A Scientometric Review of Research Trends in the Application of Technology in English Language Teaching

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Abstract

The present study sought to review research trends in the application of technology in English language teaching (ELT), using a retrospective scientometric approach. Web of Science was used as the focal database to extract the data from the start point of this field (1996) to the present time. A document co-citation analysis method was used to detect the major research clusters in the dataset. The impact of each publication on the field was measured, using the burst index. In general, we identified seven major clusters in the field: EFL, English Language, ICT Integration, Technology-mediated Task-based Language Teaching, Self-efficacy, Language Learning-mail, and Teacher Cognition. The results showed that these clusters are the most important ones, on which the major authors of the field have focused. The analyses of research trends on technology in ELT can provide suggestions for the future development of research in the field and may be beneficial for the teachers, policy-makers, and curriculum developers

بررسی علم سنجی روندهای پژوهشی در کاربرد فناوری در آموزش زبان انگلیسی

پژوهش حاضر به دنبال بررسی روندهای پژوهشی در کاربرد فناوری در آموزش زبان انگلیسی (ELT)، با استفاده از رویکرد علم‌سنجی گذشته‌نگر بود. Web of Science به عنوان پایگاه داده کانونی برای استخراج داده ها از نقطه شروع این زمینه (1996) تا زمان حاضر استفاده شد. برای شناسایی خوشه‌های پژوهشی اصلی در مجموعه داده از روش تحلیل هم‌استنادی سند استفاده شد. تأثیر هر نشریه در این زمینه با استفاده از شاخص انفجار اندازه‌گیری شد. به طور کلی، ما هفت گروه اصلی را در این زمینه شناسایی کردیم: EFL، زبان انگلیسی، ادغام فناوری اطلاعات و ارتباطات، آموزش زبان مبتنی بر وظیفه با واسطه فناوری، خودکارآمدی، یادگیری زبان-پست و شناخت معلم. نتایج نشان داد که این خوشه‌ها مهمترین خوشه‌ها هستند که نویسندگان اصلی این رشته بر روی آنها تمرکز کرده‌اند. تجزیه و تحلیل روندهای تحقیقاتی در زمینه فناوری در زبان ELT می تواند پیشنهاداتی را برای توسعه تحقیقات آینده در این زمینه ارائه دهد و ممکن است برای معلمان، سیاست گذاران و توسعه دهندگان برنامه درسی مفید باشد.

واژگان کلیدی: گرایش های پژوهشی، علم سنجی، فناوری

Introduction

It is indisputable that we now live in a world, in which technology has emerged in each part of our lives. Technology is magnificently becoming substantial in both our professional and personal lives, and students are using technology more and more. Undoubtedly, the application of technology in the context of English language teaching (ELT) is not new. Actually, it has been around in ELT for many years. Tape language laboratories, recorders, and videos have been used since the 1960s and 1970s, and are still being used in classrooms all over the world. Emerged in the early 1980s, Computer-based materials in ELT, often referred to as Computer-assisted Language Learning (CALL), is an important branch of application of technology in ELT.

Aside from its labor and time, technology can present the idea of variety and convey new chances to people, linking them to new views and to people they otherwise might not have met. This growth in the accessibility of technology has caused an explosion of attention in its use in the language classroom. In order to be successful in learning technology, it must be incorporated into the curriculum (Stanley, 2013).

The major challenge regarding holding things fresh, particularly in teaching has been getting a hold of modern technology and becoming skilled at new technological items. There is continuing interest in the meta-analysis of previous studies on technology in language learning (Grgurović, Chapelle, & Shelley, 2013). A few review studies have yet addressed the application of technology in ELT.

Scientometrics

Scientometrics is a "branch of informatics that quantitatively analyses patterns in the scientific literature to understand emerging trends and the knowledge structure of a research field" (Chaomei Chen, Hu, Liu, & Tseng, 2012). Researchers frequently use "bibliometrics" and "Scientometrics" interchangeably (Yang, Yuan, & Dong, 2020). However, Scientometrics concentrates largely on the quantitative features of science, unlike bibliometrics which concentrates more on library and document science (Hood & Wilson, 2001). Numerous language teaching fields have been largely influenced by the wide-ranging applications of Scientometrics.

After analyzing research trends in applied linguistics, it was discovered that there were several changes in research scope and focus from 2005 to 2016 (Lei & Liu, 2019). Some broadly discussed subject topics in applied linguistics like identity, functional, and socio-cultural topics garnered a

noteworthy increase of interest among researchers. In contrast, there was a considerable fall in interest in other areas such as generative linguistics, grammatical, and phonological topics.

The findings of a study demonstrated that the number of publications on linguistics from Mainland China, Macau, Taiwan, and Hong Kong had significantly increased from 2003 to 2012 (Lei & Liao, 2017). In addition, Aryadoust (2020) performed a scientometric review of publications on reading comprehension, as well as identified multiple comprehension sub-skills like word-level reading, phonological awareness skills, linguistic comprehension, orthographic processing, and decoding competence (Aryadoust, 2020).

According to Jones (1997), Scientometrics can appear either in a normative or descriptive form (Jones, 1997). The normative approach highlights the existence of standards and rules of the discipline. It is theory-based (Liesch, Håkanson, McGaughey, Middleton, & Cretchley, 2011) and concentrates more on practical applications (Ivancheva, 2008). However, the descriptive approach pursues analyzing research activities connected to the subject of interest to recognize the discipline. The latter approach was used in the present review study because of its advantages (Serenko, Bontis, Booker, Sadeddin, & Hardie, 2010) compared with the normative approach. Firstly, unlike the normative approach which concentrates narrowly on individual investigations, the descriptive approach covers a broader extent as it comprehensively scrutinizes all subjects in a discipline (Sidorova, Evangelopoulos, Valacich, & Ramakrishnan, 2008). Besides, amid the ever-burgeoning growth of knowledge, it is helpful to sometimes stop to perform a retrospective review of the discipline to recognize its development and respond to critical questions like what topics have been investigated (Holsapple, 2008). The present study adopted the descriptive approach to generate a retrospective review of the discipline.

Literature Review

In the international communication context, the English language is of high importance. The students and teachers use various language skills, such as reading, speaking, listening, and writing to communicate (Grabe & Stoller, 2020).

The fruitful employment of educational technologies is largely governed by the attitudes of educators, who ultimately decide how they are used in the classroom. Bullock (2004) stated that teachers' attitudes are a main enabling or disabling aspect in the implementation of technology. Likewise, Kersaint et al. asserted that teachers with positive attitudes regarding technology feel more comfortable with using it and usually include it in their teaching (Kersaint, Horton, Stohl, &

Garofalo, 2003). Woodrow (1992) stated that any effective change in educational practice needs the progress of positive users' attitudes regarding the new technology (Woodrow, 1992).

The expansion of teachers' positive attitudes regarding CALL is a major factor not only in improving computer incorporation but also in avoiding teachers' resistance to computer use. Watson (1998) alerted against the severance of the innovation from the classroom teacher and the idea that the teacher is an empty vessel into which this externally defined innovation must be poured (Watson, 1998). Knezek and Christensen's (2002) analysis of some key cross-cultural studies finalized during the 1990s and associated with CALL in education implied that teachers progress in technology incorporation via a set of well-defined stages, which occasionally necessitates changes in attitude more so than skills (Knezek & Christensen, 2002).

Liu et al. (2003) conducted a review on CALL in the range of 1990 to 2000 (Liu, Moore, Graham, & Lee, 2002). Out of the 70 studies examined by Liu et al., 44 dealt with the efficiency of CALL in language teaching vs. traditional teaching, 15 dealt with the way of using CALL more efficiently, and 11 dealt with students' attitudes on how to use CALL. Even when we go through more current investigations, we learn that these three key areas remain the major focus for investigators, as we can see in two studies (Genç & Aydin, 2011) (Heift & Schulze, 2007).

However, a crucial component has been overlooked to a great degree in most investigations in spite of its significance in the classroom; the teachers. Teachers and lecturers are responsible for encompassing CALL in their classrooms, and as Sagarra and Zapata (2008) described, the success of CALL is connected with the abilities of those who supervise the course (Sagarra & Zapata, 2008).

As Ahmadi (2017) mentioned, in order to learn and teach a language, it is important to consider a method to facilitate the procedure of ELT (Ahmadi, 2017). Becker (2000), on the other hand, maintains that technology is a fundamental and signifying tool for teachers in language learning in classes (Becker, 2000). It aids both teachers and learners, yet teachers would be capable of using the technology in the teaching language. Teachers use different technologies with respect to providing the quality education. Bull & Ma (2001) maintain that using technology offers numerous kinds of resources to English language learners, particularly in the classrooms (Bull & Ma, 2001).

As Harmer (2007) stated, teachers should retain the knowledge of language teaching based on new methods, such as using technology, that enables them to increase their proficiency in language communications (Harmer, 2007).

İlter (2015) mentioned that the teachers could highlight and encourage the language learners to use suitable techniques to be successful language communicators, using computer technologies (İlter, 2015). Likewise, based on the findings of Clements & Sarama (2003), using technology can help learners and teachers in language learning classrooms (Clements & Sarama, 2003). Harmer (2007) stated that the use of technology-based ELT activities to develop collaborative language learning empowers them to use language in communication very proficiently (Harmer, 2007). The technology-based activities give language learners an appropriate and exact way of language learning in the language classroom.

Methodology

The Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) 2020 checklist, containing 27 items, was used in this review article. Four phases, including eligibility criteria, information sources, search strategy, and data collection process were considered in this study.

Eligibility Criteria Phase

Studies connected with the research question were covered in this study. Studies, which were included in this review, shed light on the application of technology in ELT. Though, surveys that were not linked to the stated area were left out of this review. Much emphasis was put on the findings to confirm that the research question was completely addressed and analyzed.

Information Sources Phase

To search for research studies related to technology in ELT, the Web of Science (WoS) database was used. WoS is a platform that offers multiple databases that present reference and citation data from conference proceedings, academic journals, and other documents in numerous academic disciplines.

Search Strategy Phase

The keywords "English Language Teaching" and "Technology" were searched in the titles, abstracts, and keywords of the articles. The period was set to all years to the present (1996-2022). Only articles were selected and the "AND" function was used to add multiple articles. The publications were from different areas of WoS.

Data collection process phase

By limiting the Web of Science Categories to "education Educational Research", "Linguistics", and "Language Linguistics", there were 1046 articles, which were completely related to the field of ELT.

A frequency analysis was conducted on the combined documents by years, sources, authors, affiliations, and countries extracted from WoS. Although data on the number of publications in 2022 are obtainable, they were inadequate since the data w generated in July 2022. Thus, the analysis of documents by year would focus on 1996 to 2021.
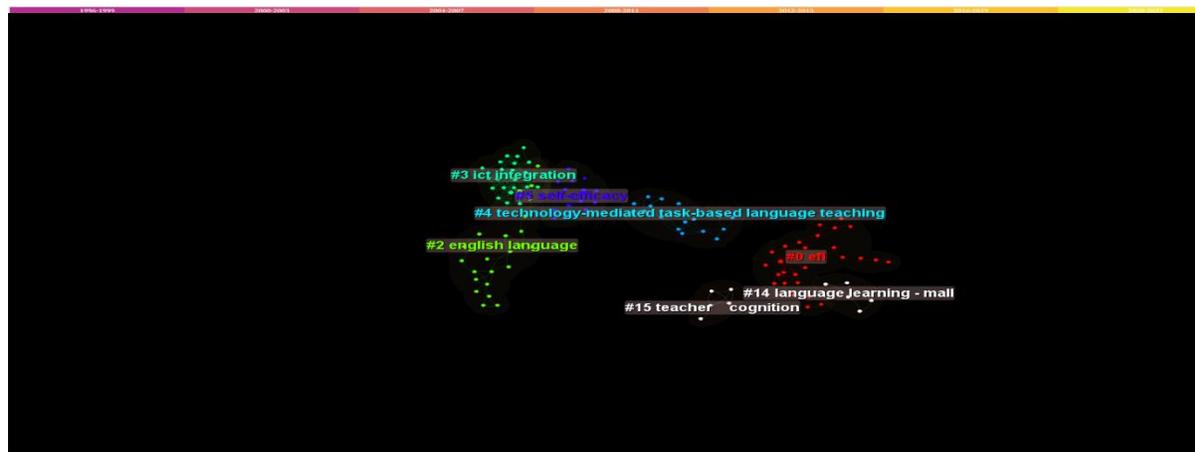
Results

Document Co-citation Analysis

As a refinement of the h-index, the g-index was considered as the selection criteria in *CiteSpace* with the scale factor k set to 25. The g-index is the biggest digit that is equal to the mean number of citations of the top g publications with the highest number of citations. It is a more suitable approach to choosing nodes from each period because, unlike the h-index, the g-index takes into account citations (Chen, 2016).

Figure 1

Major clusters detected in DCA

Log-likelihood rate (LLR) that was found to present reliable results in terms of unique labeling and sufficient coverage (Chen, 2014) was used to automatically extract the cluster labels. The content of each cluster was read to cross-validate the extracted label.

Figure 1 below shows the cluster view of 62 major clusters in technology in ELT and Figure 2 shows the timeline view by burstness from left (1996) to right (2021).

The timeline view shows clusters set chronologically on a horizontal timeline. *CiteSpace* identified 276 nodes and 567 links. The nodes present cited references and the links depict the connections or relationships between nodes. Co-citation links are represented by the lines that connect the nodes. The smaller the cluster number, the larger the size of the cluster.

Figure 2

Timeline view (by burstness) from left (1996) to right (2021)

The clusters from the largest to the smallest were #0 EFL, #2 English Language, #3 ICT Integration, #4 Technology-mediated Task-based Language Teaching, #5 Self-efficacy, #14 Language Learning-mall, and #15 Teacher Cognition.

There are no clusters labeled #1, #6 to #13, and #16 to #62 presented in the visualization network because these clusters are either too small or do not have any links with other clusters. Also, a burst was detected in a publication to show its importance in the field of application of technology in ELT. Table 1 below shows the top publication with the strongest document citation burst (the most co-cited and influential publication) extracted from *CiteSpace*.

Table 1

Top publication with the strongest document co-citation burstness

Author	Year	Burst Strength	Begin	End	Span
Golonka E	2014	4.31	2014	2019	5

Table 2 shows the top-ranked publications by citation counts. The top-ranked item by citation counts is Golonka E (2014) in Cluster #0, with citation counts of 13 (Golonka, Bowles, Frank, Richardson, & Freynik, 2014). The second one is Liu H (2017) in Cluster #3, with citation counts of 7. The third is Chun D (2016) in Cluster #2, with citation counts of 6. The 4th is Ziegler N (2016) in Cluster #4, with citation counts of 5. The 5th is Teo T (2018) in Cluster #3, with citation counts of 5. The 6th is Burston J (2015) in Cluster #4, with citation counts of 5. The 7th is Kessler G (2018) in Cluster #2, with citation counts of 5. The 8th is Duman G (2015) in Cluster #4, with citation counts of 5. The 9th is Huang F (2019) in Cluster #3, with citation counts of 5, and the 10th is Macintyre P (2020) in Cluster #3, with citation counts of 4.

Table 2

Top publications with the strongest citation count

Author	Year	Citation Counts	Cluster ID
Golonka E	2014	13	0
Liu H	2017	7	3
Chun D	2016	6	2
Ziegler N	2016	5	4
Teo T	2018	5	3
Burston J	2015	5	4
Kessler G	2018	5	2
Duman G	2015	5	4
Huang F	2019	5	3
Macintyre P	2020	4	3

Discussion

Just as technology, speedily changing English teachers must have creativity in yielding and innovating modern methods and techniques of teaching that expand using technology that fulfills students' needs in the current time. From traditional classes to new technology-based learning, technology has been a medium that maintains the education paradigm changes. ICT- interweaved

training has shown to be successful in increasing teachers' positive attitudes toward incorporating ICT in EFL contexts.

The present study had a scientometric view on the application of different forms of technology in the field of ELT. Technology has improved the teaching setting in the classroom more efficiently than in lecture-based classes. While the teachers could not use the technology more meritoriously than the IT experts, they must discover some practical methods of teaching language by applying the technology. Patel (2013) maintains that technology presents some alternatives for making teaching productive and pleasurable (Patel, 2013). Bennett et al. (2000) argue that the use of technology is a reason for advancing the teachers' teaching competency and learners' learning ability in the classroom (Bennett, Culp, Honey, Tally, & Spielvogel, 2000). Further, Bransford et al. (2000) state that the uses of technology empower the learners to make their global and local societies connected to them with people that increases opportunities for learning the language more proficiently. Yet, the positive effects of computers do not come automatically or suddenly. Therefore, it depends on the teachers that they use it during the learning language in the classes. Douglas and Hegelheimer (2007) recommended the application of technology in assessment language teaching such as authoring computer-based, developing, feedback, scoring, and validating (Douglas & Hegelheimer, 2007). Their research suggested computer-based assessment to make interesting automatic scoring, self-assessment tests, and more benefits to the test takers. Furthermore, they added that engaging technology in teaching language assessment like computers gave substantive choices and more precise results than conventional assessment. It is important to consider that technology-mediated task-based language teaching should be intertwined with appropriate assessment by considering three essential substantives such as effectiveness, innovation, and equivalency.

Conclusion

This study presented a retrospective review of the application of technology in ELT. The data of all relevant studies on this field at all educational levels were used for the scientometric analysis. Using document co-citation analysis, 62 research clusters were identified. The burst index was used to measure the impact of each publication on the field. The content of influential publications was closely analyzed to determine the focus of each cluster. Additionally, seven clusters, including #0 EFL, #2 English Language, #3 ICT Integration, #4 Technology-mediated Task-based Language

Teaching, #5 Self-efficacy, #14 Language Learning-mail, and #15 Teacher Cognition were identified by *CiteSpace* as the most influential and cohesive ones.

This study is not without limitations. Firstly, this study did not include unpublished studies. According to Rosenthal (1979), studies that found statistically insignificant results were often not published (Rosenthal, 1979). Consequently, the results of this research may be skewed towards studies with statistically significant results. Secondly, *CiteSpace* only used the names of the first authors and generated results based on them, which posed problems because the DCA might have generated different results if other authors were included. Finally, this study did not examine why publications have high document co-citation burstness. Other than studies that truly make a significant contribution to the field of technology in ELT, some studies can also be influenced by the Matthew effect of accumulated advantage of the halo effect. All else equal, eminent authors are relatively more likely to be cited than less-known authors (Merton, 1988). Similarly, articles published in reputable journals with high journal impact factors are more likely to be cited (Zhang & Poucke, 2017).

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