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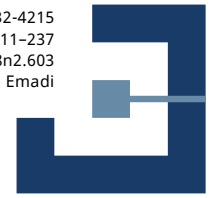

Castledown

Purpose, outcome, and methodology in computer-assisted language learning publications: A systematic review

Somayeh Fathali
s.fathali@alzahra.ac.ir
Alzahra University, Iran

Azadeh Emadi
azadeh.emadi@ut.ac.ir
University of Tehran, Iran

Although CALL is still an emerging area of study in many countries, several studies have shown the significant contribution of these countries to the development of CALL worldwide, among which Iran is no exception. Contrary to the vast number of review studies on how this interdisciplinary area of study has been developed at the international level, there are very few studies presenting the development of CALL at the national level, especially in the highly contributing countries. Accordingly, the present study is an attempt to systematically review the trend of CALL in Iran focusing on research purpose, outcome, and methodology. The two major databases of WoS and Scopus were searched from 2007 to 2020. Following the exclusion and inclusion criteria, 229 studies were selected for the present systematic review. The research purpose and outcome of the studies were analyzed according to four classifications of linguistic, affective, cognitive/metacognitive, and technology domains. The findings indicated a large number of studies in linguistic and affective domains with a positive effect of technology. Furthermore, a few studies have been conducted with a focus on the cognitive/metacognitive and technology aspects. The analysis of the research methodology of the publications revealed a lack of sufficient data about participants, research setting, and duration of the treatment/tasks. More importantly, the absence of longitudinal qualitative studies in natural settings was found as a major shortcoming. It is worth mentioning that measurement instruments/data collection methods, data analysis methods, and the implemented devices were clearly explained in nearly all the studies.

Keywords: Computer-assisted language learning, systematic review, research purpose, research outcome, research methodology

Introduction

A large number of people have been using computers for the purpose of learning and especially language learning as a distinctive field of study known as computer-assisted language learning (CALL). Although this usage has been increasing rapidly, the emergence of COVID-19 in late 2019 accelerated the speed and expanded the use of technology for language learning along with the number of related publications. As stated by Cooper (2018), as the number of publications grows in an area of study, the need for research syntheses and trustworthy records of past research increases accordingly. So far there have been multiple review studies about the development of CALL all around the world (Egbert et al., 2018; Gillespie, 2020; Golonka et al., 2014; Hubbard, 2005; Hwang & Fu, 2018; Pérez-Paredes, 2019; Sharifi et al., 2017; Wang & Vásquez, 2012). For instance, Gillespie (2020) reviewed publications in three major CALL journals, and it was found that 50 countries were contributors to CALL, among which 21 countries were remarkable contributors. However, there is no clear record of how CALL has been studied and practiced in these contributing countries at the national level that resulted in the existing international evolvement.

One of those highly contributing countries has been Iran (Gillespie, 2020), which has also been identified as productive in CALL research in a bibliometric analysis of technology-enhanced language learning (Chen et al., 2018). However, there have been no studies indicating the development of CALL in this country. To identify an all-embracing trend of CALL in Iran, recently, Fathali and Emadi (2021) conducted an integrative review of 687 CALL publications in various databases with a major focus on the trend of CALL in Iran between 2007 and 2019. The findings indicated a comprehensive picture of how CALL has been progressing from its emergence onward. However, in addition to this general overview, more detailed investigations based on rigorous methodology and criteria are required to provide a clearer picture of CALL as an emerging field of study in Iran. According to Gough et al. (2012), a systematic review can be a powerful way "to gain an understanding of the breadth, purpose and extent of research activity in a given area" (p. 45). Systematic reviews differ from other reviews in following a certain methodology for selecting, coding, analyzing, and synthesizing the data (Denyer & Tranfield, 2009). Therefore, the present study attempted to systematically review Iran-based CALL publications between 2007 and 2020, in two major reliable digital databases of Web of Science and Scopus. Chong and Reinders (2021) believe in a superabundance of methodological traditions and practices in CALL research. As the field of CALL continues to grow and become more theoretically and methodologically sophisticated, selecting an appropriate research methodology can be more challenging (Levy et al., 2015). In this regard, 229 studies were reviewed with a major focus on principal components of scientific research papers including the purpose, outcome, and research methodology of the studies. Selinger and

Shohamy (1989) delineated the basic components of research as introduction and statement of the problem or generally the topic, literature review, design, methodology, data analysis, and the findings. Accordingly, the present study categorized three main components of purpose, methodology, and outcome, which represents purpose as the statement of the problem, research questions, or the topic, methodology as the research contexts, data collection methods, and data analyses, and outcome as the research findings or results.

CALL development worldwide and in Iran

CALL as an individual discipline emerged in the 1960s with the integration of computers into English language teaching, and was defined generally by Levy (1997) as "the study of applications of the computer in language teaching and learning" (p. 1). Later, Beatty (2003) offered another definition for CALL as "any process in which a learner uses a computer and, as a result, improves his or her language" (p. 7). The history of CALL as an independent field of study has been framed by several researchers during different eras (Bax, 2003; Beatty, 2003; Chapelle, 2001; Colpaert, 2004; Levy, 1997; Warschauer & Healey, 1998). Although CALL in itself lacks CALL-based theories and pedagogical frameworks (Hubbard, 2009; Hubbard & Levy, 2016; Oskoz & Smith, 2018), Warschauer and Healey (1998) defined the history of CALL according to three individual phases based on the three dominant language learning theories of the time, *Behavioristic CALL* (later called *Structural CALL*) informed by the theory of behaviorism in the 1970s-1980s, *Communicative CALL,* based on the methods of communicative language teaching in the late 1980s and early 1990s, and *Integrative* CALL (21st-century CALL). The given classification of the history of CALL by Warschauer and Healey (1998) was later criticized by Bax (2003). He stated that this classification of CALL does not accurately follow the phases of language learning theories and it is not possible to indicate phases for CALL in different eras. Accordingly, Bax (2003) proposed three well-known approaches to CALL, called *Restricted CALL, Open CALL,* and *Integrated CALL.*

The constantly changing trend of digital technology brings a dynamic nature to computer-related areas of study including CALL. Accordingly, there is always a serious need for frequent reviews of the past, present, and future of CALL. So far, the history of CALL and its theoretical developments have been reviewed by several researchers (Bax, 2003; Beatty, 2003; Chapelle, 2001; Colpaert, 2004; Colpaert, 2012; Levy, 1997; Warschauer & Healey, 1998). More importantly, there are also multiple reviews of its practical research from various perspectives that are the center of attention in the present study (Chun, 2006; Egbert et al., 2018; Gillespie, 2020; Golonka et al., 2014; Hubbard, 2005; Hwang & Fu, 2018; Pérez-Paredes, 2019; Sharifi et al., 2017; Wang & Vásquez, 2012).

Hubbard (2005) reviewed CALL publications between 2001 and 2003 in a number of CALL-related journals in terms of subject characteristics. The findings revealed that there is insufficient explicit information about the number of subjects, the subjects' prior experience with tasks and applications, duration of treatments, training provided before and during the studies, and

questionnaires of the studies. The only explicitly given information about the subjects in several studies was their lack of experience and training. Later, Hubbard (2008) conducted another review study on the use of theories in studies published from 1983 to 2007 in the CALICO Journal. The fundamental drawback of CALL as an individual discipline was clearly reflected in the reviewed studies. Lack of pedagogical frameworks and CALL-based theories resulted in the implementation of 113 distinct theories in 166 reviewed studies.

Other review studies were conducted focusing on the use of technologies for learning different language skills. The findings indicated that the majority of CALL studies focus on grammar, vocabulary, reading, writing, pronunciation, listening, speaking, and culture respectively (Levy, 2009). In a study by Okonkwo (2011), reading and listening were identified as the main studied skills among the four major language learning skills. Even though the major skills of language have largely been the center of attention in CALL research, the scope of research has been evolving from only focusing on language learning skills to other areas such as learning communities, learner identity, and online collaboration (Wang & Vásquez, 2012).

Finally, in terms of the analysis of the implemented technologies in CALL research, Golonka et al. (2014) focused on technology types and their effectiveness in more than 350 empirical TELL studies. Automatic speech recognition (ASR) for pronunciation and chatting for language production were among the most effective technologies. Moreover, in a review by Zhang and Zou (2020), multimedia tools, socializing tools, speech-to-text and text-to-speech recognition tools, and games, respectively, were indicated as highly used technologies. In addition, Shadiev and Yang (2020) found games and videos to be highly implemented technologies in their review of studies in the top ten educational technology journals.

In addition to the previously-mentioned reviews, a comprehensive review of CALL research was conducted by Gillespie (2020). Publications in three prominent international CALL journals, namely ReCALL, CALICO, and CALL Journal were reviewed investigating top countries working on CALL, the variety of topics researched, frequency of CALL publications, types of publications, and types of empirical studies (small-scale or broad). It was revealed that CALL research exclusively focuses on specific topics and leaves several others less studied or even untouched. Writing, CMC, vocabulary, speaking, and corpora were the five highly studied topics. It was also found that the majority of the papers were small-scale empirical studies rather than theoretical or meta-analytical. Overall, the findings revealed the increasing number of CALL research internationally. Fifty countries have been contributing to CALL among which 21 countries were remarkable contributors. One of those highly contributing counties has been the Islamic Republic of Iran which is the focus of the present study.

As reported by Shafiee (2005, as cited in Fotouhi-Ghazvini et al., 2008), the Ministry of ICT in Iran started developing e-learning in the educational system between 2005 and 2009. Following that, training teachers to apply technology in EFL courses also increased, and in 2007 the first CALL course was officially

established at Alzahra University for PhD students of TEFL, and in 2010 for MA students (Hedayati & Marandi, 2014; Marandi, 2019). Previously, CALL was considered a subfield of SLA (Chapelle, 1997), and there were some CALL courses at different universities. However, attempts were made gradually to establish CALL as a new discipline in some countries including Iran. Accordingly, CALL was established as an individual discipline at the MA level in some Iranian universities from February 2020.

According to Chen et al. (2018) and Gillespie (2020), Iran has been a prolific country in CALL and there have been several studies conducted in different areas. However, there has not been a comprehensive review of how CALL has been developing in Iran. There have been two very brief reviews with a focus on integration of technology in language skills (Pourhosein Gilakjani, 2017), and educational technology's role in teaching English (Rahmati et al., 2021). Therefore, witnessing the existing gap of having no comprehensive overviews of CALL in Iran, Fathali and Emadi (2021) conducted an all-inclusive review of 687 studies published between 2007 and 2019 in Iran. Even though the previous study provides a general picture of CALL in Iran, it still lacks a detailed report of the key components of scientific research including the purpose, research methodology, and outcomes of the studies. Therefore, the present review tries to systematically investigate the above-mentioned components through the following research questions:

1. What are the dominant research purposes and outcomes in Iran-based CALL publications?
2. What are the dominant research types and approaches in Iran-based CALL publications?
3. What are the dominant participant characteristics, research settings, and task/treatment duration in Iran-based CALL publications?
4. What are the dominant measurement instruments/data collection methods, data analysis methods, and device types in Iran-based CALL publications?

Method

According to Gough et al. (2012), conducting a systematic review is a powerful way "to gain an understanding of the breadth, purpose, and extent of research activity in a given area" (p. 45). Moreover, the implementation of scientific and systematic methods decreases error and bias in a systematic review and helps synthesize the findings of research papers (Petticrew & Roberts, 2006). Therefore, the present study tried to gain an in-depth understanding of the development of CALL research in Iran between 2007 and 2020 through a systematic review approach. The search period was chosen due to the official emergence of CALL in Iran as an established university course in 2007 (Hedayati & Marandi, 2014; Marandi, 2019). Additionally, studies published in 2021 were not included in the data since we were still in 2021 at the time of data collection.

Search strategy

The two topmost bibliographic databases of Web of Science and Scopus were systematically searched for Iran-based CALL publications from 2007 to 2020. Since almost all high-ranked ELT and CALL journals have been indexed in either WoS or Scopus, searching the two digital databases could ensure we located high-quality peer-reviewed publications. The following combination of keywords was used for searching through the databases: 'computer-assisted language learning' and 'Iran', 'mobile-assisted language learning' and 'Iran', 'technology-enhanced language learning' and 'Iran', 'computer' and 'language learning' and 'Iran', 'mobile' and 'language learning' and 'Iran', 'technology' and 'language learning' and 'Iran', 'computer' and 'language learning' and 'Iranian', 'mobile' and 'language learning' and 'Iranian', 'technology' and 'language learning' and 'Iranian'. The initial search resulted in 378 publications of which 103 publications were eliminated due to duplications. Since we were only concerned with original peer-reviewed journal publications, we removed book chapters, conference presentations, and book reviews (if any). To answer the research questions of the present study, only empirical studies were required. Therefore, the abstracts of the papers, and where necessary the whole articles, were scrutinized to remove non-empirical studies such as review/theoretical/opinion papers, resulting in 22 studies being eliminated. Some studies (N=24) were also removed which did not fall within our intended scope of CALL and the keywords were only mentioned as terminologies throughout the papers. Finally, 229 studies remained for further analysis which were published between 2011 and 2020. It should be noted that although the search started from 2007, the year of the official emergence of CALL in Iran, no studies were found between 2007 and 2011.

Coding procedure

After the selection procedure, the papers went through rigorous systematic coding by two CALL researchers individually, in terms of publication year, purpose of the study, research type and approach, participant characteristics, research setting, study duration, task/treatment duration, measurement instruments/data collection method, data analysis method, device type/technology, and finally, the outcome of the study. As a final point, the findings were checked by a CALL expert and some minor modifications were applied. All the related data and coding were recorded in an Excel file.

The purposes and the outcomes of the studies were extracted using primary and secondary coding. The three sections of abstract, introduction, conclusion, and when necessary the results sections were read, analyzed, and coded rigorously. Considering the purpose of the studies, after the primary analysis, the authors decided on coding them against the four major domains of linguistic, affective, cognitive/metacognitive, and technology. It should be noted that the coding against the four domains does not mean one domain per study. All the studies were carefully scrutinized and all the studied domains were coded for. Therefore, several studies were identified as corresponding to combinations of

two or more domains. The coding framework for the linguistic domain included the four major language skills (i.e., reading, writing, listening, and speaking) and the language components (i.e., vocabulary, grammar, and pronunciation). In addition, there were also several studies with a major focus on affective factors rather than linguistic. The affective domain was coded according to the terminology used by the authors such as attitude, perception, perspective, acceptance and readiness, motivation, and self-regulation/self-efficacy/autonomy. The studies centering on cognition or metacognition such as critical thinking, cognitive discourse analysis, and metacognitive strategies were all grouped as part of the cognitive/metacognitive domain. Finally, a few studies were identified as belonging to the technology domain. Even though the technology was used as an inevitable aspect of all the reviewed CALL studies, there were some publications that could not be classified within any of the aforementioned domains. In other words, there were a few CALL publications that were conducted in an ELT context but with no focus on ELT. For instance, there were some studies (mainly descriptive) that focused on the investigation of English teachers'/learners' use of technology or their familiarity with technology rather than linguistic or affective factors (e.g., Alizadeh, 2018; Pourhosein Gilakjani & Sabouri, 2014). The analysis of technological tools in English textbooks was another example in this domain (e.g., Nushi & Momeni, 2020).

After the coding of the purposes, the same classifications of the domains were used for the coding of the outcomes. The outcomes of the specified domains were coded as *positive*, *neutral*, and *negative*. The purpose of some studies was to detail the contextual factors, inform the design, develop and evaluate new CALL artifacts (i.e., language learning Apps, software, CALL tasks, etc.) through a deeper understanding of the users' perspectives (Levy & Moore, 2018). Therefore, the outcomes of such explanatory studies were not coded as distinct positive, negative, or neutral outcomes but rather as an explanation of the findings.

The research methodology of the studies was coded following the classifications given by Ary et al. (2010), including the types and approaches of the studies. The coding was conducted according to the explicit terminologies used by the researchers, and in some cases by reading through the papers. The studies were generally classified into three types of quantitative, qualitative, and mixed methods. The research approaches were classified as experimental/quasi-experimental, correlational research, and survey research for the quantitative studies, and basic qualitative/interpretative study, case study, content analysis, narrative inquiry, and phenomenological study for the qualitative papers.

Participant characteristics (including both learners and teachers) were oded based on the number of participants, gender, English language proficiency level, age/teaching experience, the field of study, and digital literacy. The coding of the research settings was conducted based on formal (in the classroom) and informal/non-formal (out-of-class) contexts. Task/treatment type and duration were also coded based on the terminology used by the researchers, namely session, week, month, semester, and academic year. Instrumentations/data

collection method was coded according to Ary et al. (2008). The measurement instruments for quantitative studies included achievement tests (i.e., standardized tests and teacher-made tests), aptitude tests, scales, and direct quantitative observations (i.e., checklists, rating scales, and coding systems). Also, for qualitative studies, the data collection methods included interviews (e.g., structured, semi-structured, or focus group), qualitative observations (e.g., narratives or field notes), and document or artifact analysis (e.g., physical, visual, or written materials). The data analysis method was coded based on the analysis methods used for quantitative and qualitative studies. Device type and technologies were also coded according to the terminology used by the researchers such as desktop computer, laptop, mobile phone, iPad, iPod, and tablet, among others.

Results and discussion

Before answering the research questions, to visualize the development of CALL in Iran, the trend of CALL publications indexed in WoS and Scopus between 2011 and 2020 was investigated. As stated previously, searching for the publications started from 2007, the official emergence of CALL in Iran. However, because there were no studies indexed in the above-mentioned databases between 2007 and 2011, the present study reviewed studies published from 2011 to 2020. As indicated in Figure 1, CALL-related research has seen a rising trend in Iran except for 2017. Unfortunately, even our comprehensive review of the literature of CALL both at international and national levels could not identify any specific reasons for the sharp fall in 2017. Rather, an international review by Shadiev and Yang (2020) identified 2017 as CALL publications' most productive year.

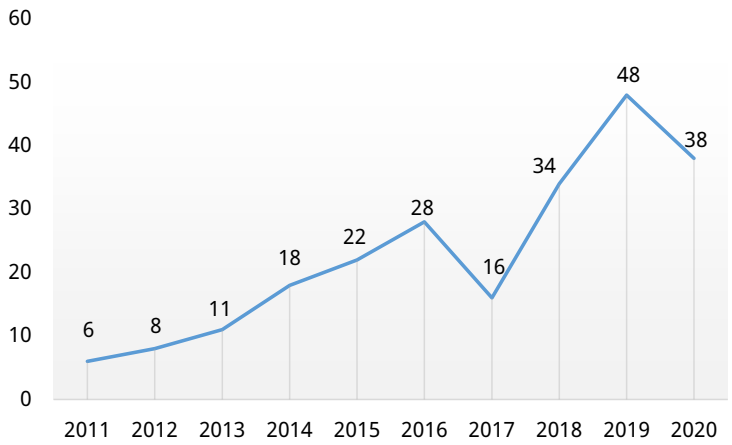

Figure 1. Trend of Iran-based CALL publications in WoS & Scopus

RQ1. What are the dominant research purposes and outcomes in Iran-based CALL publications?

Linguistic domain. The purposes of the studies were coded according to their focus on the effect of technology on four main domains of linguistic (N=162), affective (N=121), technology (N=20), and cognitive/metacognitive (N=15). Since some studies investigated more than one specific domain at a time, the number of the examined domains (N=318) is more than the total number of the studies (N=229). Contrary to the idea of Golonka et al. (2014) that CALL studies mostly center on the affordances of a specific technology or the changes in the students' affective factors with the use of specific technology rather than the main goal of learning, most of the CALL publications in Iran focused on learning as the main goal. As represented in Table 1, the findings indicated that the majority of the studies were centered on the investigation of the effect of technology on language learning, including the four major language skills (i.e., reading, writing, listening, and speaking) and the language components (i.e., vocabulary, grammar, and pronunciation). As argued by Chapelle and Sauro (2017), even though communication is a final goal for language learning, there have always been teachers and learners who focus on a specific language skill or area, and this tendency in ELT has also been transferred to CALL (Hubbard, 2009). Among the skills and components, vocabulary is the highest attended skill in applied linguistics (Lei & Liu, 2019), and CALL (Gillespie, 2020; Hwang & Fu, 2018; Shadiev & Yang, 2020), which is also true for Iran-based CALL (Table 1). As stated by Ma (2017), the advances of technology have resulted in rich materials and software that assist L2 vocabulary teaching and learning. Following vocabulary, writing skills has been the most studied area of Iran-based CALL. As stated by Li et al. (2017), the multi-author function of Web 2.0 facilitated writing practice for L2 teachers and learners and resulted in a vast implementation of technology for L2 writing. The other skills and components of language learning also follow with different degrees of attention (Table 1).

Regarding the outcomes of the reviewed studies, the effect of technology on the linguistic domain was coded as *positive*, *neutral*, *negative*, and *explanation of the findings*. In order to get a more detailed understanding of the outcomes of the studies, the outcomes are reported based on the same domains given for the studies. As displayed in Table 1, the majority of the linguistic-domain studies resulted in positive outcomes, indicating that the use of technology has been beneficial for language learning. The positive effect of technology on language learning is what has also been observed in multiple other studies. Only a few studies did not identify any specific effect of technology on the linguistic domain and resulted in neutral outcomes.

Table 1. Purpose and outcome in Iran-based CALL publications: Linguistic domain

Language domain	Frequency	Positive	Neutral	Negative	Explanatory
Vocabulary	44	40	4		
Writing	35	32	2		1
Speaking	20	19	1		
Grammar	19	17	2		
Reading	15	14	1		
Listening	14	14			
Pronunciation	9	8	1		
Language proficiency	6	4	1	1	
	162	148	12	1	1

Affective domain. Along with the focus on language skills and components as the major purposes of the studies, a considerable number of studies focused on the affective domain. Attitude, perception, perspective, acceptance, motivation, anxiety, and self-regulation were among the studied factors (Table 2). Following the concept of affective filter proposed by Dulay and Burt (1977), it was argued that various affective factors could influence second language learning (Gardner, 1985; Krashen, 1981) which also applies to CALL. The importance of affective factors in CALL, not only in Iran-based publications, has also been shown in some previous international reviews (Golonka et al., 2014; Shadiev et al., 2017; Wang & Vásquez, 2012). Levy (2015) highlighted the importance of one's attitude toward a task in CALL and its effect on final achievement cannot be easily ignored. As such, it should be considered a required stage of the research. Similar to what Levy (2015) emphasized, attitude has been the most highly studied affective domain in CALL publications in Iran (Table 2).

Regarding the outcome, as stated by Stern (1983), "the affective component contributes at least as much and often more to language learning than the cognitive skills" (p. 386). The critical role of the affective domain in language learning success has also been emphasized previously (Gardner, 1985; Krashen, 1981). Considering the effect of technology on the affective domain in CALL publications, although a large number of studies resulted in positive outcomes, a few studies resembled the negative effect of technology on the students' affective factors (Table 2). According to Wright (1987), positive or negative attitudes are shaped by values. If a person believes in the importance of something, then a positive attitude is fostered. Accordingly, the high positive attitudes in the outcome of Iranian CALL publications reflects the participants' belief in the importance of technology. Among the studies, there were six studies with explanatory findings rather than positive or negative outcomes, such as students' preference for using various social media (Table 2).

Table 2. Purpose and outcome in Iran-based CALL publications: Affective domain

Affective domain	Frequency	Positive	Neutral	Negative	Explanatory
Attitude	57	51	3	1	2
Perception	22	16	1	4	1
Self-efficacy (5); Self-regulation (3); Autonomy (2); Satisfaction (1); Self-perceive (1)	12	10		1	1
Motivation (6); Willingness (2)	8	8			
Perspective (8); Belief (1)	9	9			
Anxiety	4		1	3	
Acceptance and readiness	3	1		1	1
Preference	3	1	1		1
Behavioral management	2	2			
Aversion	1			1	
	121	98	6	11	6

Technology domain. Due to the increasing change in the nature of communication and the advancement of technology, simply relying on language knowledge cannot lead language users to successful communication (Blommaert, 2015). However, successful learning and teaching practices require adequate knowledge of technology and digital literacies, which has been discussed extensively throughout the past decades (Pegrum et al., 2018). Meanwhile, among the reviewed papers, there were a few studies (N=20) that focused on the issues related to technology rather than linguistic, affective, or cognitive domains. Even though these studies were conducted in ELT contexts such as an English language institute or class, they did not focus on or measure any linguistic or affective factors. These studies mainly focused on digital literacy, technology use, experience, and familiarity in an ELT context (Table 3). For instance, a few descriptive studies investigated language teachers'/learners' technology literacy/familiarity (e.g., Pourhosein Gilakjani & Sabouri, 2014). As shown in Table 3, contrary to the generally positive outcomes of the linguistic and affective domains, the studies within the technology domain reported findings mostly as explanations, for example, describing the use of various electronic tools used by language learners (e.g., Alizadeh, 2018), or the analysis of technological tools in English language textbooks (e.g., Nushi & Momeni, 2020).

Table 3. Purpose and outcome in Iran-based CALL publications: Technology domain

Technology	Frequency	Positive	Neutral	Explanatory
Technology Familiarity	5			5
Computer Literacy (1); Technology knowledge (2); Internet based abilities (1)	4	1		3
TPACK perceptions (Major focus on technology)	4			4
Teachers' [tech] experiences (2); Technology use (1)	3	1		2
Computer based vs. paper-based Assessment	2		2	
Tech tools in textbooks (1); Electronic Learning Tools (1)	2			2
	20	2	2	16

Cognitive/metacognitive domain. Finally, regarding the cognitive/metacognitive domain, the invisible internal mental processes (Bloom et al., 1956), although cognition or metacognition might have been involved in the language learning process in several studies, there were not so many studies with an explicit reference to or focus on cognition and its analysis or measurement (Table 4). Despite the importance of cognitive process in CALL (Vinther, 2005), the reviewed CALL studies in this research showed less inclination towards it, and as can be seen in Table 4, only 15 papers focused on topics associated with cognitive processes in CALL.

Table 4. Purpose and outcome in Iran-based CALL publications: Cognitive/metacognitive domain

Cognitive/metacognitive	Frequency	Positive	Neutral	Explanatory
Cognitive metacognitive strategies (1); cognitive, social, and teaching presence (1); Metacognitive Reading Strategies (1); Metacognitive Awareness (1)	4	2		2
Critical thinking	2	2		
Management	2		2	
Multimedia discourse analysis: participation (1); form and sequence of the questions and answers (1)	2	1		1
Pragmatic competence (2); Humor (1); politeness (1)	4	4		
Reasons (of not using technology)	1			1
	15	9	2	4

RQ2. What are the dominant research types and approaches in Iran-based CALL publications?

The research methodology of the studies was classified into three major categories of quantitative (N=128), qualitative (N=22), and mixed-methods (N=79). The findings indicated that, similar to CALL and MALL publications around the world that mainly employ quantitative research methods (Hubbard, 2009; Hwang & Fu, 2018; Stickler & Hampel, 2015), most of the CALL researchers in Iran also prefer quantitative research methods. The history of CALL indicates its beginning by quantitative studies including experimental and control groups that compared the presence and absence of technology in language learning contexts (Hubbard, 2009). Levy (2015) questions the investigation of normal real-life experience in controlled quantitative experiments. He states that exploring learners' experience and voice with the new technology is of critical importance in CALL, and he acknowledges mixed-methods research that is strengthened by an additional qualitative investigation over purely quantitative methods, such as through open-ended questions.

Furthermore, the approaches of the studies were also identified according to the classification given by Ary et al. (2010). Figure 2 shows that the majority of the quantitative studies were experimental/quasi-experimental with observable benefits of technology-enhanced over traditional classrooms. Moreover, the dominant quantitative experimental aspect of mixed-methods studies that follow the design of "QUAN + Qual" given by Dörnyei (2007, p. 172) reveals researchers' preference for quantifying the results of CALL studies. As shown in Figure 3, only a few publications studied CALL qualitatively mainly through case studies and content analysis.

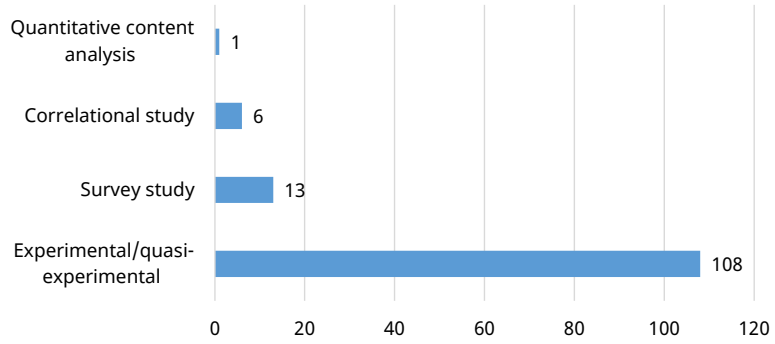

Figure 2. Quantitative approaches in Iran-based CALL publications

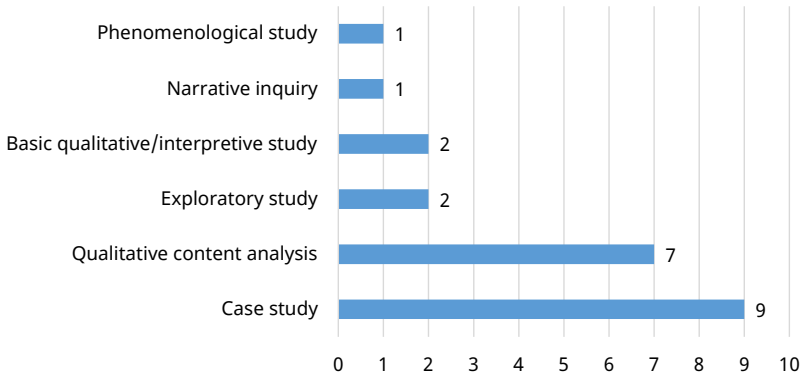

Figure 3. Qualitative approaches in Iran-based CALL publications

RQ3. What are the dominant participant characteristics, research settings, and study duration in Iran-based CALL publications?

Participant characteristics. One of the important sections of methodology is the given information about the participants of the studies. The participant sections of the studies were analyzed carefully and the findings revealed that the majority of the studies investigated language learners as their main participants. Overall, language learners (N=197), teachers (N=43), CALL EFL experts (N=1), directors of the ministry of education (N=1), and textbook writers (N=1) were studied in the publications. Table 5 presents detailed information of the learners and teachers in the reviewed studies.

The number of participants in each study was carefully extracted and as shown in Table 5, they ranged between 1 and 1001 participants. This range resembles the different types and approaches of the studies that require a different number of participants. In terms of learners being the participants, studies with 60 learners were the most frequent, while in terms of teachers as the participant, studies with 20 teachers were the most frequent. Regarding gender, as shown in Table 5, the majority of the publications studied both genders at once. It is believed that different genders learn differently from each other (Oxford & Nyikos, 1989). Moreover, some scholars claim that technology is gendered (Fallows, 2005), and the attitude of men is more positive than women toward the use of technology, especially in technologically advancing countries (Hilbert, 2011). Accordingly, gender has been a controlled variable in both studies related to learners and teachers. In addition, the findings show that the majority of learners were at the intermediate level, and although language learning is the target of CALL, numerous studies (N=79) have not provided any reports of the participants' proficiency level. The most common age range for participants was between 20 and 29, presumably due to the context of the studies which are mainly at universities (represented in the next section).

When teachers have been the participants of the studies, teaching experience was reported instead of age, though in several studies neither age nor teaching experience was reported. Gotbonton (2008) argues that teachers in the training stage with little experience (i.e., less than two years) are considered

Table 5. Participant characteristics in Iran-based CALL publications

	Language learners		Teachers/instructors	
Number of studies	197		43	
Number of participants	Minimum	2	1	
	Maximum	1001	427	
	Mean	92	91	
	Mode	60	20	
Gender	Male	14	0	
	Female	33	5	
	Male & female	116	26	
	Not specified	34	12	
English language proficiency level	Elementary	17		
	Intermediate	102		
	Advanced	14		
	Multi-level	17		
	Not specified	78		
Age/teaching experience	10–19	45	Novice	3
	20–29	102	Experienced	21
	30–39	12	Not specified	19
	Not specified	38		
Major	English language	31		9
	Human science excluding English majors	13		4
	Basic sciences and Engineering	12		3
	Medical science	9		2
	Computer science	4		
Computer literacy	Questionnaire/test	7		9
	Participants' self-report	4		2
	Prior/within-course training	24		6

novice, and the ones with nearly four, five or more years of experience are called experienced teachers. The teaching experience was classified according to Gotbonton's (2008) criteria. However, it should be noted that the years of experience may not reflect the teaching expertise of the teachers (Tsui, 2003). Considering the major of the participants, mainly in the context of the university, the English language was the most studied major. More importantly, as shown in Table 5, just very few studies (N=20) indicated computer literacy and the participants' background with technology. As stated by Felix (2005), in several CALL studies the essential information about the design of the study such as participants' background with technology is missing. Hubbard (2005) emphasized that the participants of CALL studies are usually novice computer users, therefore, the studies were reviewed in terms of any specific prior/within course training. The findings resembled that only 30 studies provided

the participants with specific technological training related to the treatment of the study, such as training on using WebQuest, Google Drive, and Moodle, etc.

Research setting. Since the majority of CALL researchers are faculty members or students at university, higher education contexts become the central targets of the studies (Elaish et al., 2017; Hwang & Fu, 2018), and schools and young learners remain untouched or rarely explored. As demonstrated in Figure 4, Iran-based CALL publications also centered on the context of university and language institutes. The poor ELT education at Iranian schools has brought language institutes to the center of attention, and they have become very popular among Iranian language learners (Jahanban-Isfahlan et al., 2017; Zandian, 2015). More importantly, the analysis of the environmental context in the reviewed publications signifies that formal traditional face-to-face learning, a type of learning offered by educational institutions with identified objectives and assessments (Benson, 2011; Stevens & Shield, 2010), is the preferred learning mode by CALL researchers (Figure 5). It was interesting that only 19 studies were conducted in formal online classes through online classroom platforms. Nevertheless, technology can assist the optimization of learning both inside and outside the classroom (Chapelle, 2010; Fathali & Okada, 2018), yet, the focus has not well-shifted toward non-formal/informal language learning beyond the classroom at the international level (Trinder, 2017) as well as in CALL research in Iran. The distinction between non-formal and informal learning is so subtle that the two terms are frequently used interchangeably (Jin, 2015). However, Stevens and Shield (2010) distinguish the two according to learning objectives and intention, in which non-formal learning usually follows specific objectives and is intentional while informal learning might be intentional or unintentional with no identified objectives. As demonstrated in Figure 5, since the two terms were not clearly distinguished in the reviewed papers, they are grouped together in the present analysis.

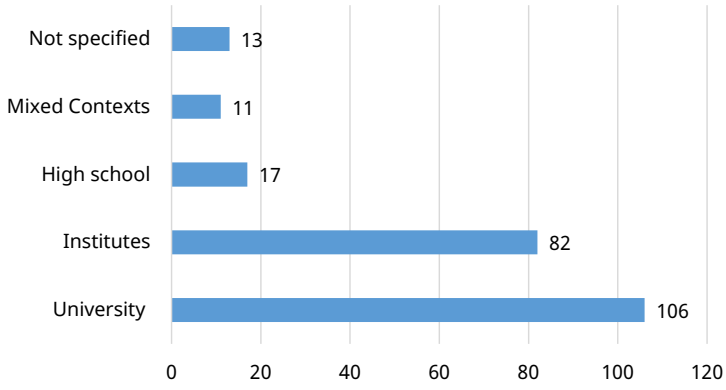

Figure 4. Research setting in Iran-based CALL publications

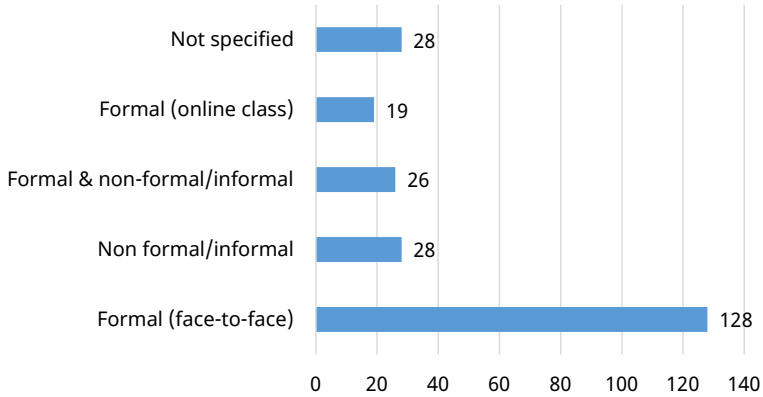

Figure 5. Environmental context in Iran-based CALL publications

Task/treatment duration. The review of the publications with regard to the task/treatment duration revealed that CALL researchers used various units to explain the study duration, or as named by Hubbard (2005), "time on task" (p. 356). In many studies, the researchers identified the duration of the task/treatment in the unit of a session, while in a few studies weeks, months, semesters, and years were also identifiers of time (Table 6). The range for each unit is also presented in Table 6 to indicate the least and most frequent treatment durations. For each unit, the mode is also reported to specify the highest occurrence of units in that data set. According to Table 6, for instance, 123 studies reported the duration of the task/treatment in their study using the term "session", and the sessions ranged between 2 to 48 sessions among which studies with 12 sessions were the most common. In addition to the number of the studies that did not specify any task/treatment duration, the number of non-experimental or informal studies with no certain task/treatment is also reported in Table 6. Overall, there is no consistent unit or clear explanation for the task/treatment duration in the reviewed studies. It might be easy to estimate the duration of the task/treatment when the unit of time is a session. Even though sometimes there is no clear definition for a session, in many studies it was referred to as a classroom session which resembles a typical session within 90 to 120 minutes. However, for instance, it is not easy to calculate the exact duration when it is reported in weeks with no indication of how many hours/sessions are held per week. Oskoz and Smith (2018) highlighted the absence of a clear research design and insufficient data about the duration of the treatment in CALL publications. Moreover, there are not enough longitudinal studies reflecting naturalistic language learning using a specific technology.

Table 6. Task/treatment duration in Iran-based CALL publications

Unit	N. of study	Range of unit	Mode of unit
Session	123	2–48	12
Week	19	2–13	4 & 7
Month	11	1–6	2
Semester	7	1	1
Academic year	1	1	1
No duration required	51		
Not specified	17		

RQ4. What are the dominant measurement instruments, data collection methods, data analysis methods, and device types in Iran-based CALL publications?

Measurement instruments/ data collection methods. The publications were reviewed for the types of measuring instruments (quantitative studies) and data collection methods (qualitative studies). According to Ary et al. (2008), the measurement instruments for quantitative studies included achievement tests (i.e., standardized tests and teacher-made tests), aptitude tests, scales, and direct quantitative observations (i.e., checklists, rating scales, and coding systems). Moreover, for qualitative studies, the data collection methods included interviews (e.g., structured, semi-structured, or focus group), document or artifact analysis (e.g., physical, visual, or written materials), and qualitative observations (e.g., narratives or field notes). In line with the higher number of quantitative studies, the analysis of the instrumentation sections revealed the vast use of achievement tests and questionnaires/scales in the studies (Table 7). Figure 6 represents the highly used standardized tests in quantitative/mixed-methods studies. These are world-famous standardized tests that, as highlighted by the authors, were mainly purchased by language institutions or educational organizations rather than through individual accounts. In addition to the tests, questionnaires/scales were vastly used in quantitative/mixed-methods studies (Figure 7). Consistent with the purposes of the studies, the highly used questionnaires were affective scales (i.e., attitude, perception, anxiety, willingness, etc.). As Levy (2015) emphasized, the importance of one's attitude toward a task in CALL and its effect on the final achievement cannot be easily ignored and it should be considered a required stage of the research.

Table 7. Measurement instruments/data collection methods in Iran-based CALL publications

	Instrumentations	Frequency
Measurement instruments	Achievement tests (Standardized tests: 162; Teacher-made tests: 75)	237
	Questionnaires/ scales	120
Data collection methods	Interviews	83
	Document or artifact analysis (Journals, memos, narrations: 14) (Written interaction and dialogues: 9) (Assignment/written performance: 4) (Texts:3)	30
	Observations (Field notes: 7)	26

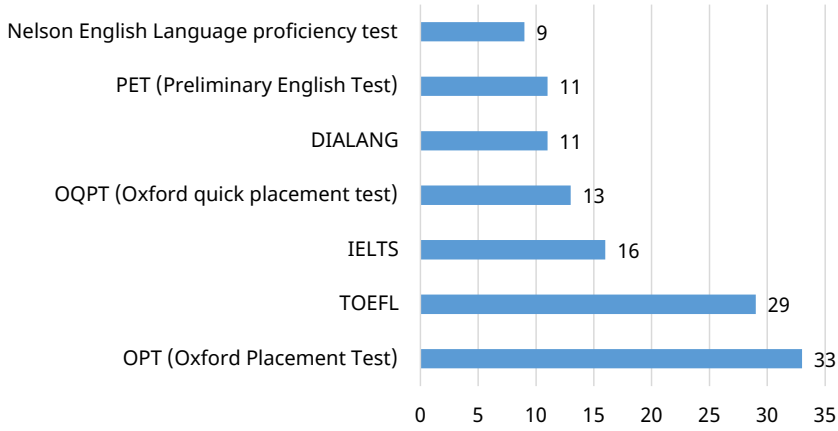

Figure 6. Achievement tests in Iran-based CALL publications

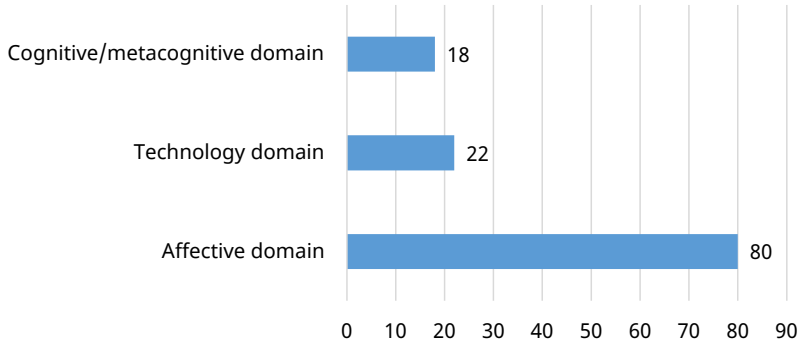

Figure 7. Domain-based questionnaires/scales used in Iran-based CALL publications

Data analysis methods. In line with the higher number of quantitative publications, quantitative methods of analysis were more common in the studies (Table 8). Tests of variance (i.e., ANOVA, ANCOVA, MANOVA, RAMOVA, and Levene's Test of Homogeneity of Variances) and T-tests were highly prevalent in several studies. Hubbard (2009) believed that early CALL compared and

contrasted technology-enhanced with traditional language learning through basic empirical quantitative studies. As shown in Table 8, the quantitative data analysis, mainly using comparisons of the means, is an indicator of the fact that the early quantitative approach to CALL dominates CALL publications in Iran.

Table 8. Measurement instruments/data collection methods in Iran-based CALL publications

Data analysis method	N. of studies
Test of Variance: (ANOVA: 65; ANCOVA: 11; MANOVA: 11; RAMOVA: 13; Levene's Test of Homogeneity of Variances: 10)	109
T-test	100
Coding	80
Post hoc	28
Correlation analysis	21
Mann-Whitney U test	14
Factor analysis	12
Kolmogorov-Smirnov test (One-Sample)	9
Kruskal–Wallis test	7
Shapiro-Wilk test	6

Device types. Regarding the device types used in the reviewed publications, it was found that several studies (N=141) were designed device-free, meaning that different sorts of devices (i.e. portable and non-portable) could be implemented to accomplish the objectives of the study. Therefore, the researchers had not identified any specific devices to be used in their studies. For instance, in a study focusing on collaborative writing through Wikis, the researchers had not specified if the participants used desktop PCs, laptops, mobile phones, etc. On the other hand, the device type was an important issue in some other studies in which using a specific type of device was an inevitable requirement (Figure 8). As presented in Figure 8, most of the studies were conducted in formal teaching environments such as CALL classrooms or multimedia laboratories with the use of desktop PCs. Among the portable devices, only mobile phones are used which might be attributed to their easier access and affordable price (Fathali, Marandi, & Okada, 2022).

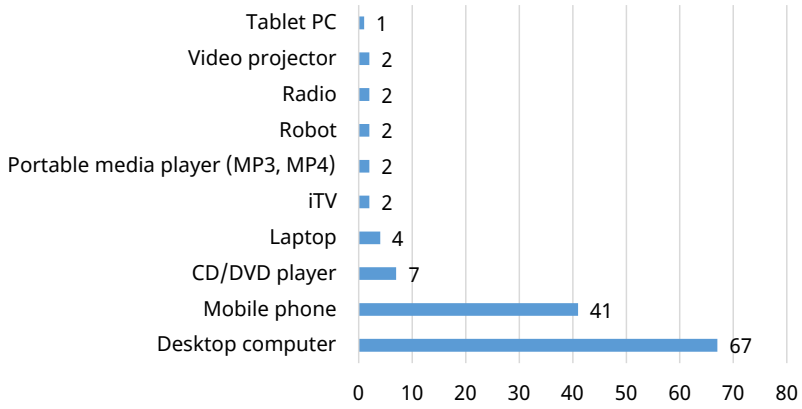

Figure 8. Device types in Iran-based CALL publications

Conclusion and implications

This study attempted to systematically review CALL publications in Iran from 2007 to 2020 published in two leading databases of WoS and Scopus. Previously, Fathali and Emadi (2021) provided an integrative review of CALL in Iran from its emergence in 2007 to 2019 in all databases. The findings resembled that CALL is still an emerging discipline in Iran with an unsteady trend. Lack of appropriate national CALL journals, centralization of CALL mainly in the capital city, and some weaknesses in the research methodology of the publications were noteworthy issues. Accordingly, the present systematic review tried to delve more deeply into the CALL publications with a specific focus on the main components of a research paper including purpose, outcome, and research methodology.

The classification of the purpose and outcome of the studies into linguistic, affective, technology, and cognitive/metacognitive domain indicated that the majority of the studies implemented technology at the service of language learning with major attention to the linguistic domain. According to Stickler and Hampel (2015), CALL as an interdisciplinary area of study encompasses computer sciences, linguistics, applied linguistics, social sciences, and education. Therefore, depending on the research purpose and the questions of a study, the focus might shift between the above-mentioned disciplines. Considering the findings of the present study, it can be concluded that applied linguistics can be considered as the first dominant aspect in Iran-based CALL. Moreover, in line with the importance of students' attitudes in CALL (Levy, 2015), a large number of studies devoted themselves to the investigation of the affective domain, resembling social sciences and education as the second dominant aspect of CALL in Iran. Overall, the analysis of the outcomes of the studies also showed the positive effect of technology on linguistic and affective domains. Additionally, the findings indicated that cognition and metacognition as aspects of the language learning process have not been the focus of analysis and measurement in CALL publications in Iran.

More importantly, the major findings of the study center on the research

methodology of the publications. Similar to the international CALL (Oskoz & Smith, 2018), publications in Iran mainly lack sufficient data about participants' characteristics (almost nothing about computer literacy), context, duration of treatment, and tasks/activities. Therefore, future CALL researchers need to inquire more about participants' demographic information, especially their technological background, as well as provide more detailed information about the experimental treatments of the studies.

The results also highlighted a noticeable absence of longitudinal studies in more natural settings employing qualitative methods that resemble actual learning rather than pre-defined short experimental quantitative studies. A large number of the studies have been mostly conducted in formal teaching environments such as language classrooms with the use of desktop computers. As stated by Chen et al. (2021), mobile devices could help to "bridge formal and informal settings in CALL" (p. 166). Accordingly, future CALL publications in Iran need to step away from formal preset experimental settings to more real-life natural settings and examine the long-term usage of mobile technology for language learning. In addition, although the use of mobile devices for language learning is not only limited to mobile phones, similar to the international CALL (Burston, 2015), most MALL studies in Iran have relied only on the portability of mobile phones rather than other portable devices. Consequently, there should be future attempts to make use of other potential portable devices in CALL. Contrary to the aforementioned shortcomings, it should be emphasized that nearly all the CALL publications in Iran provided sufficient explanation about the measurement instruments/data collection methods, data analysis methods, and the implemented devices.

Altogether, it is hoped that the findings of the present study would bring changes to the present status of CALL in Iran and help overcome the current shortcomings. It is also hoped that the present study would stimulate other CALL researchers worldwide to investigate CALL more deeply and systematically in different countries, especially where CALL is still emerging rather than established.

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