COMPUTER ASSISTED LANGUAGE LEARNING
https://doi.org/10.1080/09588221.2021.1936562

REVIEW

Informal digital learning of English (IDLE): a scoping review of what has been done and a look towards what is to come

Ali Soyoof[a], Barry Lee Reynolds[b,c], Boris Vazquez-Calvo[d] and Katherine McLay[e]

[a]Faculty of Education, Monash University, Clayton, Australia; [b]Faculty of Education, University of Macau, Taipa, Macau SAR, China; [c]Centre for Cognitive and Brain Sciences, University of Macau, Taipa, Macau SAR, China; [d]Universidad de Málaga, Málaga, Spain; [e]School of Education, The University of Queensland, Brisbane, Australia

ABSTRACT

As technology has advanced, so have opportunities for language socialization and practice. This reciprocal relationship has resulted in the emergence of a subfield of Computer Assisted Language Learning (CALL): Informal Digital Learning of English (IDLE). IDLE has manifested in various forms, including the more notable extramural and extracurricular varieties. Given the recent attention given to IDLE by Applied Linguists and language educators, this scoping review provides a roadmap for future research and explores the potential of IDLE to support English language teaching and learning in informal digital contexts. A *Web of Science* core eight database search for relevant research published between 1980 and 2019 using 35 IDLE-related key terms resulted in 38 studies of which 30 aligned with the inclusion criteria. Results showed the studies were conducted mostly under a mixed-method and qualitative paradigm and were published between 2017 and 2019. Only two studies used longitudinal data collection methods. Topics investigated included the linguistic dimension of CALL, the affective and cultural dimension of CALL, and the agency and digital literacies dimension of CALL. The small, yet salient, body of emergent IDLE literature points towards three trends: a growing relevance of langua-technocultural competence, the importance of digital literacies to communicative competence, and the importance of non-professional translation and interpreting to digital language learning.

KEYWORDS

Digital language learning; IDLE; Informal Digital Learning of English; informal language learning; scoping review

1. Introduction

In response to the ubiquity of digital technologies, language researchers and practitioners have investigated the potential of digital tools for

CONTACT Barry Lee Reynolds BarryReynolds@um.edu.mo

informal language learning online (Lee, 2019a). Since English is a global language, Informal Digital Learning of English (IDLE) has attracted increasing attention from scholars and practitioners. IDLE is defined as 'self-directed, informal English learning using a range of different digital devices (e.g., smartphones, desktop computers) and resources (e.g., web apps, social media) independent of formal contexts' (Lee, 2019b, p. 2). IDLE has been examined in different countries and regions, including Denmark (Hannibal Jensen, 2019), South Korea (Lee, 2019b), Brazil (Cole & Vanderplank, 2016), and Morocco (Dressman, Lee, & Sabaoui, 2016), to name but a few.

IDLE is a significant subfield of interest in CALL (Computer Assisted Language Learning) because it makes visible under-researched out-of-class language learning contexts and practices (Benson, 2011). Recent studies show that out-of-class CALL plays a crucial role in students' second language learning (Lai, Zhu, & Gong, 2015). Benson (2011) proposes an explanatory framework for the basic features of out-of-class CALL applicable to IDLE. Benson's framework involves four dimensions of out-of-class L2 learning including: (1) *formality* (formal, non-formal, or informal learning), (2) *location* (in-class, out-of-class, extracurricular, and extramural i.e., the physical context of language learning), (3) *pedagogy* (the extent to which formal language learning processes are included i.e., instructed, self-instructed, naturalistic), and (4) *locus of control* (the extent to which language learners have control over their own learning i.e., self-directed or other-directed).

In the present scoping review, IDLE is conceptualized using Benson's (2011) four-dimension framework. To conceptually situate readers, Table 1 shows the two possible IDLE contexts (extracurricular and extramural) in connection with other formats of learning. It is relevant to note that we understand that 'digital' refers to digital devices (e.g., tablets, e-readers, gaming consoles, smartphones, personal computers, laptops, etc.) and related resources (e.g., mobile apps, web apps, computer software, social media, etc.) (Lee, 2019a). Moreover, the 'certification' subcomponent under 'formality' refers to any official and reliable document proving that an individual has the qualifications for a specific competence (Lee, 2019a).

Table 1. Types of digital learning of English in combination with Benson's conceptual framework (2011).

	Formal Digital Learning of English	Non-Formal Digital Learning of English	IDLE	
			Extracurricular	Extramural
Formality	Structured; Certification	Structured; No certification	Semi-structured; Certification	Unstructured; No certification
Location	In-class	Out-of-class	Out-of-class	Out-of-class
Pedagogy	Instructed	Instructed	Self-instructed	Naturalistic
Locus of Control	Other-directed	Other-directed	Self-directed	Self-directed

There are some differences between extracurricular and extramural IDLE that should be clarified. According to Sylvén and Sundqvist (2016, p. ii), extracurricular L2 engagement is to some extent attached to educational contexts with the purpose of pursuing formal learning. As an example, learning language in evening schools is considered as extracurricular L2 engagement because language learning in evening schools both involves language teachers and is still connected to the educational contexts (Sylvén & Sundqvist, 2016). In contrast, extramural engagement is related to 'L2 outside the walls'; that is, learners come in contact with or are involved in the L2 outside the walls of the classroom' (Sylvén & Sundqvist, 2016, p.ii). This kind of language learning or involvement is initiated by the students themselves rather than teachers and is usually a voluntary decision which is made by students (Sylvén & Sundqvist, 2016). In summary, extramural L2 engagement is not attached to an educational context, is totally voluntary, and is initiated by students themselves, while extracurricular L2 engagement is connected to formal and educational contexts (Sylvén & Sundqvist, 2016).

As an emergent subfield in CALL and language learning, IDLE is often met with parallel nomenclature. We find Online Informal Learning of English (OILE), for instance. OILE refers to 'language development through online activities such as social networking, streaming and/or downloading television series or films, listening to music on demand and web browsing' (Toffoli & Sockett, 2015, p.1). For OILE, students, rather than language teachers or course designers, determine the resources that could be used, and these resources are not necessarily developed for language learning purposes (Toffoli & Sockett, 2015). Given the prior definition, we believe OILE to be equivalent to extramural IDLE. Despite the existence of different terms, we deploy IDLE as an umbrella term because we focus on the way that students learn English using digital media in informal contexts. Further, the researchers involved in the current study are interested both in the digital devices mediating activities and the activities that mediate digital technologies (Hannibal Jensen, 2019).

Overall, the purpose of this study was to investigate both the extramural and extracurricular types of IDLE, which have attracted lots of attention in recent years (see, Lee, 2019a; 2020; Lee, & Dressman, 2018; Soltovets, Chigisheva, & Dubover, 2019). While Benson's IDLE framework (2011) has been labeled as 'rudimentary' (Chik, 2014, p. 15), our stance is that it provides CALL researchers and practitioners with a contextualized overview of IDLE. Such a contextualization requires, of course, a detailed examination through review, empirical, and action research studies to develop a more comprehensive IDLE framework.

Another purpose of this study was to explore IDLE alongside closely related concepts selected by the researchers, following standard procedures for scoping reviews (see 3. Methodology). To find IDLE and closely relevant concepts, the researchers first carefully studied the literature. Subsequently, the concepts such as IDLE, extramural, extracurricular, and OILE were found, noted, and defined. Finally, the researchers searched the Web of Science using the keywords from the concepts and their synonyms found in the literature (please see section 3.2). Whereas in the last two decades, the affordances and constraints of IDLE have been discussed in numerous publications (e.g., Godwin-Jones, 2019; Jensen, 2016; Lee, 2019b, 2020), scant attention has been paid to the historical and emergent research focus of digital technologies and out-of-class CALL contexts or spaces. Understanding the emergent research focus of IDLE is crucial, since the language learning practices of language learners are generally shaped by the emergent and ever-changing research focus of digital technologies, particularly in out-of-class CALL contexts (Godwin-Jones, 2018, 2019).

2. Previous studies on digital technologies and language learning in out of classroom contexts

In the out-of-class language learning literature, many studies have focused on how digital technologies helped develop vocabulary learning. As an example, Sundqvist (2019) found that experienced gamers outperformed inexperienced gamers in learning productive vocabulary. Also, Sundqvist and Wikström (2015) in a study of 80 Swedish teenagers found that there was strong correlation between male video gamers and vocabulary learning. Likewise, Sylvén and Sundqvist (2012) found that gamers performed significantly better on receptive and productive vocabulary measures compared to non-gamers. Similarly, Sundqvist and Sylvén (2014) found that frequent gamers self-rated their English proficiency as either good or very good. Likewise, Jensen (2016) found that there was a significant relationship between gaming (either games with written English input or both oral as well as written input) and vocabulary scores, especially for males. She further found that gaming was among the popular out of classroom Extramural English (EE) habits of Danish children to learn new words. She also found that boys in particular performed better in acquiring new words through gaming compared to girls.

The use of digital technologies outside the classroom affords language learners' additional learning opportunities. For instance, Wible, Kuo, and Tsao (2004) investigated the impact of using digital technologies outside the classroom on language learning by introducing two online tools that can help language learners to detect unknown collocations (i.e., *Collocator)* and new clues for learning unknown words (i.e., *Word Spider*). The study was important for language learners because it concentrated on individual language learning in an online space rather than on cooperative or collaborative language learning. Likewise, Beres's (2011) study reinforces the importance of MALL (Mobile Assisted Language Learning) in providing additional and individualistic learning of English for language learners, including listening to music, watching videos, and using English language applications. In a parallel vein, Rodgers and Webb (2016) found that watching television programs with captions can improve the comprehension of Japanese EFL students, particularly when English television programs are most difficult to comprehend. Similarly, Kusyk (2016) reported that French and German university students engaged in a variety of meaning-focused activities to improve their English proficiency such as watching English films, series and listening to music.

While the previous studies promoted meaning-focused digital informal learning, more recent studies have emphasized a combination of form (e.g., to practice grammar using Google) and meaning-focused (e.g., reading English websites) digital informal learning. For example, Lee and Dressman (2018) found that language learners need to have a diversity of form-focused and meaning-focused digital informal learning to obtain high levels of English-speaking proficiency. Likewise, Lee (2019b) found that the quantity of IDLE (i.e., the amount of time allocated) cannot improve the vocabulary knowledge of Korean students; rather, the quality of IDLE (i.e., both form-focused and meaning-focused) can significantly contribute to vocabulary development. In a parallel vein, Scholz (2016) conducted a study in Canada to explain how Massively Multiplayer Online Role-playing Games (MMORPGs) can establish an 'affinity' space among language learners to interact in English with each other and learn the language cooperatively or collaboratively. Taken as a whole, sustaining a balance between form-focused and meaning-focused cooperative or collaborative activities is underscored by scholars (Lee, 2019a; 2019b; Lee & Dressman, 2018). However, it is important to consider the motivation, interests, and shared experience of group members in learning a foreign language in establishing affinity space (Vosburg, 2016). Finally, the role of affinity space such as *eTandem* should not be underestimated as it plays a role in identity construction and L2 learning (Yang & Yi, 2016).

While paying attention to form-focused and meaning-focused IDLE is important, the needs of contemporary language learners transcend functional skills (i.e., language skills or subskills). Language learners today must also improve their 'digital literacies' (Hafner, 2019; Hafner, Chik, & Jones, 2015, p. 1). Digital literacies are broadly defined as 'the practices of reading, writing, and communication made possible by digital media' (Hafner, Chik, & Jones, 2015, p. 1). Empirically, Tan's (2013) study explored how YouTube clips can help language learners form a community to cooperatively communicate in English. In her study, language learner practices went beyond reading and writing to engage in assessment, evaluation and meaning making—which are in line with digital literacy practices. Stressing the importance of digital literacy practices, Meyers, Erickson and Small (2013) went on to classify digital literacy into three different literacies with a purpose: digital literacy to obtain new information (finding and assessing information for academic and non-academic purposes); digital literacy as a mindset (observing and analysing verbal and non-verbal messages circulating through digital media); and digital literacy as a practice (engaging in digital communication comprehensively, critically and with an active role with awareness of individual needs and social expectations concentrating on the needs of individuals in a digital society rather than on discrete skills). Overall, recent studies show that attending to digital literacy practices is necessary for language learners to participate effectively in a digital society (Hafner, 2019).

Given the importance of digital literacy practices, it is also necessary to consider the affordances of IDLE for language learning. For example, Lee (2019a) found that the diversity of IDLE can promote language learners' self-confidence and enjoyment. Similarly, Lee and Drajati (2019a) found a strong correlation between receptive and productive informal activities, affective variables (i.e., motivation, grit, self-confidence, L2 speaking anxiety), and L2 willingness to communicate. Relatedly, Lee (2019c) found that socio-political, contextual, and individual factors can influence Korean EFL learners' willingness to communicate. Likewise, Lee and Drajati (2020) conducted explanatory and confirmatory factor analysis in Indonesia to extend the context of L2 WTC (i.e., an affective variable) into different contexts such as in classroom, out of classroom, and in digital space. In line with these affordances of IDLE, Lee and Lee (2019) found that there is a strong relationship between engagement in IDLE activities and Korean EFL learners' perceptions about the use of English as an international language. Like previous findings, Lee (2020) found that those Korean EFL learners who have participated more often in IDLE activities can more effectively use cross-cultural strategic communication strategies. Godwin-Jones (2019) emphasizes the role of the *digital wild* in promoting identities, motivation, autonomy, and agency in language learners. Overall, as Godwin-Jones (2019) argues, the research focus of digital technologies in the *digital wild* has shaped how people use digital technologies for language learning purposes. For instance, the role of agency in using digital technologies in the *digital wild* has changed over time and today; language learners have more agency than ever before. While paying attention to the ever-changing research focus of digital technologies is critical to address the needs of language learners in a digital society, there is no single historical and scoping review to bridge the gulf. To this end, another purpose of this study was to cast light on the ever-changing research focus of digital technologies and language learning in informal contexts from 1980 to 2019.

3. Methodology

This study is a scoping review, seeking to 'map rapidly the key concepts underpinning a research area and the main sources and types of evidence available, and can be undertaken as stand-alone projects in their own right, especially where an area is complex or has not been reviewed comprehensively before' (Mays, Roberts, & Popay, 2001, p. 194). In sharp contrast to a systematic literature review that 'might typically focus on a well-defined question where appropriate study designs can be identified in advance', a scoping review 'tends to address broader topics where many different study designs might be applicable' (Arksey & O'Malley, 2005, p. 20). Further, while the purpose of a systematic literature review is to answer questions across 'a relatively narrow range of quality assessed studies', the goal a scoping review "is less likely to seek to address very specific research questions nor, consequently, to assess the quality of included studies' (Arksey & O'Malley, 2005, p. 20). Additionally, unlike a meta-analysis, the purpose of a scoping review is not summarizing and synthesizing the results of quantitative research studies thorough statistical analysis. As such, the present scoping review aims to discover the extent, range, and research focus of IDLE and related concepts. As a scoping review, this study explores not only the extent and range, but also the research focus of IDLE and similar concepts over the last 39 years.

3.1. Search procedure

To identify potential studies to be included in the scoping review, the Web of Science Core Collection (SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, and ESCI indexes) was queried with 'peer reviewed' checked. The literature search covered studies published from 1980 up to and including 2019.[1] Although research investigating IDLE only started appearing around 2010 when most relevant terminologies and approaches emerged, an inclusive search was still conducted. This allowed for the potential of previously published research not classified as IDLE to still be considered for review.

3.2. Search terms

The search string used was (informal OR wild OR extramural OR out* classroom OR extracurricular) AND (digital OR computer-assisted OR computer assisted OR CALL OR computer-aided OR computer aided OR CAI OR CALI OR technology-enhanced OR technology enhanced OR TELL OR mobile-assisted OR mobile assisted OR mobile aided OR mobile-aided OR online OR virtual OR internet) AND (learning OR teaching OR education OR e-learning OR instruction) AND (English OR literac* OR foreign OR language OR L2 OR second). Key terms were searched by title in order to receive hits only for the most relevant studies. The searches resulted in 38 hits for the Web of Science Core Collection Databases.

3.3. Inclusion criteria

Inclusion criteria were (1) language of publication: English; (2) consideration of non-empirical and empirical studies (mixed method, quantitative or qualitative) relevant to IDLE or associated concepts such as OILE, extramural, and extracurricular language learning. After excluding duplicated publications (N = 3), publications not in the English language (N = 3), and publications not relevant to IDLE (N = 2), 30 publications (22 journal articles, one conference paper, two book reviews, four book chapters, and one book) met the inclusion criteria. The publications spanned the years 2004 to 2020 with most papers published between 2017 and 2020 (N = 17). Figure 1 shows a publication timeline and Appendix, an overview of the studies with descriptive information. Figure 2 illustrates the inclusion and exclusion process in a flowchart. Also, in the references list, included publications were marked with an asterisk (*).

3.4. Coding of publications

Publications were coded with SPSS according to (1) purpose; (2) research design (e.g., mixed-method, qualitative and quantitative); (3) conceptual or theoretical framework; (4) the process of data collection; (5) the process of data analysis and related techniques; (6) the findings of the studies; and (7) the location where the studies were conducted. To assess the coding quality, three researchers coded the total data and calculated the coding schemes with 94% inter-code reliability (Cohen's κ = .95). Cohen's kappa coefficient (κ) is generally used to statistically evaluate inter-rater reliability for qualitative items (Kraemer, 2015).

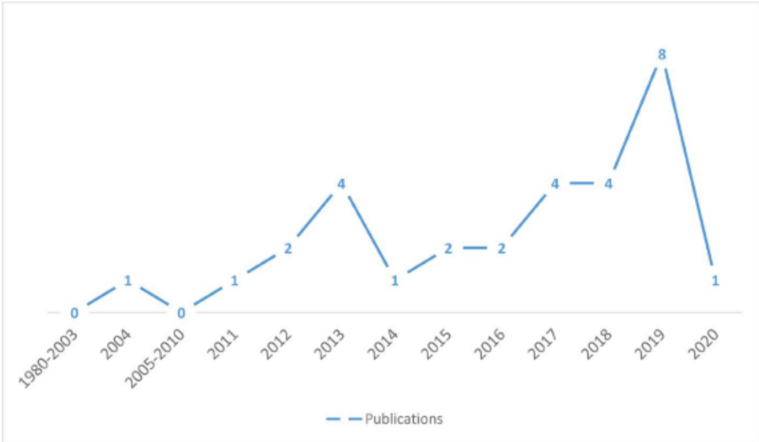

Figure 1. Publication timeline.

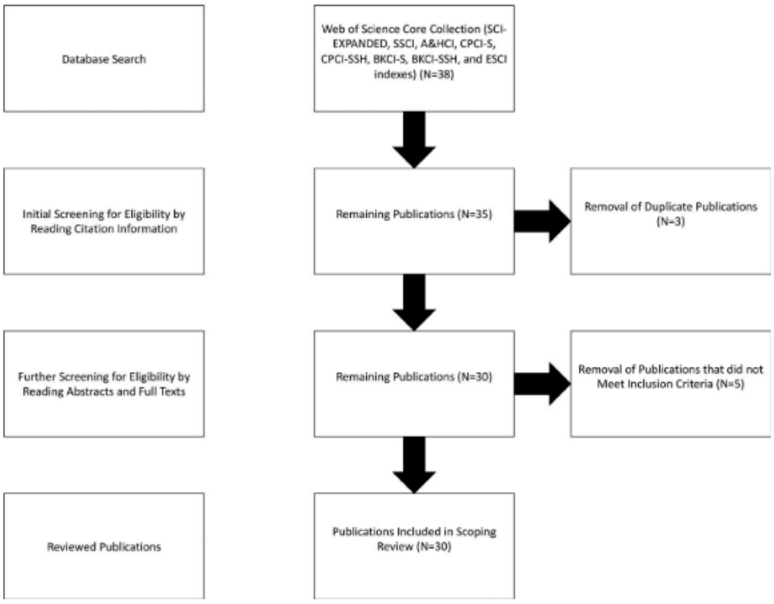

Figure 2. Inclusion and exclusion process.

4. Findings

4.1. Research purpose

Most studies had multiple research focuses, so the reviewed studies were coded based on the main or 'dominating' research focus. Main research focuses included (1) the linguistic dimension of CALL; (2) the intersection between digital literacies and agency in CALL; and (3) the intersection of affective and cultural dimensions of CALL (Table 2).

4.2. Research design, theories, methodologies and the location of publications

Of the 30 studies, eight (26.66%) used a mixed-method design, while only two out of 30 studies (6.66%) used a quantitative design. Moreover, eleven out of 30 studies (36.66%) used a qualitative design, while another nine studies out of 30 studies (30%) were review or theoretical studies. Four out of the 9 qualitative studies (44.44%) used ethnographic methods, while other qualitative approaches involved case studies, grounded theory, and action research. Only two out of nine qualitative studies (22.22%) were longitudinal. While the two quantitative studies used questionnaires as an instrument, most of the mixed-method studies used a combination of interviews, observations, language tests, and questionnaires.

The theoretical frameworks were diverse with some publications employing more than a single theory to frame the study. Eleven (36.66%) out of 30 studies did not specify their theoretical framework. Seven out of 30 studies (23.33%) used the most common theoretical framework among the reviewed studies—dynamic systems (Larsen-Freeman, 1997; 2017). Next, six out of 30 studies (20%) adopted an IDLE framework (Benson, 2011). Two studies (6.66%) out of 30 studies used online informal learning of English (Sockett, 2014) as their theoretical frameworks. Only one out of 30 studies (3.33%) used grounded theory (Glaser & Strauss, 2017), Activity Theory (3.33%) (Engeström, 2001), informal learning and the Internet (3.33%) (Werquin, 2007), and participatory culture, new media literacies, and engagement (3.33%) (Jenkins, 2009).

The researchers have also identified two important characteristics of research methodologies deployed in the publications included in the present scoping review i.e., data collection and data analysis. Ten different data collection tools were used (Table 3). Respectively, these were: questionnaire (46.6%), interview (36.6%), observation and diary (13.3), text taken from websites or blogs, documents and language tests (10%), and field notes (6.6%). Finally, chat logs, the lab recording, and

Table 2. Research purpose of the publications[a].

Research focus	Frequency	%
The linguistic dimension of CALL	21	70%
digital literacies and agency dimension of CALL	5	16.66%
The affective and cultural dimension of CALL	4	13.33%

[a]$N = 30$.

Table 3. Data collection used in the publications.

Data collection	Frequency	%
Questionnaire	14	46.6
Interview	11	36.6
Observation	4	13.3
Diary	4	13.3
Language test	3	10.0
Documents	3	10.0
Chat logs	1	3.3
Field notes	2	6.6
Audio-recording sessions	1	3.3
Text taken from websites or blogs	3	10.0

audio-recording sessions were included in 3.3% of the studies. While some of the publications did not clearly explain the types of data analysis used, two studies used structural equation modelling (6.6%), and four studies used (13.3%) multiple regression. As for the qualitative data, thematic analysis was used in ten studies (30.3%).

The number of participants varied significantly across the publications, ranging from a study with only six participants (Shafirova & Cassany, 2019) to a study with 905 participants (Jurkovič, 2019). While in most publications the participants were adults (Lee, 2020; Lee & Drajati, 2019a; Lee & Lee, 2019; Sockett & Toffoli, 2012a), one publication involved non-adult participants (Tan, 2013). While in most studies the purpose was English language learning and teaching, a few studies explored other languages including Slovene, Uyghur, and Korean (Clothey, 2017; Isbell, 2018; Jurkovič, 2019). In 28 out of 30 publications (93.3%), participants comprised English as foreign language learners.

Table 4 indicates the continents where the studies took place. Europe with 12 (40%) had the highest rate of publication, following by Asia with 11 (36.6%), North America with six (20%) and finally Oceania with one study (3.3%).

4.3. Findings of the publications

To synthesize the findings of the 30 publications (presented in Appendix), a strategy of data analysis drawn from the grounded theory approach was used (Corbin & Strauss, 2008). The researchers combined the main findings of the publications as originally presented into a textual database of almost 9 pages (Appendix). The researchers used open coding

Table 4. The classification of the publications by continents.

Continents	Frequency	%
Asia	11	36.66
Europe	12	40%
North America	6	20%
Oceania	1	3.33%

by 'breaking data apart and delineating concepts to stand for blocks of raw data' and axial coding as 'the act of relating concepts/categories to each other' (Corbin & Strauss, 2008, p.198) to code the findings. Afterwards, those codes with a similar focus to a single category were determined. Given the studies' different research areas and different results, some publications were selected for more than one category. The coding process resulted in determining three main categories: linguistic dimension, affective and cultural dimension, and agency and digital literacies dimension of CALL. These three categories are in line with Warschauer's (2013) three stages of CALL from the 1950s until the 21st century. Although the findings of our study are in line with Warschauer's (2013) three stages of CALL, our findings added a few new layers to the stages of CALL proposed by Warschauer (2013) such as the affective and cultural dimension of CALL. More importantly, our hypothetical relationship between the research focuses on CALL (see Figure 3) is dynamic rather than static.

4.3.1. The linguistic dimension of CALL

4.3.1.1. Focus on meaning and individualistic english learning. This research focus of CALL is in line with the cognitive approach of CALL and language teaching and learning and reflects Communicative Language Teaching (CLT) pedagogies that were solidified across the 1980s and 1990s (Warschauer, 2013). The focus of the use of CALL in these publications is fluency and learning language in texts (e.g., learning new words or collocations found in online texts). Two of the studies (6.6%) paid attention to the focus on lexical meaning and individualistic English learning. For instance, Wible, Kuo, and Tsao's study (2004) explored two online tools (i.e., *Collocator* and *Word Spider)*, respectively, for learning new collocations and unknown new words in an online text. In another study, Beres (2011) stressed the importance of some mobile applications

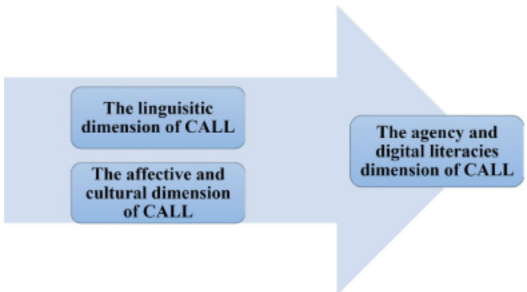

Figure 3. The hypothetical relationships among the themes determined in the findings of the publications.

for individualized learning of English skills i.e., listening and reading. Further, the focus of both studies was individualistic language learning rather than collaborative or cooperative. While a focus on meaning seems important, in this view of CALL, the form of language is mostly neglected. Accordingly, while English language learners have an acceptable fluency skill, they mostly struggle in their accuracy skills (Nassaji & Fotos, 2011).

4.3.1.2. Focus on meaning and form. Since language learners need to have acceptable fluency and accuracy skills, some scholars have stressed the significance of sustaining a balance between language form and language meaning in using digital technologies for language learning (Lee, 2019a; Lee & Dressman, 2018). For instance, Lee and Dressman (2018) found that language learners need to have a diversity of form-focused and meaning-focused digital informal learning to be successful in their English-speaking proficiency. Similarly, Lee (2019a) found that a combination of form-focused and meaning-focused digital informal learning can lead to higher vocabulary achievement among Korean EFL learners. Aligned with the above studies, Lee (2019b) reported that the quality of IDLE (i.e., meaning-focused and form-focused learning English using digital technologies) can result in vocabulary development rather than quantity of IDLE (i.e., the amount of time being allocated for learning English through digital technologies).

4.3.1.3. Cooperative or collaborative English learning. As for cooperative and collaborative learning, Jurkovič's study (2019) showed that online mobile use and communicating with other English speakers online can enhance the proficiency of Slovenian university students. In line with these findings, Scholz (2016, p.39) conducted a study in Germany to explain how Massively Multiplayer Online Role-playing Games (MMORPGs) can establish an 'affinity' space among language learners to interact in English with each other and learn the language cooperatively or collaboratively. Similarly, Sockett and Toffoli (2012a, 2012b) found that through using digital technologies collaboratively, the listening and vocabulary knowledge of English language learners in France improved. In line with previous findings, Ranieri and Bruni (2013) found that collaborative participation of English language learners can improve their linguistic knowledge. Finally, Sun, Franklin, and Gao (2017) found that collaborative participation in GRE forums helped participants to improve their English language proficiency.

4.3.2. The affective and cultural dimension of CALL

Some studies showed that using digital technologies for English learning not only has linguistic benefits but also affective and cultural advantages.

For instance, Lee (2020) found that Korean EFL students who have used IDLE have a positive attitude towards cross-cultural communication strategies. In line with this study, Lee and Lee (2019) found that there is a strong relationship between IDLE and the perception of Korean EFL learners towards English as an international language (EIL). Overall, IDLE had a contributing role in the attitudes of language learners in both cross-cultural communication strategies and perception of EIL.

It seems clear that using digital technologies for English learning plays a crucial role in the affective variables of students (e.g., improving cross-cultural communication strategies and the perception of EIL). For instance, Lee (2019a) found that the diversity of IDLE has a strong relationship with the motivation and self-confidence of Korean EFL learners. Similarly, Lee and Drajati (2019b) reported that there is a relationship between IDLE, receptive informal activities, productive informal activities, grit, motivation, self-confidence and second language speaking anxiety (L2WC). In line with these studies, Godwin-Jones (2019) emphasized the benefits of digital technologies in informal contexts for promoting motivation and self-confidence among English language learners. Similarly, Shafirova and Cassany (2019) suggest that engaging in the context of fandom can enhance the motivation of English language learners. This finding is echoed in other studies which stress the motivational aspect of using digital technologies for learning English out of the classroom (Scholz, 2016; Sockett & Toffoli, 2012a, 2012b; 2013; Sun, Franklin, & Gao, 2017; Sylvén & Sundqvist, 2016). Taken together, digital technologies can support language learners across different affective variables.

4.3.3. The agency and digital literacies dimension of CALL

Agency refers to giving students the power to influence and control their own learning and lives (Lindgren & McDaniel, 2012). Digital literacies are defined as 'the practices of reading, writing, and communication made possible by digital media' (Hafner, Chik, & Jones, 2015, p. 1). So, the intersection of digital literacies and agency aims to use digital technologies not only to communicate through digital technologies but to use digital technologies as a practice that can give power to students to affect their own learning and express their attitudes in their lives. Some studies demonstrated that using digital technologies in informal contexts promotes the agency of language learners. For instance, Godwin-Jones (2019) stressed the significance of using digital technologies in informal contexts by taking agency and autonomy factors into account. This view of digital technologies aligns with Warschauer's CALL framework (2013). In the third stage of this framework, CALL for the 21st century, the role of agency is highlighted. In line with the importance of agency, Shafirova and Cassany (2019) remarked that by having agency, language learners can make meaning and find new ways for communicating, socializing, and learning English.

Additionally, the role of digital literacies is emphasized in some studies. For example, Tan (2013) reported that when using YouTube, language learners need to evaluate, analyse, and think critically to create new knowledge. In line with this view, Shafirova and Cassany (2019) highlight the importance of digital literacies in effectively using websites for English language learners. Further, Soltovets, Chigisheva, and Dubover (2019) found that the role of informal English teaching and learning using digital technologies is crucial to promote the digital literacies of students. Likewise, Toffoli and Sockett (2015) and Kettle (2018) stressed the significance of digital literacies for English language teachers. Finally, the importance of digital literacy as a way to acquire information as well as a mindset and practice has been offered by Meyers, Erickson and Small (2013). In particular, the field of CALL should pay more attention to the role of agency and digital literacies as the research focus of online forums, online games, and so forth require language learners to effectively participate in a digital society. Thus, it is insufficient for language learners to simply be codebreakers when using digital technologies in the 21st century; they need to evaluate, analyse, think, and create new information (Hafner, 2019; Hafner, Chik, & Jones, 2015).

5. Discussion

The central purpose of this scoping review was to examine scholarly activity that informs technology-mediated language learning of English in informal contexts—commonly known as informal digital learning of English or IDLE. The body of peer-reviewed literature is small so far, but the salient studies in this review can give insight into the stated purpose of the research, frequent research methods, and most commonly drawn results and conclusions. Some key findings and implications can be drawn from the review.

Our review indicates that most IDLE research directly tackles some aspect of language learning in both English as an L1 or L2. Less frequently, some studies refer to the use of English and another language with some cross-cultural communication (mediation activity that requires intercultural and/or interlinguistic work), digital literacies and the affective variables in L2 acquisition. A key global implication is that IDLE is still an emergent subfield in CALL. Current studies in IDLE point towards three fundamental trends:

1. The growing relevance of langua-technocultural competence in technology-mediated contexts of learning. This highlights how

communication is increasingly multimodal and intercultural. In explaining the progression toward langua-technocultural competence, Sauro and Chapelle (2017) highlight: (1) how communication is increasingly multimodal and intercultural; (2) how innovation transfer should be a normalized aspect of language teaching; and (3) that research should be integral to formal teaching and learning. The need to transfer or bridge the informal and formal language learning is salient, as much learning online is incidental and digital literacies emerge, develop and flourish in hybrid, digital contexts. Furthermore, the online and language dyad provides fertile ground for the emergence of new literacies, often accompanied by complex linguistic and semiotic practices like translanguaging (Shafirova & Cassany, 2019). Fanfiction or remixing are good examples of these new literacies. New literacies and novel linguistic and semiotic practices are worthy of further interrogation in their own naturalistic contexts as part of online discourse, or for classroom use.

2. The increasing importance of digital literacies as part of the soft skills repertoire that should be acquired in parallel to linguistic and communicative competence. Digital literacies refer to a wide array of practices expanded by digitization: increasingly multimodal assemblages of meaning making or the ability of users not only to read and consume content, but to (re)write and (re)produce it are only two of the main drivers behind the popularization of digital literacies. One example is memes or the use of emoticons in written discourse that partially represent or compensate for the loss of oral traits when no oral exchange is possible or wanted. Ability to use memes or emoticons is one example of acquiring digital literacies. Besides changing ways of communication that need to be further explored[2], digital literacies also underscore how individuals and groups appropriate and eventually gain dexterity using digital technologies for their communicative purposes. For instance, Wible, Kuo, and Tsao (2004) early on pointed out the necessity to grasp the affordances and limitations of language technologies, like collocation dictionaries and similar resources online. This is a point taken in recent book chapters outside the scope and inclusion criteria of this review, but equally relevant like Reinhard and Thorne's (2019), where they mention how important it is to know how to use machine translation (see trend (3) in relation to mediation). In this respect, Hafner (2019) encourages language educators to critically educate students along five axis: (1) doing —effectively and critically managing information—, (2) meaning —understanding effective communication in context,

for instance, if a particular interaction must contain an emoji or not given the context—, (3) relating —attracting audience attention or managing relationships—, (4) thinking —reflecting on online communication, its longevity, its discourse features, etc.—, and (5) being —identifying and adopting identities in digital spaces and relate them to identities possible in classroom settings—.

3. How mediation—understood as non-professional translation and interpreting—is emerging as an interdisciplinary field of interest in language learning. Mediation does not consider L1–L2 transfer as problematic or a source of interference in language learning. Instead, including mediation as a pedagogical activity is meant to conceive interlinguistic work as a productive element of language learning (Council of Europe, 2018), including potential for metapragmatic and metalinguistic discussion, linguistic awareness and focus on form in context, with the subsequent gain in learners' locus of control in the language learning process and intercultural awareness. As an example of investigation into classroom praxis that juxtaposes the three prior trends, Reinhardt and Thorne (2019) review previous studies and propose further inquiry about the use of language technologies, including automated translation software, in language classrooms. Formalizing the use of language technologies in language education may promote students' metalinguistic and interlinguistic awareness. Students may be given instructions about how to critically assess the affordances and limitations of technologies. This may lower internal digital divides and imbalances in digital literacies and competence that impact L2 writing skills. This is demonstrated by studies that specifically tackle how EFL students, without prior instructions in language technologies in secondary education, would incorporate Google Translate in their English L2 writing tasks with varying degrees of sophistication among students in Catalonia (Vazquez-Calvo & Cassany, 2017). The uneven dexterity is explained by prior usage, individual ability, and absence of instruction in language technologies in secondary education.

Our review also indicates that there is a lack of specific methodologies applicable to informal and technology-mediated contexts of language learning, whether incidental, implicit, or explicit. In informal contexts of learning, social SLA methodologies are prevalent (most studies report on ethnographies, single case studies or action research studies). Some include a language test and a questionnaire in combination with qualitative techniques or alone. Out of the purely qualitative studies, only two out of nine (with 30 studies in total) report some longitudinal perspective. As a consequence, most studies only display a broad account of social participation in the L2. The problematic aspect here is 'change', a key feature in providing substantial evidence of language acquisition over time. According to Ellis (2015), to demonstrate language acquisition in a constituent part of the language system, there needs to be proof on three levels: (1) change originating in social activity because social participation is key to learning; (2) change in the learner (or language user) in a similar context; and (3) change in the learner (or language user) in an entirely different context. Our scoping review only shows learning happening at the first level. Consequently, further research in IDLE and informal contexts of language learning more generally, may want to ensure that 'learning is demonstrated by tracking specific learning objects over time to demonstrate that change has occurred' (Ellis, 2015, p. 231), whether by using qualitative, quantitative, or mixed methods.

Related to the first level of social participation, Benson's (2011) analytical proposal tries to offer a more accurate account of learning through metalinguistic discussion. Drawing on discourse and computer-mediated analytical tools (discourse structure, informational acts, and stance marking), Benson (2011) presents a framework of analysis in relation to YouTube video comments (conceptualized as a response to the video posting as initiator in the discourse). Benson (2011) argues his proposal may serve for environment/macro studies as well as micro/interaction-level accounts. In a recent study (Vazquez-Calvo, 2020), Benson's (2011) proposal was adapted for a multiparty discussion on Telegram to determine whether fan translators of games learn language from metalinguistic reflection on their fan translation activity (Vazquez-Calvo, 2020). We suggest that analytical frameworks like Benson's (2011) are needed to reinforce the argument that language learning happens informally and incidentally in online contexts of social interaction. Additionally, customizing methods from other fields such as Media Studies for informal and vernacular contexts of language learning and use may have value; for example, digital ethnography or app walkthroughs. Using the latest advances in learning analytics and data science may also confirm prior—and often case-based—results in IDLE and adjacent fields of interest, as well as improve current methodological approaches.

At the same time, quantitative studies refer to motivation and confidence as the affective factors for language users to be willing to participate in IDLE activities. However, motivation remains just part of the picture when incorporating the use of a novel technology and configures a fraction of learners' complex identities. Consequently, there is room for more empirical IDLE studies that examine multiple identities, often intertwined with affinities. An exception to this trend in our review is Shafirova and Cassany (2019) who explored vernacular practices in English as a L2 in combination with the unconventional and emergent identities of being a 'fan artist' and a 'brony' (a male adult fan of the animated TV show *My Little Pony*). As bronies, fans contest dominant gender discourse in Russian-speaking communities using English as a channel for free expression and access to their affinities. Other studies in online spaces that focus on vernacular practices, languaging and translanguaging, include Vazquez-Calvo, Elf, and Gewerc (2020). While not specifically IDLE, the study reports on Catalan teenagers' identity traits and role formation on YouTube using multiple languages like English, Spanish and mostly Catalan as an act of linguistic activism for the normalization of this minoritized language, and to prolong the lifetime of their affinity as gamers through online socialization. While back in 2015, Ellis claimed that 'there has been no exploration of the myriad social identities that L2 learners can and do draw on in their social encounters in the real world' (Ellis, 2015, p. 239), current advancements seem to explore this niche of research from the vernacular, re-centering the importance of identity development in language learning and languaging and translanguaging practices (Alonso-Belmonte & Vinagre, 2017; García-Pastor, 2020).

Finally, the spectrum of studies covers various dimensions of language learning through IDLE that mirror historical stages in CALL: (1) IDLE studies that focus more on individualistic affordances of tools and practices and are geared towards developing greater fluency and expanding vocabulary; (2) IDLE studies with a balance of form and meaning in tools and practices; and (3) IDLE studies that report on contexts where peer cooperation and collaboration is facilitative of language learning. All three lines of research merit further investigation. However, greater attention has been fixed on those contexts involving cooperation and collaboration, mostly due to the profusion of multiplayer online digital gaming. As Reinhardt (2019) points out, digital games (and other game-related L2 learning) represent contextualized language learning practice under self-regulated conditions. For example, control over time, progression in games, scaffolding through "heltered practices' (with tutorials, *modding*—customizing games to one's own needs, level or preferences). Digital games, with their goal-oriented research focus, and associated paratextual and socialization practices like fan translating games or streaming, are fantastic venues for future research. As technologies progress, VR or augmented technology are potential catalysts for revolutionizing and consolidating IDLE and informal language learning as a subfield of interest in CALL.

6. Suggestion for further studies

Having noted that most of the studies have employed a mixed-methods or qualitative design, conducting more quantitative research, particularly using experimental and quasi-experimental studies, is recommended. Further, only two of the qualitative design studies (see Sockett & Toffoli, 2012a, 2012b) have used a longitudinal data collection method. Longitudinal studies are valuable to cast light on not only the research focus of digital technologies for second language learning but also on complex adaptive theory (Freeman & Cameron, 2008). Additionally, to find out more about the dynamic research focus of digital technologies on language learning, more ethnographic studies are proposed as students conceive the affordances of digital technologies differently based on their cultural-historical values, beliefs, and attitudes (Gee, 1999).

Studies that address the efficiency of agency and digital literacies in CALL for second language learning are also worthy of further attention. While some studies have been launched to explore this issue (e.g., Shafirova & Cassany, 2019; Soltovets, Chigisheva, & Dubover, 2019) this area of CALL deserves more attention. More importantly, while the research focus of some online informal contexts such as YouTube, MMORPGs, fandom, blogs, and forum have been investigated, the affordances of other online informal contexts such as social media, vlogs, and LinkedIn should be investigated. Finally, while most studies were done in the context of Europe, Asia, and North America, paying attention to the context of the Middle East, Africa, Australia, and South America is advised.

7. Limitations

The scoping review approach taken to this study offers 'a rigorous and transparent method for mapping areas of research' (Arksey & O'Malley, 2005, p. 30). Moreover, through using a scoping review this study aimed to shed light on the variety, volume and research focus of digital technologies for language learning out of the classroom from 1980 to 2019. This study has some predictable limitations due to the use of a scoping review. For instance, the quality of the evidence offered by the primary research involved in the study was not evaluated critically. Results obtained from different sources (peer-reviewed proceedings, journals, book chapters, book reviews and books) were classified and reported without emphasizing one source over another. Consequently, this study which is a typical scoping review, 'cannot determine whether particular studies provide robust or generalizable findings' (Arksey & O'Malley, 2005, p. 27).

Finally, since the number of quantitative studies were few in this scoping review and field of study, it was impossible to conduct a meta-analysis. This is possibly the limitation which should encourage scholars in the field of CALL and out-of-classroom language learning to launch more quantitative studies. The two quantitative studies and ten mixed-method studies explored interrogated different aspects of language through digital technologies. Only a few studies have addressed the agency and digital literacy dimension of CALL in recent years (Godwin-Jones, 2019; Tan, 2013). More importantly, more studies should examine the cultural and affective dimensions of CALL.

8. Conclusion

While the nature of out-of-classroom language learning with digital technologies has changed over time, there is broad scholarly consensus in the field and in relation to CALL literature that digital technologies offer considerable affordances for language learning. This review reveals that, the focus on the study of digitally mediated out-of-classroom language learning has changed over time. From a focus on meaning to a balanced interest in meaning and form in language learning in such contexts. More recently, studies tend to focus on digital literacies, agency, and identification. The latter context of study remains underexplored and needs further attention.

The evolution of CALL studies in formal instruction have tried to keep up with and adapt to coetaneous digital affordances in a normalization effort (Bax, 2011). We believe that such normalization comes together with paying more attention to what happens outside classrooms. Godwin-Jones (2019) emphasizes that the future of ELT and, generally, language learning and teaching with technology will be shaped by digital technologies for language learning beyond classrooms. Hence it stands to reason that we should pay greater attention to these out-of-classroom practices.

Notes

1. As Lee (2020) was extracted with the "FirstView article" publication date of 2019, it has been included but with the updated print publication date of 2020.
2. Approaches from translanguaging (García & Li, 2013) and multimodal analysis (Jewitt, Bezermen, & O'halloran, 2016) can be of use given the fluid nature of digitally mediated discourse.

Funding

This study was partly supported by *ForVid: Video as a language learning format in and outside the classroom* (RT2018-100790-B-100; 2019–2021), 'Research Challenges' R + D + i Projects, Ministry of Science and Innovation, Spain.

Notes on contributors

Ali Soyoof is currently a PhD student at Monash university. His research areas of interest are video games, Computer Assisted Language Learning (CALL) and out of classroom language learning.

Barry Lee Reynolds is Assistant Professor of English Education in the Faculty of Education at the University of Macau. He has taught EGP, EAP, ESP and trained language teachers in the USA, Taiwan, and Macau. He conducts interdisciplinary applied linguistics, CALL, and literacy research.

Boris Vazquez-Calvo is an assistant professor in EFL and L2 education at the University of Málaga, Spain. His current research interests touch upon language learning and translation, digital culture and fan practices, and technology-mediated discourse.

Katherine McLay is a lecturer at the University of Queensland. Her areas of interest are digital literacies, learning technology, and sociocultural theory. She has published in a number of quality journals such as *Frontiers in Psychology, British Educational Research Journal, Discourse: Studies in the Cultural Politics of Education, Journal of Computer Assisted Learning and International Journal of Educational Research.*

ORCID

Ali Soyoof http://orcid.org/0000-0002-8037-5632
Barry Lee Reynolds http://orcid.org/0000-0002-3984-2059
Boris Vazquez-Calvo http://orcid.org/0000-0001-8574-7848
Katherine McLay http://orcid.org/0000-0002-7111-5396

References

*Reviewed publications are marked by an asterisk

Alonso-Belmonte, I., & Vinagre, M. (2017). Interculturality and identity in computer-mediated communication: Findings from L2 teaching contexts. *Computer Assisted Language Learning*, *30*(5), 343–350. doi:10.1080/09588221.2017.1321329

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, *8*(1), 19–32. doi:10.1080/1364557032000119616

Bax, S. (2011). Normalisation revisited: The effective use of technology in language education. *International Journal of Computer-Assisted Language Learning and Teaching*, *1*(2), 1–15. doi:10.4018/ijcallt.2011040101

Benson, P. (2011). Language learning and teaching beyond the classroom: An introduction to the field. In P. Benson & H. Reinders (Eds.), *Beyond the language classroom: The theory and practice of informed language learning and teaching* (pp. 7–16). New York, NY: Palgrave Macmillan

*Beres, D. L. (2011). Mobile-assisted language learning from the student perspective: Encouraging effective language learning strategies outside of the classroom. In B. R. Facer, & M. Abdous (Eds.), *Academic podcasting and mobile assisted language learning: Applications and outcomes* (pp. 93–110). Hershey, PA: IGI Global.

Chik, A. (2014). Digital gaming and language learning: Autonomy and community. *Language Learning & Technology*, *18*(2), 85–100. doi:10125/44371

*Clothey, R. A. (2017). The Internet as a tool for informal education: A case of Uyghur language websites. *Compare: A Journal of Comparative and International Education*, *47*(3), 344–358. doi:10.1080/03057925.2017.1281103

*Cole, J. (2016). The online informal learning of English. *System*, *57*, 149–151. doi:10.1016/j.system.2016.01.012

Cole, J., & Vanderplank, R. (2016). Comparing autonomous and class-based learners in Brazil: Evidence for the present-day advantages of informal, out-of-class learning. *System*, *61*, 31–42. doi:10.1016/j.system.2016.07.007

Corbin, J., & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed.). Thousand Oaks: Sage. doi:10.4135/9781452230153

Council of Europe. (2018). Common European Framework of Reference: Companion Volume. Retrieved from https://rm.coe.int/cefr-companion-volume-with-new-descriptors-2018/1680787989.

Dressman, M., Lee, J. S., & Sabaoui, M. A. (2016). Paths to English in Korea: Policies, practices, and outcomes. *English Language Teaching*, *28*(1), 67–78.

Ellis, R. (2015). *Understanding Second Language Acquisition* (2nd ed.). Oxford: Oxford University Press.

Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work*, *14*(1), 133–156. doi:10.1080/13639080123238

Freeman, D. L., & Cameron, L. (2008). Research methodology on language development from a complex systems perspective. *The Modern Language Journal*, *92*(2), 200–213. doi:10.1111/j.1540-4781.2008.00714.x

García, O., & Li, W. (2013). *Translanguaging: Language, bilingualism and education*. New York: Palgrave MacMillan.

García-Pastor, M. D. (2020). Researching identity and L2 pragmatics in digital stories: A relational account. *CALICO Journal*, *37*(1), 46–65. doi:10.1558/cj.38777

Gee, J. P. (1999). Critical issues: Reading and the new literacy studies: Reframing the national academy of sciences report on reading. *Journal of Literacy Research*, *31*(3), 355–374. doi:10.1080/10862969909548052

Glaser, B. G., & Strauss, A. L. (2017). *Discovery of grounded theory: Strategies for qualitative research*. London: Routledge.

*Godwin-Jones, R. (2018). Chasing the butterfly effect: Informal language learning online as a complex system. *Language Learning & Technology*, *22*(2), 8–27. doi:10125/44643

*Godwin-Jones, R. (2019). Riding the digital wilds: Learner autonomy and informal language learning. *Language Learning & Technology*, *23*(1), 8–25. doi:10125/44667

Hafner, C. A. (2019). Digital literacies for English language learners. In X. Gao (Ed.) *Second handbook of English language teaching* (pp. 1–20). Cham: Springer.

Hafner, C. A., Chik, A., & Jones, R. H. (2015). Digital literacies and language learning. *Language Learning & Technology*, *19*(3), 1–7. Retrieved from http://llt.msu.edu/issues/october2015/commentary.pdf.

Hannibal Jensen, S. (2019). Language learning in the wild: A young user perspective. *Language Learning & Technology*, *23*(1), 72–86. doi:10125/44673

*Isbell, D. R. (2018). Online informal language learning: Insights from a Korean learning community. *Language Learning & Technology*, *22*(3), 82–102. doi:10125/44658/

Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century*. Cambridge: The MIT Press.

Jensen, S. H. (2016). Gaming as an English language learning resource among young children in Denmark. *CALICO Journal*, *34*(1), 1–19. doi:10.1558/cj.29519

Jewitt, C., Bezemer, J., & O'Halloran, K. (2016). *Introducing multimodality*. London: Routledge.

*Jurkovič, V. (2019). Online informal learning of English through smartphones in Slovenia. *System*, *80*, 27–37. doi:10.1016/j.system.2018.10.007

*Kettle, M. (2018). Connecting digital participation and informal language education: Home tutors and migrants in an Australian regional community. In M. Dezuanni, M. Foth, K. Mallan, & H. Hughes (Eds.), *Digital Participation through Social Living Labs* (pp. 173–190). Hull, UK: Chandos Publishing.

Kraemer, H.C. (2015). Kappa Coefficient. In N. Balakrishnan, T. Colton, B. Everitt (Eds.), *Wiley StatsRef: Statistics reference online*. Hoboken: Wiley. doi:10.1002/9781118445112.stat00365.pub2

Kusyk, M. (2016). The development of complexity, accuracy and fluency in L2 written production through informal participation in online activities. *CALICO Journal*, *34*(1), 75–96. doi:10.1558/cj.29513

Lai, C., Zhu, W., & Gong, G. (2015). Understanding the quality of out-of-class English learning. *TESOL Quarterly*, *49*(2), 278–308. doi:10.1002/tesq.171

Larsen-Freeman, D. (1997). Chaos/complexity science and second language acquisition. *Applied linguistics, 18*(2), 141–165. doi:10.1093/applin/18.2.141

Larsen-Freeman, D. (2017). Complexity theory: The lessons continue. In L. Ortega & Z. H. Han (Eds.), *Complexity theory and language development: In celebration of Diane Larsen-Freeman* (pp. 11–50). Amsterdam: John Benjamins.141-165.

*Lee, J. S. (2019a). Quantity and diversity of informal digital learning of English. *Language Learning & Technology*, *23*(1), 114–126. doi:10125/44675

*Lee, J. S. (2019b). Informal digital learning of English and second language vocabulary outcomes: Can quantity conquer quality?*British Journal of Educational Technology*, *50*(2), 767–712. doi:10.1111/bjet.12599

Lee, J. S. (2019c). EFL students' views of willingness to communicate in the extramural digital context. *Computer Assisted Language Learning*, *32*(7), 692–712. doi:10.1080/09588221.2018.1535509

*Lee, J. S. (2020). Informal digital learning of English and strategic competence for cross-cultural communication: Perception of varieties of English as a mediator. *ReCALL*, *32*(1), 47–62. doi:10.1017/S0958344019000181

*Lee, J. S., & Drajati, N. A. (2019a). Affective variables and informal digital learning of English: Keys to willingness to communicate in a second language. *Australasian Journal of Educational Technology*, *35*(5), 168–182. doi:10.14742/ajet.5177

Lee, J. S., & Drajati, N. A. (2019b). English as an international language beyond the ELT classroom. *ELT Journal*, *73*(4), 419–427. doi:10.1093/elt/ccz018

Lee, J. S., & Drajati, N. A. (2020). Willingness to communicate in digital and non-digital EFL contexts: Scale development and psychometric testing. *Computer Assisted Language Learning*, *33*(7), 688–707. doi:10.1080/09588221.2019.1588330

*Lee, J. S., & Dressman, M. (2018). When IDLE hands make an English workshop: Informal digital learning of English and language proficiency. *TESOL Quarterly*, *52*(2), 435–445. doi:10.1002/tesq.422

*Lee, J. S., & Lee, K. (2019). Informal digital learning of English and English as an international language: The path less traveled. *British Journal of Educational Technology*, *50*(3), 1447–1461. doi:10.1111/bjet.12652

Lindgren, R., & McDaniel, R. (2012). Transforming online learning through narrative and student agency. *Educational Technology & Society*, *15*(4), 344.

Mays, N., Roberts, E., & Popay, J. (2001). Synthesising research evidence. In N. Fulop, P. Allen, A. Clarke, & N. Black (Eds.), *Studying the organisation and delivery of health services: Research methods* (pp. 188–220). London: Routledge.

*Meyers, E. M., Erickson, I., & Small, R. V. (2013). Digital literacy and informal learning environments: An introduction. *Learning, Media and Technology*, *38*(4), 355–367. doi:17439884.2013.783597

Nassaji, H., & Fotos, S. S. (2011). *Teaching grammar in second language classrooms: Integrating form-focused instruction in communicative context*. London: Routledge.

*Poole, B. (2016). The online informal learning of English. *ELT Journal*, *70*(1), 113–115. doi:10.1093/elt/ccv062

*Ranieri, M., & Bruni, I. (2013). Mobile storytelling and informal education in a suburban area: A qualitative study on the potential of digital narratives for young second-generation immigrants. *Learning, Media and Technology*, *38*(2), 217–235. doi:10.1080/17439884.2013.724073

Reinhardt, J. (2019). *Gameful second and foreign language teaching and learning: Theory, research, and practice*. Cham, Switzerland: Palgrave MacMillan.

Reinhardt, J., & Thorne, S. L. (2019). Digital literacies as emergent multifarious literacies. In N. Arnold & L. Ducate (Eds.), *Engaging Language Learners through CALL* (pp. 208–239). London: Equinox.

Rodgers, M. P., & Webb, S. (2016). The effects of captions on EFL learners' comprehension of English-language television programs. *CALICO Journal*, *34*(1), 20–38. doi:10.1558/cj.29522

Sauro, S., & Chapelle, C. A. (2017). Toward langua-technocultural competence. In C. A. Chapelle & S. Sauro (Eds.), *The Handbook of Technology and Second Language Teaching and Learning* (pp. 459–472). Oxford: Wiley-Blackwell.

*Scholz, K. (2016). Encouraging free play: Extramural digital game-based language learning as a complex adaptive system. *CALICO Journal*, *34*(1), 39–57. doi:10.1558/cj.29527

*Shafirova, L., & Cassany, D. (2019). Bronies learning English in the digital wild. *Language Learning & Technology*, *23*(1), 127–144. doi:10125/44676

*Sockett, G. (2013). Understanding the online informal learning of English as a complex dynamic system: An emic approach. *ReCALL*, *25*(1), 48–62. doi:10.1017/S095834401200033X

*Sockett, G. (2014). *The online informal learning of English*. New York, NY: Palgrave Macmillan.

*Sockett, G., & Kusyk, M. (2015). Online informal learning of English: Frequency effects in the uptake of chunks of language from participation in web-based activities. In T. Cadierno & S. W. Eskildsen (Eds.), *Usage-based perspectives on second language learning* (pp. 153–177). Berlin: De Gruyter Mouton. doi:10.1515/9783110378528-009

*Sockett, G., & Toffoli, D. (2012a). Beyond learner autonomy: A dynamic systems view of the informal learning of English in virtual online communities. *ReCALL*, *24*(2), 138–151. doi:10.1017/S0958344012000031

*Sockett, G., & Toffoli, D. (2012b). Beyond learner autonomy: A dynamic systems view of the informal learning of English in virtual online communities. Procedia - Social and Behavioral Sciences, *34*, 212–215. doi:10.1016/j.sbspro.2012.02.042

*Soltovets, E., Chigisheva, O., & Dubover, D. (2019). Foreign language e-course as informal learning tool for digital literacy development. *Dilemas Contemporáneos: Educación, Política y Valores*, *6*(3), 1–15.

*Sun, Y., Franklin, T., & Gao, F. (2017). Learning outside of classroom: Exploring the active part of an informal online English learning community in China. *British Journal of Educational Technology*, *48*(1), 57–70. doi:10.1111/bjet.12340

Sundqvist, P. (2019). Commercial-off-the-shelf games in the digital wild and L2 learner vocabulary. *Language Learning & Technology*, *23*(1), 87–113. doi:10125/44674

Sundqvist, P., & Sylvén, L. K. (2014). Language-related computer use: Focus on young L2 English learners in Sweden. *ReCALL*, *26*(1), 3–20. doi:10.1017/S0958344013000232

*Sundqvist, P., & Wikström, P. (2015). Out-of-school digital gameplay and in-school L2 English vocabulary outcomes. *System*, *51*, 65–76. doi:10.1016/j.system.2015.04.001

Sylvén, L. K., & Sundqvist, P. (2012). Gaming as extramural English L2 learning and L2 proficiency among young learners. *ReCALL*, *24*(3), 302–321. doi:10.1017/S095834401200016X

*Sylvén, L. K., & Sundqvist, P. (2016). Computer-Assisted Language Learning (CALL) in Extracurricular/Extramural Contexts. *CALICO Journal*, *34*(1), i–iv. doi:10.1558/cj.31822

*Tan, E. (2013). Informal learning on YouTube: Exploring digital literacy in independent online learning. *Learning, Media and Technology*, *38*(4), 463–477. doi:10.1080/17439884.2013.783594

*Toffoli, D., & Sockett, G. (2015). University teachers' perceptions of online informal learning of English (OILE). *Computer Assisted Language Learning*, *28*(1), 7–21. doi:10.1080/09588221.2013.776970

Vazquez-Calvo, B. (2020). Guerrilla fan translation, language learning, and metalinguistic discussion in a Catalan-speaking community of gamers. *ReCALL*, 1–18. doi:10.1017/S095834402000021X

Vazquez-Calvo, B., & Cassany, D. (2017). Aprender lengua con el traductor automático en la escuela secundaria: Un diálogo necesario. *Calidoscópio*, *15*(1), 180–189. doi:10.4013/cld.2017.151.14

Vazquez-Calvo, B., Elf, N., & Gewerc, A. (2020). Catalan teenagers' identity, literacy and language practices on YouTube. In M. Freiermuth & N. Zarrinabadi (Eds.), *Technology and the Psychology of Second Language Learners and Users* (pp. 251–278). Cham: Springer. doi:10.1007/978-3-030-34212-8_10

Vosburg, D. (2016). The effects of group dynamics on language learning and use in an MMOG. *CALICO Journal*, *34*(1), 58–74. doi:10.1558/cj.29524

Warschauer, M. (2013). Technological change and the future of CALL. In S. Fotos & C. Brown (Eds.), *New perspectives on CALL for second and foreign language classrooms* (pp. 15–25). Mahwah, NJ: Lawrence Erlbaum Associates.

*Wible, D., Kuo, C. H., & Tsao, N. L. (2004, August). *Contextualizing language learning in the digital wild: Tools and a framework*. In IEEE International Conference on Advanced Learning Technologies, 2004. Proceedings (pp. 231–235). IEEE.

Werquin, P. (2007). Moving Mountains: Will qualifications systems promote lifelong learning? *European Journal of Education*, *42*(4), 459–484. doi:10.1111/j.1465-3435.2007.00327.x

Yang, S. J., & Yi, Y. (2016). Negotiating multiple identities through eTandem learning experiences. *CALICO Journal*, *34*(1), 97–114. doi:10.1558/cj.29586

Appendix: the summary of 30 reviewed publications

Author(s)/ Year	Purpose of the study **(CALL dimension)**	Theoretical framework	Process of data collection **(Research design)**	Data analysis	Major findings	Location
Beres (2011)	Identifies affordances and constraints of EFL MALL for Japanese college students **(Linguistic dimension)**	Did not specify	Analyzed different resources (e.g., English podcasts, music and websites) used by 38 EFL learners. Then, the author has surveyed and interviewed the participants. **(Mixed-method)**	Did not specify	After using MALL, most students who were sceptical about MALL embraced the use of mobile devices for language learning	Asia
Clothey (2017)	Examines the impact of websites for language learning (Uyghur language) **(Linguistic dimension)**	Informal learning and the Internet	Analyzed 4 interactive Uyghur language websites, chatlogs and their online community forums, or *number* (platform) **(Qualitative)**	Thematic analysis	The websites played a crucial role in preserving Uyghur language and promote linguistic activity among the minority speech community	Asia
Cole (2016)	Explores how online informal learning of English should be considered in the everyday lives of people especially through recent digital technologies. **(Linguistic dimension)**	Did not specify	Review article of a book (*Online informal learning of English*) (Sockett, 2014). **(Non-empirical study)**	Did not specify	Online informal learning of English is crucial in the everyday lives of language users and their language learning trajectories.	North America
Godwin-Jones (2018)	Discusses how informal language as a complex system can contribute to the lives of language learners and users **(Linguistic dimension)**	Complex Adaptive System	Conceptual paper examining literature on *Informal language learning online as a complex system* **(Non-empirical study)**	Did not specify	How language learners and users could be affected by various factors in language learning processes, namely motivation, autonomy, and identity	North America
Godwin-Jones (2019)	Discusses the role of the extramural (digital wild) informal language learning context on the overall process of language learning **(digital literacies and agency dimension of CALL)**	Did not specify	Conceptual paper investigating the literature on extramural (digital wild) informal language learning. **(Non-empirical study)**	Did not specify	Anticipates ways in which vernacular linguistic practices are shaping and will continue to shape formal language learning	North America
Isbell (2018)	Investigates how online informal learning can contribute to Korean-L1 and English-L2 in Korean language users **(Linguistic dimension)**	Activity Theory	Kept record of the observation of a Reddit forum, a chatroom, and administered an open-ended questionnaire **(Qualitative)**	Thematic analysis	Most participants learned English-L2 as the target language; Korean-L1 remained secondary as a target language for practice in the investigated spaces	North America

(*Continued*)

Jurkovič (2019)	Examines which languages Slovenian EFL learners use more through their smartphones as a part of their online informal English learning **(Linguistic dimension)**	Online informal learning of English	Used semi-structured interviews and an online survey with 905 Slovenian EFL learners (ages 18-40) **(Mixed-method)**	Did not specify	A strong relationship was found between the language (English or Slovene proficiency of the participants) and language use	Europe
Kettle (2018)	Records and recounts how a group of learners were accompanied and assisted to use digital technologies effectively in professional settings and addressing learners' needs **(digital literacies and agency dimension of CALL)** how teaching decisions were targeted at	Did not specify	Used the lab, field notes, audio-recording sessions, and photographs, to register the practices of 6 adult female migrants in Australia **(Qualitative)**	Thematic analysis	Lab sessions helped participants to use digital technology more effectively to teach English	Oceania
Lee and Drajati (2019a)	Explores how informal digital learning of English could contribute to affect and willingness to communicate **(The affective and cultural dimension of CALL)**	IDLE	Used a survey distributed to 183 Indonesian EFL university students **(Quantitative)**	Multiple regression	Participants' WTC in English correlated significantly with IDLE activities as well as affective variables	Asia
Lee and Dressman (2018)	Investigates which types of IDLE can contribute to enhancing the speaking skills of Korean EFL university students **(Linguistic dimension)**	IDLE	Used a survey distributed to 94 Korean EFL students in addition to an English vocabulary and speaking test **(Mixed-method)**	Multiple regression	Engagement in diverse IDLE activities that included both form-focused and meaning-focused language learning could significantly predict students' English speaking proficiency	Asia
Lee (2019a)	Investigates the association between quality/quantity of IDLE and the vocabulary achievements of Korean EFL university students **(Linguistic dimension)**	IDLE	Administered a questionnaire and vocabulary test to 77 Korean EFL university students (aged 19-27) **(Mixed-method)**	Multiple regression	Rather than the quantity of IDLE (time of exposure), the quality of IDLE (type of content, practices engaged) was significantly related to vocabulary scores	Asia

(*Continued*)

Appendix: Continued.

Author(s)/ Year	Purpose of the study **(CALL dimension)**	Theoretical framework	Process of data collection **(Research design)**	Data analysis	Major findings	Location
Lee and Lee (2019)	Checks Korean EFL students' perception about English as an international language and IDLE activities **(Linguistic dimension)**	IDLE	Administered a questionnaire to 317 Korean EFL learners (aged 18-27). **(Mixed-method)**	Structural equation modeling	Results of Structural Equation Modelling indicated that there is a strong significant and positive relationship between IDLE activities in which EFL learners engage and a positive perception of English as an international language	Asia
Lee (2019b)	Examines the association between quality and quantity of IDLE and affective variables and language development **(The affective and cultural dimension of CALL)**	IDLE	Administered language tests, conducted semi-structured interviews and distributed questionnaires to 71 Korean EFL learners (aged 19-26) **(Mixed-method)**	Multiple regression	While the quantity of IDLE activities supported the participants emotionally, it was the quality of IDLE that contributed to the language development of the students	Asia
Lee (2020)	Investigates the relationship between IDLE and strategic competence for cross-cultural communication and the perception of varieties of English **(The affective and cultural dimension of CALL)**	IDLE	Conducted semi-structured interviews and administered a questionnaire to 266 Korean EFL university students (ages 19-30) **(Mixed-method)**	Structural equation modeling	The EFL Korean students who do not have overseas experience were likely to use a more effective cross-cultural communication strategy particularly as their perception of different varieties of English could be more positive through engagement in IDLE activities	Asia
Meyers, Erickson, and Small (2013)	To explore how scholarly work conceives digital literacy at the intersection of education, literacy studies, and linguistics **(digital literacies and agency dimension of CALL)**	Did not specify	Literature review on digital literacy and perceptions on digital literacy **(Non-empirical study)**	Did not specify		North America

(*Continued*)

Poole (2016)	How Online informal learning of English as a concept can play a crucial role in the everyday lives of people especially through recent digital technologies and the contribution of this concept to English learning of students. **(Linguistic dimension)**	Did not specify	Review article of a book (*Online informal learning of English*) (Sockett, 2014). **(Non-empirical study)**	Did not specify	The writers concluded that the concept of online learning of English is important and should be used in other contexts aside from France and related contexts	Asia
Ranieri and Bruni (2013)	Investigates learning opportunities afforded by MALL **(Linguistic dimension)**	Participatory culture, new media literacies and engagement	Action-research study with a 2-month observation of and diary writing by 15 Italian participants (aged 11-15) **(Qualitative)**	Thematic analysis	Mobile devices play a positive role in users' ability to express their identities and carry out collaborative practices, especially for minorities	Europe
Shafirova and Cassany (2019)	Explores language learning practices and related affective and cultural variables in fan communities of bronies (fans of animated TV series *My Little Pony*) **(The affective and cultural dimension of CALL)**	Did not specify	Used digital ethnography, interviews and observation with 6 participants (3 Russian, 3 Spanish) **(Qualitative)**	Did not specify	Participants engaged in language-intensive fan practices in English, they learned to effectively use English in real-life situations, and developed critical thinking, alternative identities, and autonomy	Europe
Scholz (2016)	Investigates the affordances and limitations of video games as a form of extramural IDLE **(Linguistic dimension)**	Complex Adaptive System	Administered questionnaires and conducted interviews and a 4-month observation of 4 German EFL university students **(Qualitative)**	Did not specify	After a complex adaptative system analysis, various factors (e.g., learners' individual differences and motivation) interplayed with the success of the gameplay experience	North America
Sockett and Kusyk (2015)	Aims at highlighting the significance of Dynamic system theory and a usage-based approach for the study of online informal learning of English **(Linguistic dimension)**	Complex Adaptive System	Reviewed literature and thoroughly explained the dynamic system theory and usage-based approach to support the relevance of online informal learning of English **(Non-empirical study)**	Did not specify		Europe

(*Continued*)

Appendix: Continued.

Author(s)/ Year	Purpose of the study **(CALL dimension)**	Theoretical framework	Process of data collection **(Research design)**	Data analysis	Major findings	Location
Sockett (2013)	Explores the affordances of online informal learning of English, through a dynamic complex system approach **(Linguistic dimension)**	Complex Adaptive System	Observed a 3-month engagement in online informal learning of English of 9 female EFL students, with a B2-above competence **(Qualitative)**	Complex Systems and Applied Linguistics	Engagement in online informal learning of English contributed to English learning in different ways depending on each individual participant	Europe
Sockett (2014)	Explains online informal learning of English through the lens of complex dynamic systems, positing the theory allows for the account of learners' individual differences in language learning **(Linguistic dimension)**	Complex Adaptive System	Reviewed prior literature on online informal learning of English, including empirical studies on the affordances of diverse digital technologies **(Non-empirical study)**	Did not specify	Online informal learning of English plays a crucial role in the everyday life of people with growing digitization and hybridization; attention should be paid to individual differences among users/ learners	Europe
Sockett and Toffoli (2012a)	Investigates how a group of EFL students engaged in websites and social media and how such engagement impacted the learning of English **(Linguistic dimension)**	Complex Adaptive System	Used diaries to account for potential learning of 5 French EFL students while engaging with websites and social media **(Qualitative)**	Thematic analysis	Participants learned new structures and vocabulary; following the complex adaptive system approach, the results emphasized individual differences in the process of language learning.	Europe
Sockett and Toffoli (2012b)	Investigates the type of engagement that French EFL students have as their online informal learning of English **(Linguistic dimension)**	Complex Adaptive System	The authors examined the eight-week diaries of five French EFL students as they engaged in various websites **(Qualitative)**	Thematic analysis	The findings of the study demonstrated that engagement in English websites can help the participants to improve their English language proficiency, particularly their vocabulary knowledge	Europe

(*Continued*)

Soltovets, Chigisheva and Dubover (2019)	Investigates how teaching English through an e-course (websites, digital technologies) can offer learning opportunities to language learners **(digital literacies and agency dimension of CALL)**	Did not specify	The authors used project research in the study to show how learning English as an e-course under the supervision of English teachers can be facilitated; the participants of the study were Russian EFL teachers and students **(Qualitative)**	Did not specify	The e-course helped students to improve their English proficiency and their digital literacy; for instance, the participants improved their skills to effectively use hyperlinks	Europe
Sun, Franklin, and Gao (2017)	Explores how engagement in a forum about General Record Examination (GRE) for Chinese students helps learners to improve their English language proficiency **(Linguistic dimension)**	Did not specify	The authors used transcript analysis and a survey to know the impact of online discussion about GRE in Chinese students **(Mixed-method)**	Did not specify	There was evidence of teaching presence, cognitive presence and social presence in the online forum; higher levels of perceived teaching, cognitive and social presence were noticed in analytical writing and discussion sections of the forum	Asia
Sylvén and Sundqvist (2016)	Explains the importance of out-of-classroom language learning in improving language learners' proficiency **(Linguistic dimension)**	IDLE	Reviewed previous literature, stressing differences between extramural informal learning of English and extracurricular English language learning **(Non-empirical study)**	Did not specify	Lacking research in out-of-classroom language learning; the concept of out-of-classroom language learning is particularly important since many new concepts worth investigating have emerged in recent years	Europe
Tan (2013)	Investigates how engagement with YouTube can help students to experiment with new forms of learning, unavailable in classroom contexts **(digital literacies and agency dimension of CALL)**	Grounded theory	Used grounded theory to analyze documents and interview transcripts of 24 participants **(Qualitative)**	Thematic analysis	Engaging with YouTube videos and sharing them can help students surpass the boundaries of formal learning, learn from each other, collaborate, and enhance their digital literacies	Europe
Toffoli and Sockett (2015)	Investigates the perception of French university professors about online informal learning of English **(Linguistic dimension)**	Online informal learning of English	The author gave a questionnaire to 30 professors of English working in French universities to investigate their perception of online informal learning of English. **(Quantitative)**	Did not specify	Most professors were aware of the kind of input their students could be exposed to via online informal learning, but lacked specific knowledge, and rarely took advantage of this input source in their English courses	Europe

(*Continued*)

Appendix: Continued.

Author(s)/ Year	Purpose of the study **(CALL dimension)**	Theoretical framework	Process of data collection **(Research design)**	Data analysis	Major findings	Location
Wible, Kuo, and Tsao (2004)	Investigates two useful softwares (*Collocator*, *Word Spider*) that can facilitate the process of vocabulary and collocation attainment **(Linguistic dimension)**	Did not specify	Provided an explanation of how the two tools can help language learners to detect unknown collocations and new clues for learning unknown words **(Non-empirical study)**	Did not specify	Using different resources (e.g., *Collocator*, *Word Spider*) can facilitate the process of language learning	Asia