nosratinia and Zaker, have established collaborations. By contrast, other authors either collaborate less frequently or work independently.

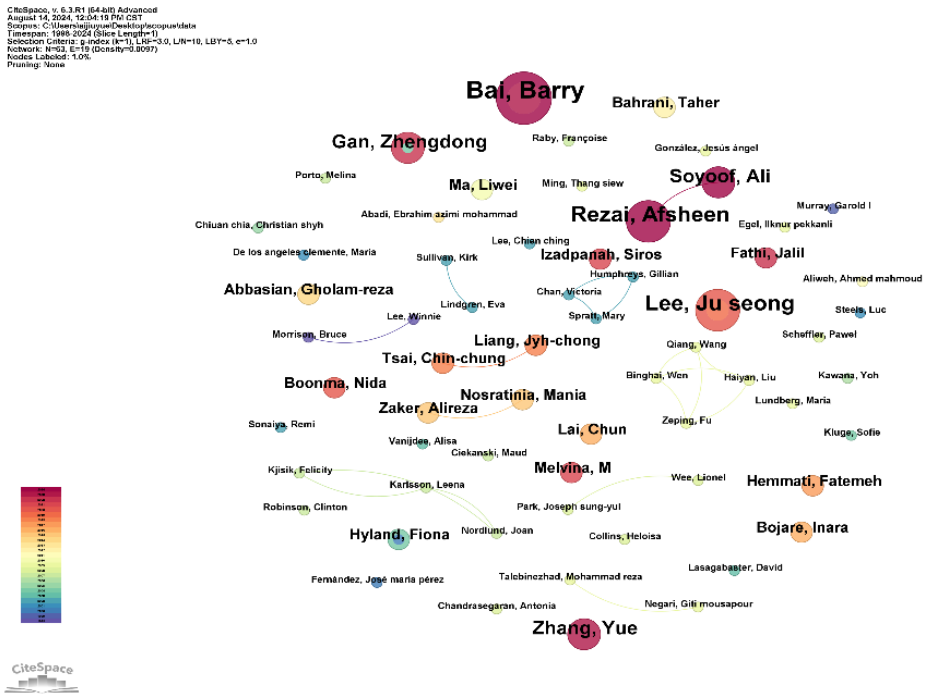

Figure 5
Co-authorship network map of the 65 authors

Keywords co-occurrence, clusters, and evolution

Keywords co-occurrence network: Keywords can effectively reflect the hot topics in scientific disciplines. Among the 216 keywords obtained in total, 116 keywords appeared only once, accounting for 53.7%. To better show the hot topics, the co-occurrence network of keywords is shown using the VOS viewer. The minimum number of keyword occurrences is set to 10, and after removing irrelevant keywords, 21 meet the threshold. Among these, “learner autonomy” has the highest occurrence (109), followed by “self-regulated learning” (72), “motivation” (56), and “self-directed learning” (31). The thickness of the links indicates the frequency of co-occurrence between keywords. According to Figure 6, “learner autonomy” has the thickest links (link strength=46), followed by “motivation” (link strength=41), and “self-regulated learning” (link strength=38). The figure also illustrates the evolution of the keywords over time. Despite “learner autonomy” and “motivation” having the highest occurrences and strongest links, the developing trends (in yellow) in ILE/ELBC are shifting towards “online learning” and “informal digital learning of English”.

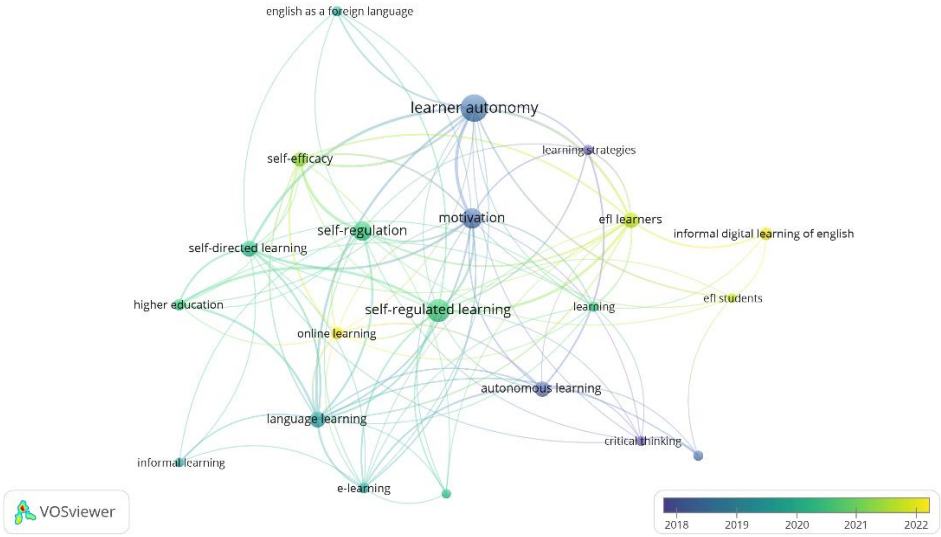

Figure 6
Co-occurrence network of the top 21 frequent keywords

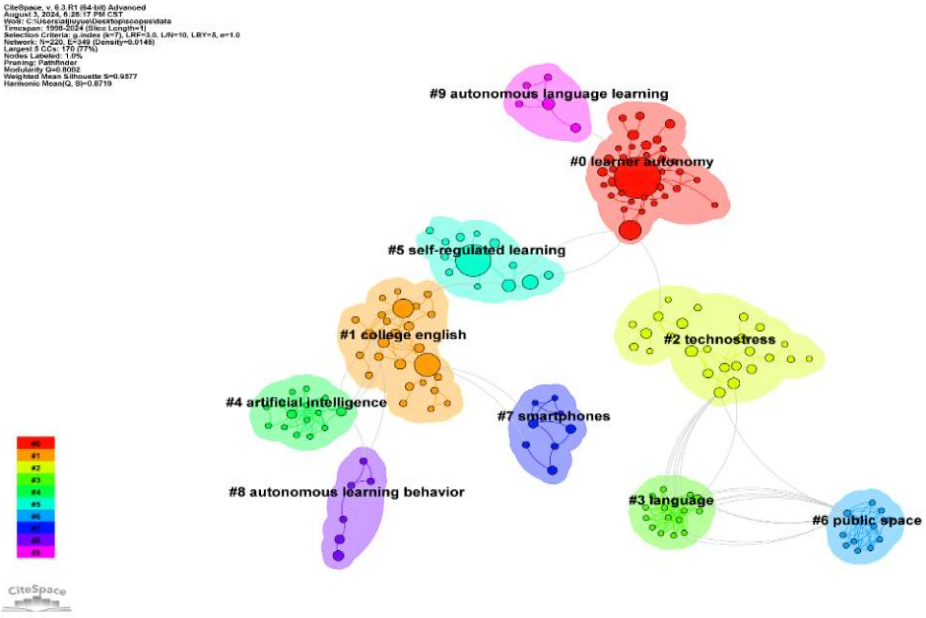

Figure 7
Key words clusters analysis

Keywords Clusters: To reduce bias by the VOS viewer, another bibliometric software CiteSpace 6.3.R1 was used to show keywords clusters. Larger clusters indicate more keywords and stronger relationships among them. Figure 7. depicts a keyword clustering map for ILE/ELBC research from 1998 to 2024. The clustering module value exceeded 0.3, indicating a significant structure, and the average silhouette value (S) was above 0.7, confirming the reliability of the results. The map identified 10 major clusters, including learner autonomy, technostress, language, artificial intelligence, self-regulated learning, public space, smartphones, autonomous learning behaviour, and autonomous language learning. These clusters demonstrate that ILE research is closely linked to learner autonomy, technology, and self-regulated learning. According to the cluster analysis shown in Table 6, the research at this stage shows the characteristics of clustering, diversification, and rapid growth. Learning autonomy, technology and EFL/ESL are closely related to the development process.

Table 6
Main cluster members of the nine clusters

C	N.N	WMS	Year	Cluster members
0	34	0.968	2012	learner autonomy (49.64, 1.0E-4); self-directed learning (11.28, 0.001); self-regulated learning (9.76, 0.005); EFL writing (8.9, 0.005); learning strategies (8.9, 0.005)
1	26	0.959	2017	learner autonomy (16.99, 1.0E-4); college English (6.26, 0.05); post-secondary education (6.26, 0.05); learning autonomy (6.26, 0.05); vocabulary learning strategies (6.26, 0.05)
2	25	0.939	2020	technostress (10.98, 0.001); growth mindfulness (5.47, 0.05); autonomous authorities' autonomous powers (5.47, 0.05); sustainable education (5.47, 0.05); informal digital learning (5.47, 0.05)
3	16	0.933	2007	language (9.61, 0.005); rural development (9.61, 0.005); literacy (9.61, 0.005); adult learning (9.61, 0.005); multilingualism (9.61, 0.005)
4	15	0.986	2003	artificial intelligence (14.25, 0.001); retrieval (7.07, 0.01); natural language processing systems (7.07, 0.01); humanized computing (7.07, 0.01); speech recognition (7.07, 0.01)
5	13	0.899	2018	self-regulated learning (39.85, 1.0E-4); higher education (13.89, 0.001); online learning (11.08, 0.001); learner autonomy (10.1, 0.005); l2 writing (9.54, 0.005)
6	12	0.972	2006	public space (8.13, 0.005); Eurasia (8.13, 0.005); urban history (8.13, 0.005); Leicester [England] (8.13, 0.005); western Europe (8.13, 0.005)
7	8	0.969	2014	smartphones (14.25, 0.001); academic writing (14.25, 0.001); mobile-assisted language learning (14.25, 0.001); informal learning (8.82, 0.005); argument in online forum (7.07, 0.01)
8	6	0.946	2021	autonomous learning behaviour (12.16, 0.001); data mining (8.44, 0.005); English proficiency (8.44, 0.005); teaching optimization (6.05, 0.05); flipped classroom (6.05, 0.05)
9	5	1	2014	autonomous language learning (23.43, 1.0E-4); practical pedagogical approaches (15.47, 1.0E-4); accountability (15.47, 1.0E-4); contrastive analysis (15.47, 1.0E-4); google translate aided language learning (7.67, 0.01)

C: Cluster; N.N: Node Number; WMS: Weighted Mean Silhouette

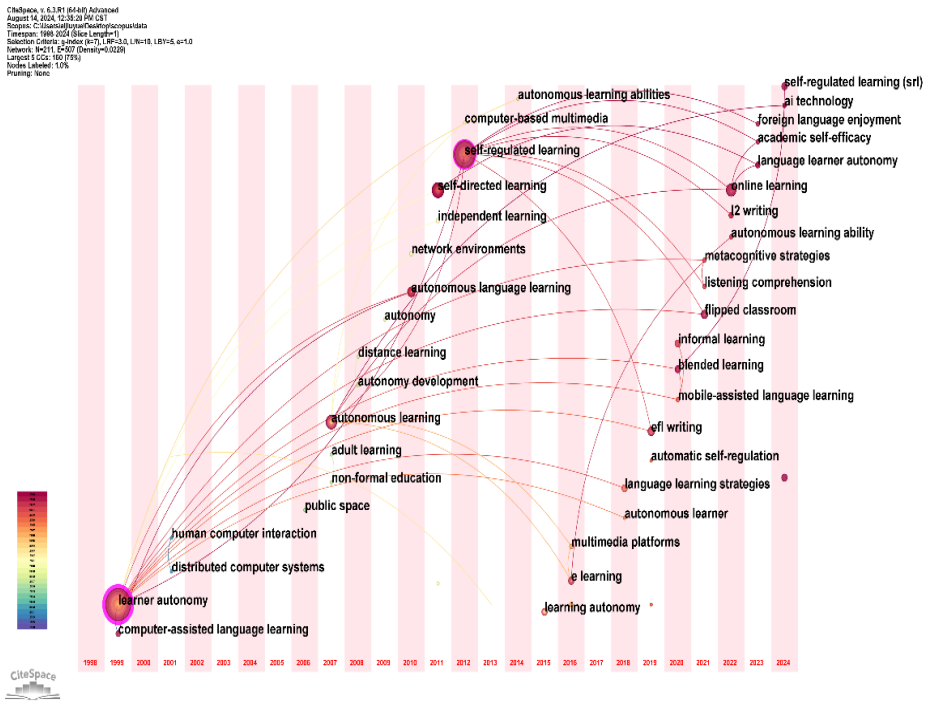

Figure 8
Keywords time zone view
Notes: Keywords are displayed along with their co-occurrence frequencies. The sizes of the cross and word represents the co-occurrence frequencies, whereas the link indicates the co-occurrence relationship.

Keywords Time Zone View: Keywords time zone view was developed by CiteSpace, and specifically designed to effectively illustrate the evolution of high-frequency keywords (Zhang et al., 2021). The criteria were set to a g-index of k=7, and the keywords' time zones were visualized using CiteSpace, as depicted in Figure 7. This visualization offers insights into research trends in ILE/ELBC across various timeframes, highlighting the connections between different periods. The analysis in Figure 7 shows a consistent focus on learner autonomy, appearing more than ten times from 1998 to 2024. Despite the prevalence of terms such as "distance learning", "independent learning", "self-regulated learning", and "autonomous learning" in publications, the term "informal learning" did not appear in the early stages. Meanwhile, the influence of technology on ILE/ELBC is evident. For example, the role of technology in English language learning has evolved significantly over time: from "computer-assisted language learning" in 1999, to "network environment" in 2010, "computer-based multimedia" in 2014, "mobile-assisted language learning" in 2020, and ultimately "AI technology" in 2024.

Analysis of the highly cited documents by systematic review

This review examined ten highly cited publications, highlighting various factors influencing ILE/ELBC. Eighty percent of the selected publications underscored technology for fostering independent learning environments for EFL/ESL learning. Hafner and Miller (2011) and Chik (2014) demonstrated that digital video projects and gaming foster learner autonomy by encouraging students to take control of their English learning. Moreover, the studies by Lai and Gu (2011), Sylvén and Sundqvist (2012), and Chen and Hsu (2020) provided compelling evidence for the effectiveness of self-regulated learning facilitated by technology.

The instructor's role varies across different ILE/ELBC concepts such as "autonomous learning", "self-regulated learning", "self-directed learning", "independent learning" and "informal learning". For instance, Lai (2015) noted that self-directed learning does not mean students are entirely independent of instructors, instead, teacher behaviour can influence how students use technology for language learning. Among these, "informal learning" involves the least amount of guidance from formal instruction or instructors.

The analysis also clarifies that although terms such as "autonomous learning", "self-regulated learning", "self-directed learning", and "informal learning" may overlap, they are not interchangeable. Some terms represent broader concepts, while others represent specific subcategories. For example, Lai and Gu (2011) discussed how self-regulation enhances out-of-class learning by allowing learners to set goals, choose resources, and independently track their progress. Chen (2013) highlighted that independent learning skills are essential for effective informal learning. Similarly, Chik (2014) emphasized that learner autonomy is crucial for learners to take charge of their own learning beyond the classroom. Notably, concepts such as independent learning, self-regulated learning, self-directed learning, and learner autonomy are prerequisites for informal learning, rather than replacements for.

The selected publications reveal that these terms highlight different aspects of EFL/ESL learning. Learner autonomy emphasizes students' responsibility and their control over what, how, and when to learn (Hyland, 2000; Chik, 2014; Hafner & Miller, 2011). Self-regulated learning focuses on the strategies and skills for managing learning activities, including setting goals, monitoring progress, and reflecting on outcomes (Lai & Gu, 2011; Kondo et al., 2012; Chen & Hsu, 2020). Self-directed learning highlights motivation and initiative, with learners independently identifying their needs and seeking resources (Lai, 2015). Additionally, psychological factors, particularly attitudes and L2 motivation, have been frequently discussed across the studies (Lai & Gu, 2011; Sylvén & Sundqvist, 2012; Kondo et al., 2012; Chen, 2013).

DISCUSSION

Publication: The analysis of the selected journals reveals a dynamic and evolving field in the study of ILE/ELBC. The steady increase in the volume of publications indicates sustained interest in this domain, with technology playing an increasingly central role. Notably, *Computer Assisted Language Learning* stands out as the most cited journal, reflecting a growing emphasis on technology-mediated learning environments in EFL/ESL research. Furthermore, the trend towards integrating psychological

perspectives with technology in ILE/ELBC studies is evident, as shown by the rising number of publications in *Frontiers in Psychology*.

Authors: The six most-cited authors revealed research trends in ILE/ELBC. Lai (2011, 2015) had the highest number of citations (n=611) and focused on ELBC. Liang, Zheng, and Tsai (2020, 2021, 2023) frequently collaborated on self-regulated learning in English, while Hyland (2004) explored learner autonomy in out-of-class English learning. Lee (2018, 2019, 2020) investigated the role of digital technologies in ILE, marking a shift towards informal digital learning of English (IDLE). Despite Lee's more recent publications (since 2018), the increasing emphasis on digital technologies in ILE has contributed to the rising prominence of IDLE. Notably, five of the six most-cited authors are from Asia, indicating significant contributions from countries like China and Korea to the development of this research field.

Countries: The geographical distribution of research highlights a significant increase in contributions from Asian countries, particularly China, which has seen a dramatic increase in publication output. This trend reflects the expanding role of English as a global lingua franca and the growing investment in English language education within these regions. Countries such as Iran, Turkey, Indonesia, and Thailand have also markedly increased their research output, suggesting a broader regional engagement with the ILE/ELBC.

Keywords: Keyword co-occurrence and time zone trends reveal the evolving hotspots. Co-occurrence networks show that "learner autonomy", "self-regulated learning", and "motivation" are prominent topics, with the former having the highest occurrence and strongest links. The time zone view reveals a shift in focus from terms such as "computer-assisted language learning" to "AI technology", indicating that language learning is closely linked to the advancements in technology. The clustering analysis further supports this, with significant clusters around learner autonomy, technology, and self-regulated learning, highlighting the dynamic nature of research topics in ILE/ELBC. To specify, Table 7 illustrates the most frequently used keywords across four distinct periods, indicating that new keywords have emerged greatly related to advancements in technology. It can be deduced that the prevalence of technology drives the changes in EFL/ESL learning.

Table 7
Keywords of each period (1998-2009, 2010-2015,2016-2020, 2021-2024)

R	1998-2009		2010-2015	
	Keywords	*Oc*	*Keywords*	*Oc*
1	learner autonomy	138	self-regulated learning	79
2	self-directed learning	29	students	42
3	language	7	language learning	27
4	learning strategies	5	critical thinking	7
5	computer-assisted language learning	4	reading comprehension	5
R	2016-2020		2021-2024	
	Keywords	*Oc*	*Keywords*	*Oc*
1	higher education	10	online learning	14
2	e-learning	7	flipped classroom	7
3	EFL students	7	extramural English	4
4	EFL writing	7	language learner autonomy	3
5	informal learning	7	L2 motivation	2

R: Rank, Oc: Occurrence.

To certain extent, keywords time zone can address the third research question by demonstrating the evolution of ILE/ELBC is significantly shaped by external factors, particularly technologies. Meanwhile, the evolution of ILE/ELBC has been also influenced by internal factors, such as "learner autonomy", "self-direction", and "self-regulation".

Systematic literature review: The top ten most-cited documents (See Appendix A) were analysed through a systematic literature review. The review revealed that while terms like learner autonomy, self-regulated learning, self-directed learning, informal learning and learning beyond the classroom often overlap, they address different aspects of EFL/ESL learning in ILE/ELBC. Learner autonomy focuses on students' control over their learning process, self-regulated learning on managing learning strategies, and self-directed learning on students' motivation and initiative (Hafner & Miller, 2011; Chen & Hsu, 2020; Lai, 2015).

Although these concepts are interconnected, they are not interchangeable. They serve as elements of informal learning, which involves the least formal guidance from instructors. Furthermore, psychological factors, such as attitudes and L2 motivation, frequently appear across studies, underscoring their importance in language learning.

In summary, ILE and ELBC are broader concepts or hypernyms, while others (i.e. learner autonomy, self-regulated learning, self-directed learning) are specific subcategories or hyponyms. To specify, ILE/ELBC represent broader categories that encompass various learning approaches. In contrast, learner autonomy, self-regulated learning, and self-directed learning are specific instances of a broader concept. Furthermore, ILE refers to a type of learning that contrasts with formal learning, often occurring outside of structured educational settings, while ELBC emphasizes learning that takes place outside of traditional educational environments.

CONCLUSIONS

The volume of documents pertaining to ILE/ELBC studies has been increasing annually. To our knowledge, this is the first study to quantitatively and qualitatively examine the field of ILE/ELBC. Bibliometric analysis serves as an effective method for revealing the evolution of research hotspots, whereas systematic literature analysis examines specific concepts within the selected documents.

Recent publications highlight a growing interest in IDLE, which has evolved from earlier concepts, such as English learning beyond the classroom and informal English learning. This shift is largely driven by advancements in technology and key factors, such as learner autonomy, self-regulation, and self-direction. Additionally, psychological factors, including L2 motivation and attitudes, are also linked to the effectiveness of English learning outside formal settings.

Regarding the trend of IDLE, some implications are recommended. Future investigations should further examine the interplay between technological and psychological factors in influencing the effectiveness of EFL/ESL learning beyond traditional classroom settings. Concurrently, educators should focus on enhancing students' digital literacy to better support IDLE.

Besides, the findings highlight the significant contribution of Asian countries to ILE/ELBC research, with China leading in output. Future research should investigate the reasons behind these trends and assess their global implications for English language education. This will enable us to gain a more profound insight into the dynamics influencing ILE/ELBC and uncover promising areas for further exploration.

This paper has several limitations that suggest directions for future research. Firstly, all data were exclusively sourced from the Scopus database, which excludes studies not indexed in Scopus. The Scopus tends to prioritize academic journals that publish in English, resulting in the exclusion of documents on ILE/ELBC published in other languages. Secondly, our selection of keywords was based on those used in ILE/ELBC research and related literature. Despite our efforts, the chosen keywords may not cover all the relevant studies. Using different search terms can lead to different clusters and interpretations of the field's current state of the field. Additionally, some papers that met our inclusion and exclusion criteria were excluded because they did not focus specifically on higher education students.

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Appendix A

Overview of the top-cited documents in the analysis, by total citations

R	Documents	Author	Research Objectives	Keywords
1	Fostering learner autonomy in English for science: A collaborative digital video project in a technological learning environment	Hafner & Miller (2011)	To explore how the "digital video project" help students develop their skills as independent learners in a well-organized language learning environment.	learner autonomy, digital video, digital storytelling, syllabus design, English for science and technology, qualitative research methods
2	Gaming as extramural English L2 learning and L2 proficiency among young learners	Sylvén & Sundqvist (2012)	To examine the correlations between L2 English proficiency and both the frequency and types of games played as extramural English activities.	digital games, extramural English, l2 proficiency, second language acquisition, motivation, incidental vocabulary acquisition
3	Self-regulated out-of-class language learning with technology	Lai, C., & Gu, M. (2011)	To investigate how EFL tertiary student use technology to self-regulate their language learning outside the classroom	Attitudes, Call, computer literacy, out-of school learning, self-regulated learning
4	ESL writers and feedback: Giving more autonomy to students	Hyland (2000)	To study the effects of feedback on ESL writers.	Not mentioned.
5	Self-regulated mobile game-based English learning in a virtual reality environment	Chen & Hsu (2020)	By using a VR game to examine the effectiveness of students' English learning, and their self-regulated learning from both cognitive and psychological viewpoints.	mobile learning, virtual reality, game-based learning, self-regulated learning, engagement
6	Digital gaming and language learning: autonomy and community	Chik Elice (2014)	To study learner autonomy by managing gameplay as out-of-class EFL learning in different dimensions (location, formality, locus of control, pedagogy and trajectory).	learner Autonomy, Second Language Acquisition, Computer-assisted language learning
7	Tablets for informal language learning: Student usage and attitudes	Chen (2013)	To explore how students use tablet computers for learning English in informal settings outside of class and how to promote independent language learning.	tablet-assisted language learning, mobile-assisted language learning, action research
8	Modeling teachers' influence on learners' self-directed use of technology for language learning outside the classroom	Lai, C. (2015)	Aim to examine how teacher behaviors affect learners' self-directed use of technology.	teacher technology use, self-directed learning with technology, informal learning, foreign language learning, post-secondary education
9	English majors' self-regulatory control strategy uses in academic writing and its relation to L2 motivation	Csizér & Tankó (2017)	This article aims to describe English majors' self-regulatory control strategies by profiling them and investigating the relationship with motivation, anxiety, and self-efficacy in academic writing.	Not mentioned.
10	Mobile assisted language learning in university EFL courses in Japan: Developing attitudes and skills for self-regulated learning	Kondo et al. (2012)	The study was to determine if specific MALL practices could promote the development of self-regulated learning as a form of advanced self-study.	mobile device, MALL, self-study, self-regulated learning