

RESEARCH METHOD TREND OF TECHNOLOGY USED IN ENGLISH TEACHING AND LEARNING: 30 YEARS OF PUBLICATION IN COMPUTER ASSISTED LANGUAGE JOURNAL

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Abstract

This research examines the scholarly literature on technology-based language learning published in the Computer Assisted Language Learning journal-one of the key journals in the field from 1990 to 2019. The researcher randomly selected 30 articles from 257 articles found in this journal during a thirty-year period (one article each year) to analyze the research method trends and the learner types focused in those studies. Results showed that mixed-method research has been more popular in recent years, and this may help academics better understand the connections between classroom environments and technology-enhanced language acquisition. For quantitative analysis, tests and Liker-scale questionnaires are the most used instruments, whereas interviews are the most common approach for qualitative analysis in mixed-method publications. Additionally, when it came to learning levels, researchers focused their attention on college and university students, but they paid no attention to pre-schoolers.

Keywords: learner types, mixed-method, research method trends, university student

1. Introduction

How languages are taught and learned has been altered and supported by the developments of computer and multimedia technologies (Hwang, Tsai, & Yang, 2008) and there have been a number of significant reviews on this topic. In 2014, Golonka et al. conducted a representative review which provided a summary of various types of technologies used for language learning between 1996 and 2010 (Golonka, Bowles, Frank, Richardson, & Freynik, 2014). It is worth noting that 1996 was considered as the start of the growing use of educational technology in language instruction. In this study, Golonka et al. claimed that technology fostered learning motivation of language learners, their language knowledge, and skills. Moreover, according to this study, the enrichment of language input resources and peer feedback encouragement were also beneficial from technology.

Appropriate types of technology for higher education were suggested by Kirkwood and Price (2014) in another technology review article. In this research, they reviewed 47 articles between 2005 and 2010 and discovered that rich learning materials, students' high participation, in-depth knowledge understanding, and peer reflection were all advantages of technology-assisted education (Kirkwood & Price, 2014). They also found that technology could support learning as it was able to replicate and support existing instruction strategies.

Shadiev and Yang (2020) reviewed 398 studies from Social Science Citation Index (SSCI) journals between 2014 and 2019 to investigate the changes in the use of technology in different timeframes. This study tried to help instructors and learners select and apply technology in educational contexts.

Robots, voice recording, online videos, wearable technology equipment and e-books were found to be promising future educational technologies. Besides, researchers identified 23 types of technology that had been used for the enhancement of learning English and Chinese – the two most popular target learning languages. Also the most frequently skills which drew much more attention from researchers were writing, vocabulary, and speaking.

Improving students' collaborative learning through technologies has been an interesting research topic for many scholars. For example, from 2004 to 2011, Hsu and Ching (2013) reviewed 9 papers about collaborative learning supported by mobile technologies. They found that mobile-supported collaborative learning could help K2 and higher education students understand the concepts, apply them and solve problems in many different fields such as language learning, math and nursing. Results also showed that mobile-supported collaborative learning activities increased student-teacher interaction, mutual feedback as well as students' motivation and engagement. Another review publication related to mobile-assisted collaborative language learning was conducted by Kukulka-Hulme and Viberg (2018). They collected 33 studies on the collaboration of language learning supported by mobile technologies which were published between 2012 and 2016. They found that there were 3 purposes of mobile-supported collaborative language learning. The first one was collaboration and peer assistance maximization while the second one was timely feedback, personalization and self-evaluation encouragement. The third purpose was to allow language teachers to quickly collect learners' improvement of language. In addition, collaborative language learning activities supported by mobile technologies positively affected students' motivation, engagement and enjoyment. Su and Zou (2020) collected 40 papers in the field up till 2019 to examine the impacts of technology-based and collaborative language learning activities on students' learning motivation and language development. Results showed that those articles were based on 10 theoretical frameworks including social constructivism, sociocultural theory, communicative language learning, incidental vocabulary learning, framing, process approach, asynchronous learning, collaborative autonomous language learning, reasoning and self-regulated learning. In addition, they found several types of technologies such as social media-based collaborative learning systems, project-based collaborative learning systems, cloud-based collaborative writing systems, etc. Moreover, eleven benefits of using technology to improve collaborative language learning were observed from this study such as language skills (listening, speaking, reading and writing), negotiation skills, vocabulary learning, sentence building, collaborative behaviors, positive attitudes and motivation, reasoning and problem-solving abilities, and practical suggestions for future application of technology-assisted collaborative language learning (Su & Zou, 2020).

Hwang and Fu (2019) collected 93 articles between 2007 and 2016 on language learning assisted by mobile technology in SCCI journals to investigate the methodology of research, research focus, types of learners and language as well as the outcomes of learning process. They found that English was the most popular target language. Also, in the first 5 years, 2007-2011, learners' individual language skills were the main focus in those papers, while in the later 5 years, delivering multiple language skills in authentic environments has been taken more into considerations by researchers. In terms of research methods, results showed that mixed methods, as well as longer time of the treatments, were found in many recent studies. In addition, in most of the articles between 2007 and 2016, mobile learning had positive effects on learners' speaking, writing, vocabulary and pronunciation.

However, there were several limitations in these review articles. Firstly, they focused on too specific or too general topics. For example, Hsu and Ching (2013), Kukulka-Hulme and Viberg (2018), Hwang and Fu (2019) only discussed mobile-assisted language learning, and Su and Zou (2020) focused on technology-enhanced collaborative language learning, while Kirkwood and Price (2014) reviewed all technology in higher education. Time frame research is another limitation in some previous studies, which was not very updated, such as between 1996 and 2010 (Golonka et al., 2014), from 2004-2010 (Kirkwood & Price, 2014), or between 2007-2016 (Hwang & Fu, 2019). In addition, there was little discussion about the trends in research methods of technology-enhanced language instruction in previous review studies. Therefore, this present research was carried out to fill these gaps.

In this study, I tried to find out the trends of using technologies to improve language education in articles collected from *Computer Assisted Language Learning (CALL)* journal – one of the core journals in technology-based language teaching and learning, namely the trends of research methodology, and learner types of these studies from 1990 to 2019. Research questions are as follows: 1-*What are the trends of research methods used in the CALL research from 1990 to 2019?*; and 2-*What are the learner types focused in these studies?*

This study therefore offers a comprehensive perspective on the topic of Computer-Assisted Language Learning, helping both novice CALL scholars situate themselves within the field and policy and decision makers assess the existing and future scholarly activities in the area. Lastly, it accommodates the needs of experienced researchers who wish to concentrate on certain areas that have received less attention.

2. Methodology

2.1 Data collection

It is recommended that a 10-year literature review is an effective way to examine educational technology trends (Hwang & Tsai, 2011). Thus, in this study, the three ten-year-timeframe articles (from 1990 to 2019) were collected from *Computer Assisted Language Learning* journal. The searching keywords were: “technology”, “Language teaching and learning” and the time range setting was between 1990 and 2019. Two inclusion criteria were that the research must apply “technology” into teaching and learning English. Review papers, papers that didn’t use technology and papers that didn’t investigate teaching and learning English were not selected. 257 articles among 638 papers were found when applying these inclusion and exclusion criteria. Then 30 articles were randomly selected from those 257 articles (one article each year).

2.2 Coding scheme

The coding scheme of this study was categorized into 2 main aspects: **research methods** and **learner types**. For **research methods**, 2 coding items were employed, which were *Types of Research Methods* and *Duration of Investigation*. There were 4 sub-items that belonged to the coding item *Types of research methods*, including qualitative method, quantitative method, mixed method and other, which refers to pure system design or development. According to Creswell and Creswell (2017), research collecting data only in text, audio visual or image forms was qualitative research, while for quantitative research, data was transformed into numbers and analyzed statistically. Mixed methods research, therefore, included both statistical and text analysis. The characteristics of these three types of research methods were summarized in **Table 1** below. Qualitative research, as described by Payne and Williams (2005), tends to focus on providing explanations rather than making generalizations. It achieves this by unraveling the various meanings associated with a certain social construct. Nevertheless, qualitative research faces criticism in three specific areas. There are three main limitations of qualitative research. Firstly, small samples do not allow for generalization or replication. Secondly, researcher bias can influence the interpretation of raw data based on their own predispositions. Lastly, in extreme cases, qualitative research can lead to idiosyncratic theory building, where one theory only applies to one specific issue, case, or individual. In contrast to qualitative method, which is employed when there is a lack of information or uncertainty regarding a phenomenon (Cronholm, 2011), quantitative method mostly aims to confirm theories or hypotheses by determining cause and effect or the variables’ relationships (Creswell, 2017). While numerical data is the main focus of quantitative approaches, the vast majority of social phenomena (including health, organizational performance, and education) do not naturally produce numerical data (Muijs, 2010). Additionally, quantitative researchers miss more by looking at the phenomenon as outsiders compared to qualitative researchers who become part of the research process (Mays and Pope, 1995), despite quantitative research being more rigorous due to the relative ease of checking validity, reliability, and generalizability of results (Stenbacka, 2001). The third type of research method is mixed-method which incorporates qualitative and quantitative techniques into a single study (Driscoll et al., 2007). Mixed-method research often yields more robust findings

compared to only using qualitative or quantitative data collecting and analysis approaches (Shah and Corley, 2006; Driscoll et al., 2007). The reason for this is that the majority of social issues cannot be directly quantified or correctly assessed using direct variables or by using either a quantitative or qualitative research methodology.

Duration of Investigation included 4 sub-coding items, which were short term (less than 11 weeks), intermediate term (between 11 weeks and 4 months), long term (more than 4 months), and not specified.

TABLE 1. Characteristics of quantitative, qualitative and mixed methods

Quantitative Methods	Qualitative Methods	Mixed Methods
-Pre-determined	-Emerging methods	-Both pre-determined and emerging methods
-Instrument-based questions	-Open-ended questions	-Both open- and closed-ended questions
-Performance, attitude, observational, and census data	-Interview, observation, document, and audio-visual data	-Multiple forms of data drawing on possibilities
-Statistical analyses	-Text and image analyses	-Statistical and text analyses
-Statistical interpretation	-Themes, patterns interpretation	-Across databases interpretation

Regarding **learner types**, it includes *learners' nationalities*, *sample size* and *learners' education levels*. In this study, there were sixteen content items: Taiwan, Japan, Hongkong, China, Korea, Malaysia, Thailand, Saudi Arabia, Jordan, Germany, France, Spain, Turkey, Norway, Italy and Denmark in the coding scheme regarding learners' nationalities. For *sample size*, this study employed the characteristic of sample size suggested by Hwang and Fu (2019). According to Hwang and Fu, the sample size was small if there were less than 30 participants, medium if the number of participants were among 30-50, medium to large (from 51 to 100 participants), and large (more than 100 participants). For *learner's education levels*, there were 5 sub-coding items, including preschool, elementary-, secondary-, & higher-education, graduate school. and not specified.

3. Results and discussion

3.1 Types of Research Methods and Durations of Investigation between 1990 and 2019

This part presents the research design trends relating to types of research methods and durations of the investigation.

As illustrated in **Figure 1**, overall, there was a decreasing trend in the adoption of other method throughout the three time-frame period, while an increasing trend was observed in quantitative and mixed method. Qualitative method seemed to be stable between 1990 and 2019. This can be explained by the fact that researchers changed from pure technology-enhanced systems design to investigate the effects of those systems on English instruction and paid more attention to the teaching context, description and explanation of technology-enhanced English learning and teaching.

To be more detailed, in the first time-frame period (1990-1999), the most common research method used in technology-enhanced English teaching and learning was the other method, which referred to pure system design or development. This type of method accounted for 80% of the total articles collected. Quantitative method and qualitative method were in the next place with 10% for each. In the second time frame (2000-2009), there was a substantial decrease in the application of other method compared to the first (from 80% to 20%), while the use of quantitative, qualitative and mixed methods increased by 10% each. Also, there was a large increase in the adoption of mixed method, up to 40%. In the third period of time frame, quantitative and mixed method were observed to be the most common types of method used in the articles collected, which accounted for 40% and 50% respectively. On the other hand, qualitative method accounted for a small percentage of the total (10%), while other method was no longer used in this period.

The increasing number of research using mixed-method suggests that researchers have been trying to more deeply investigate the interrelationship between teaching contexts and technology-enhanced language learning activities, which cannot be done by quantitative method only.

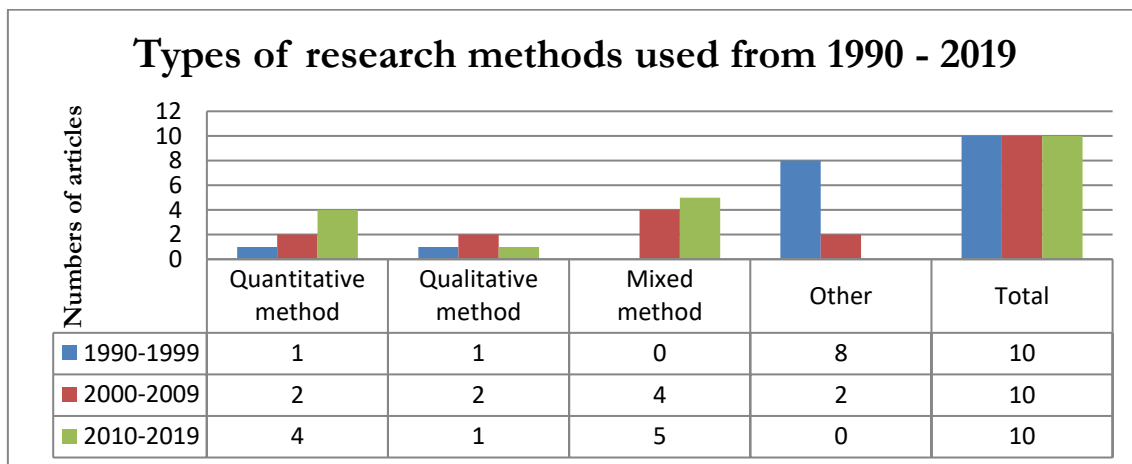


Figure 1. Types of research methods used in three time-frame period: 1990-1999, 2000-2009 and 2010-2019

Regarding the duration of investigations, there was an increasing trend for those studies carried out in short term (less than 11 weeks) and intermediate term (11 weeks to 4 months), while a decreasing trend was observed in those which didn't mention the time of investigation. On the other hand, there was a fluctuation in the number of articles having long term treatment durations (more than 4 months). Specifically, most of the studies in the period of 1990-1999 (9 out of 10 articles) didn't specify the duration of the investigation since they were mostly just system design or development of technology used to enhance language learning. This number decreased by 3 times in the second period (3 out of 10 articles) and went back to 0 in the third period. This was the result of the decrease in using of "other method" through the three time frames.

For articles having short term treatment durations, the numbers increased from 0 to 2 and 4 articles in the first, second, and third time-frame period respectively. Articles carried out in intermediate term had a similar trend as there was an increase from 1 article in the first period to 4 articles in the third period. However, for long term treatment duration articles, the number of articles increased from 0 in the first period to 4 articles in the second one and went back to 2 articles in the third period.

The fact that long-term treatment durations have increased since the second period (2000-2009) implies that the nature of language acquisition, which needs longer time to explore the impacts of technology on the language improvement of learners.

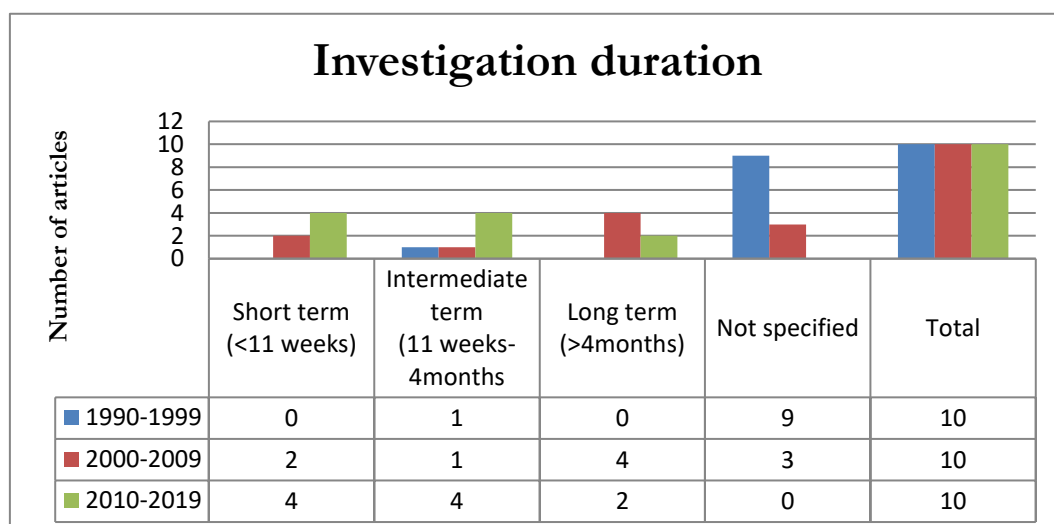


Figure 2. Investigation duration in three time-frame period: 1990-1999, 2000-2009 and 2010-2019

3.2 Mixed methods used in papers from 2000-2019

In this session, nine articles using mixed-method were explored in detail. As illustrated in Table 1, most research using mixed method between 2000 and 2019 dealt with students' attitudes towards technology-enhanced language learning activities. Tests and questionnaires were found to be the main quantitative analysis tools in those papers. However, most of qualitative methods used in those papers were based mainly on interviews, so in future research, to understand more thoroughly technology-enhanced language instruction activities, other qualitative methods such as observation, text analysis, etc. should be taken into consideration.

TABLE 2. Articles using mixed-method from 2000-2019

No.	Year	Authors	Research title	Mixed-method research instruments	Research focus
1	2002	Trinder, R.	Multimedia in the Business English Classroom: The Learners' Point of View	-Lesson monitor sheets; -Observation; -Likert scale questionnaire	Students' reactions and comments during and after a semester-long use of a CD-ROM
2	2004	Torii-Williams, E.	Incorporating the Use of E-mail into a Language Program	-email letters analysis; -class notes analysis; -Likert scale questionnaire; -open-ended questionnaire	Students' learning motivation and student's learning improvement thanks to the use of e-mail in the target language
3	2007	Son, J. B.	Learner experiences in web-based language learning	-questionnaire (open-ended and likert-scale questions) -observation -interview	Students' perception and attitudes towards web activities
4	2008	Murday, K. et al.	Learners' and teachers' perspectives on language online	-surveys -interviews -test (grammar, vocabulary, oral and written)	Students' and instructor's satisfaction with the language online courses
5	2011	Nah, K. C.	Optimising the use of wireless application protocol (WAP) sites for listening activities in a Korean English as a foreign language (EFL) context	-questionnaire surveys; -interviews	-Barriers discouraging EFL learners from using internet; -students' attitudes
6	2013	Wang, Y. J. et al.	Exploring the impact of using automated writing evaluation in English as a foreign language university students' writing	-semi-structured interviews; -pre and post writing test	Students' writing performance
7	2014	Hwang, W. Y. et al.	Improving English as a foreign language writing in elementary schools using mobile devices in familiar situational contexts	-writing pre and post test; -Likert scale questionnaire -interviews	-Students' writing performance; -students' perception
8	2015	Hwang, W. Y. et al.	Evaluating listening and speaking skills in a mobile game-based learning environment with situational contexts	-speaking & listening pre and post tests; -questionnaire survey; -semi-structured interviews	-Students' listening and speaking performance; -students' attitudes
9	2017	Tseng, J. J.	Exploring TPACK-SLA interface: insights from the computer-enhanced classroom	-lesson plans; -classroom observation; -interviews; -questionnaire survey	-students' perceptions; -teachers' knowledge

3.3 Learner types

This session presents the sample size, learners’ education levels and learners’ nationalities. Regarding sample size, as illustrated in Figure 3, there was only one study out of 30 articles collected using a large sample size from 1990-2019. Also, it should be noted that this paper was a survey study. In the first period (1990-1999), most studies didn’t mention sample size since they were just technology-enhanced system designs. In the second period (2000-2009), while studies without mentioning sample size decreased to 30%, there was an increase in the number of papers using small size and medium size samples by 20% and 40% respectively compared to the first period. In the third period, the medium sample size was observed to be the most dominant, which was adopted by 7 out of 10 articles in the period. Research using medium to large sample size was in the second place with 3 articles. The small number of participants in most of the studies reviewed may be a problem since it made those studies have low statistical power. According to Cook and Hatala (2015), generally, the sample size should be large enough to avoid the low precision of the research.

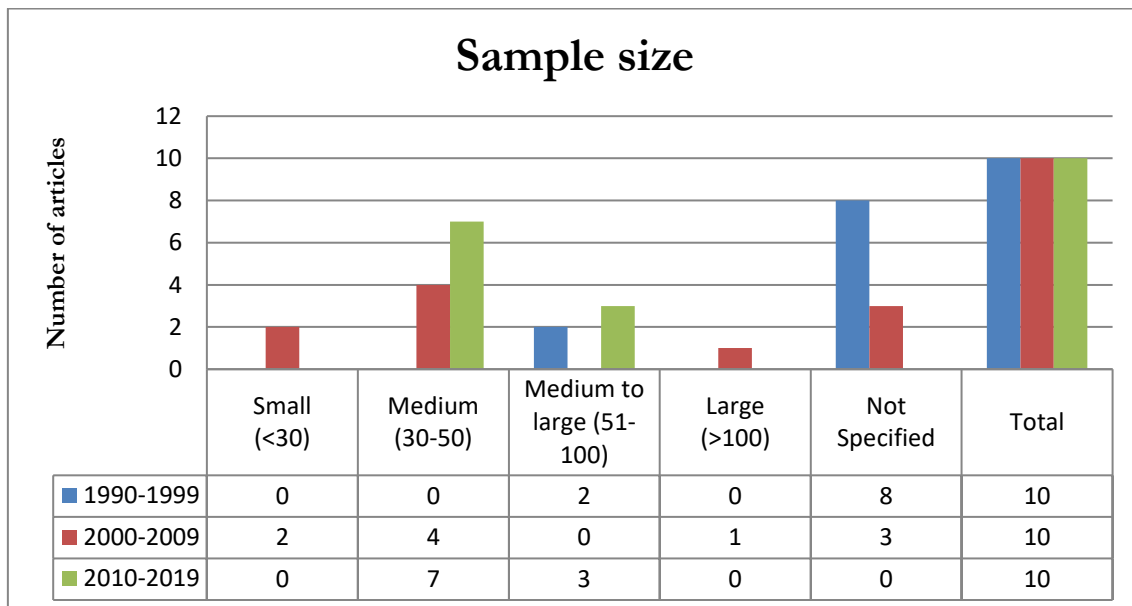


Figure 3. Sample size in three time-frame period: 1990-1999, 2000-2009 and 2010-2019

For learners’ education levels, Figure 4 shows that the most attention was paid to higher-education level students while few studies focused on elementary, secondary and graduate students. Additionally, pre-school students attracted no attention from researchers in 30 articles collected between 1990 and 2019. This is mainly because most of the researchers of technology-enhanced language learning coming from universities use university students as their research participants. Also, these students are generally able to learn through technology-based items or software much more easily than the younger students, so they attracted the most attention (Shadiev, Hwang, & Huang, 2017).

As for the growing trend, the attention to higher-education group has increased greatly since the second period (2000-2009) compared to the first one (1990-1999). On the other hand, the groups of elementary and secondary education just started to attract researchers’ attention in the third period (2010-2019). This implies that technology-enhanced language teaching and learning has been recently recognized and welcomed by a broader group of people including teachers, parents as well as their young children.

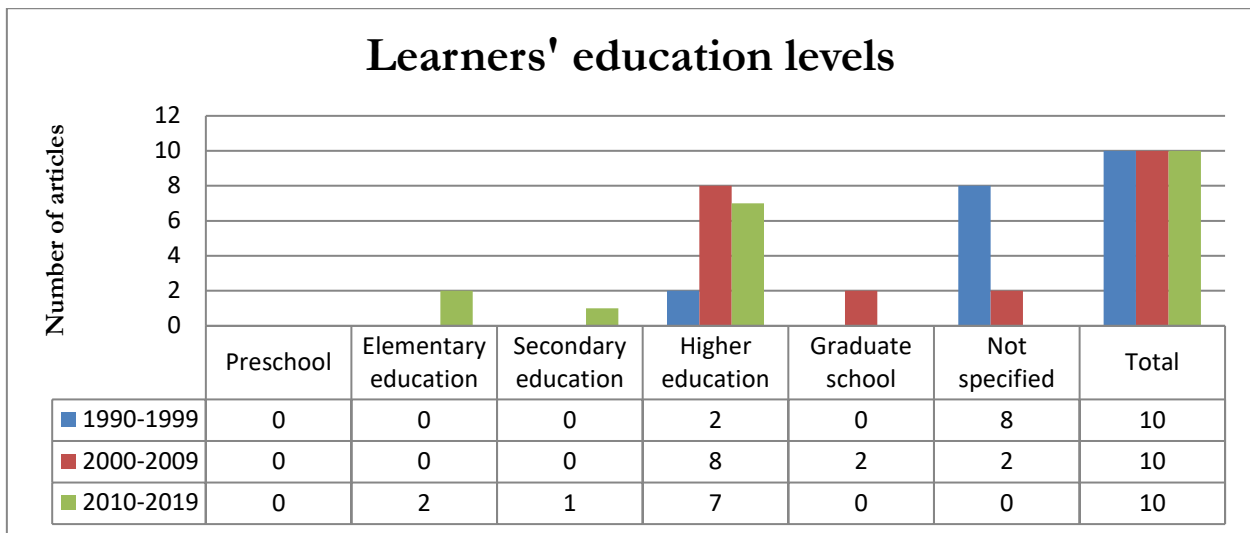


Figure 4. Learners' education levels

Learners' nationalities

Regarding learners' nationalities, Figure 5 shows that over two-third of the studies focused on Asian countries where English is taught as a foreign language. This result was consistent with the research conducted by Burston (2014).

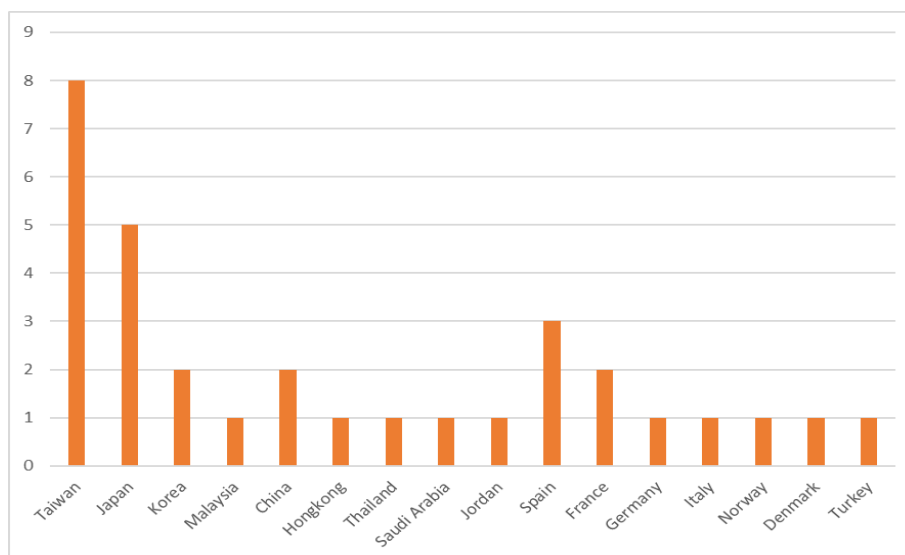


Figure 5. Learners' nationalities

4. Conclusion

Through the review of 30 articles (from 1990 to 2019) related to technology-enhanced language teaching and learning, it is found that the research method trend in recent years is mixed-method, which can help researchers better investigate and explain the interrelationship between teaching and learning contexts and technology language learning activities. Additionally, in those mixed-method papers, tests and Liker-scale questionnaire are the main tools for quantitative analysis, while interview is the dominant tool for qualitative analysis. Moreover, since the sample sizes in most of the studies reviewed were not large and most of them had short treatment durations, further studies should be conducted with bigger number of participants and longer time of treatment.

As this research was conducted based on only 30 publications selected in CALL journal, which is just a small-scale review, it may not be generalized. Therefore, to gain a wider view of technology-enhanced language learning studies, future research should take into account more articles collected from other SSCI journals and conference paper as well.

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