



REVIEW ARTICLE



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# Bibliometric analysis of willingness to communicate in the English as a second language (ESL) context

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Willingness to communicate (WTC) is an individual's predisposition to communicate with a person or persons at a specific time. Over the past century, there has been a dramatic increase in WTC research. This study aims to offer an overview of the existing literature regarding WTC from 1900 to 2022 and provide a bibliometric and visual analysis of the research status as well as the development trend of this research field. A total of 428 journal articles were retrieved for the purpose of conducting bibliometric research. The data for this study were collected from the Web of Science (WOS). The results established the development status of the field of WTC, the annual scientific production and growth rate, the thematic evolution and trend topic, co-citation, and coupling between authors, sources, and countries. The bibliometric analysis showed that: (1) In the past decades, research in WTC has continued to soar and annual publications can be divided into three stages, which are an initial stage, a slow development stage, and a rapid expansion stage. It has been discussed to a wider extent mainly within the fields of education and linguistics; (2) of the 38 countries that the articles were exported from, the United States topped the list with the most publications, and Canada received the most citations. China has the most inter-country collaboration compared to other countries, which is at the center of international cooperation. China's main cooperation countries were Iran, Japan, Canada, and Australia. The top author in the WTC field with the most production and impact is MacIntyre, PD, while System was the most popular journal. (3) By means of keyword analysis, "second language" was the most frequent keyword, followed by "model" and then "attitude". Based on the results of the thematic evolution analysis, the research themes for 2021 to 2022 are "model", "competence", "Chinese", "abroad", "teachers". The findings may be beneficial to L2 teachers and learners better to understand the role of WTC in language study. Researchers in this field might find the study useful for finding new research directions, relevant sources, and opportunities for collaboration.

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## Introduction

Willingness to communicate (WTC) refers to an individual's disposition to choose whether to speak or remain silent and is recognized to be the most immediate determinant of L2 communication behavior (MacIntyre et al., 1998). With modern language pedagogy placing great emphasis on communication (MacIntyre et al., 2002), researchers in the field have shown greater interest in studying willingness to communicate (WTC). Especially in second-language communication, having strong English communication skills can assist one in standing out from the competition in a variety of global sectors and professions. High WTC is associated with increased frequency and amount of communication, which can produce a variety of positive communication outcomes, whereas low WTC is associated with decreased frequency and amount of communication, which produce a variety of negative communication outcomes. As a result, WTC has become a significant area of interest in language acquisition (Lee, 2019; Lee et al., 2019; Macintyre and Legatto, 2011; Yashima et al., 2004a; Zhang et al., 2018).

There have been several research reviews focusing on WTC in the WoS database (Syed et al., 2022; Zhang et al., 2018). Such as Zhang et al. (2018), they conducted a systematic review of situational antecedents of WTC in the L2 classroom. Their study provided future researchers with a better understanding and consisted of terminology regarding situational antecedents of WTC. However, the study only focused on a specific kind of antecedents of WTC instead of the overview of WTC research, and the discussion of trait-like variables was not mentioned. Another work was a narrative review conducted by Syed et al. (2022). They mainly focused on discussing the strengths as well as limitations of the major conceptualizations and the complex and dynamic nature of L2 WTC. They conducted a traditional review of the conceptual and methodological developments in L2 WTC research; however, it suffered bias due to a lack of systematicity and depth in reviewing each study.

In the literature, there is no mention of bibliometric analysis being used to evaluate WTC research. In light of this, the purpose of the present work is to conduct a bibliometric analysis of all WTC papers in the Web of Science Core Collection. Web of Science was chosen because it is the most widely accepted and frequently used database for analyzing scientific publications (Aghaei Chadegani et al., 2013). All details of the selected publications, such as title, abstract, keyword, author, address of the author, publication year, journal information, country, citation, reference, and H-index, were collected from the database. The study provided co-citation analysis and statistical analysis, such as scientific productions and citation trends, highly cited authors, journals and institutions, and network visualizations of WTC research. To achieve the research objectives above, this paper set out to answer the following research questions:

RQ1: What is the trend of scientific publication in the WTC field?

RQ2: What is the main research stream of the WTC field?

RQ3: What is the research focus and future direction in the field of the WTC?

## Methodology

A bibliometric examination of the WTC research community is presented in this paper. Bibliometric analysis, also known as scientometrics, uses math and statistics to numerically describe scientific activity and relevance across a certain period (Donthu

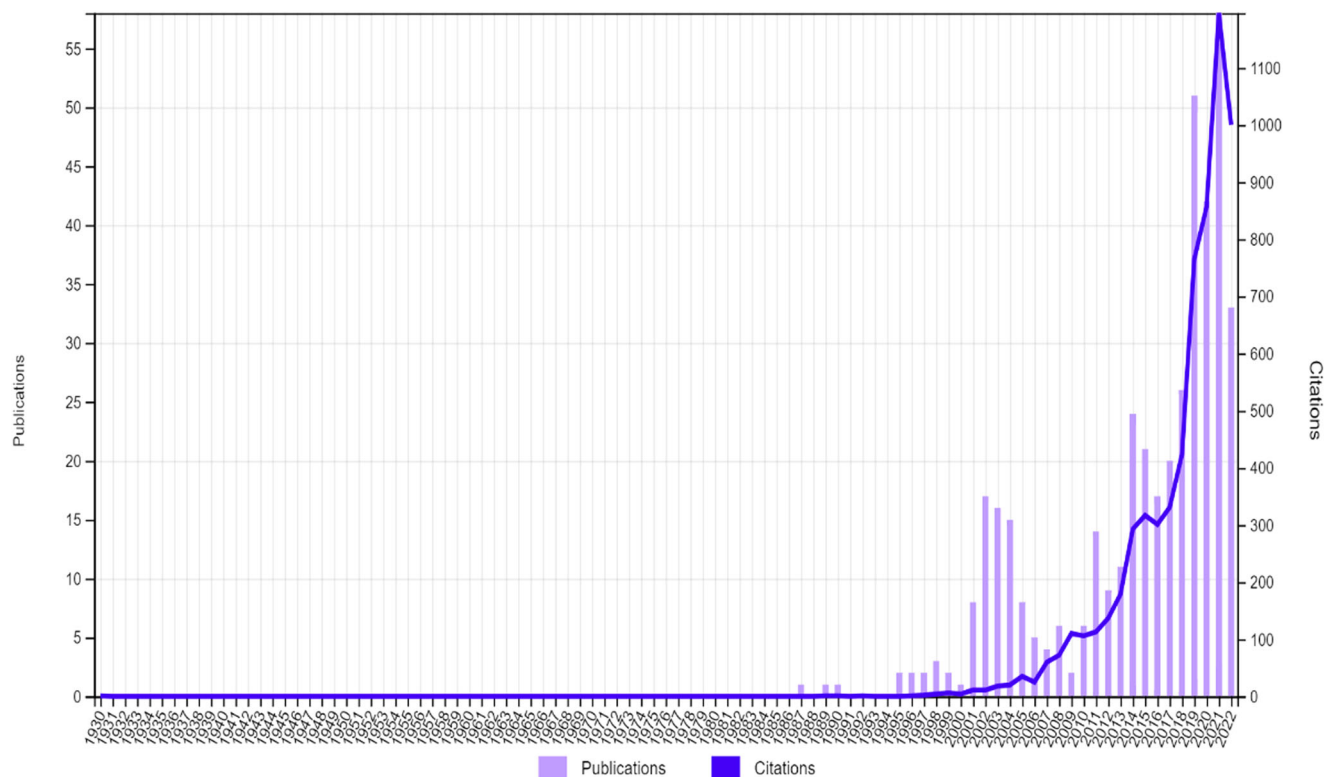
N. et al., 2021). In bibliometric research, a type of systematic literature review, quantitative and statistical methods are applied to data gathered from previously published studies by examining the study outputs, such as the themes sought, the procedures used, and the samples used. In the past, literature reviews have typically been organized according to a narrative methodology built to frame earlier work. However, most of the work carried out by using narrative methodology fails to provide a complete overview of the research field. Even more so, when the number of publications rises, it is vital for researchers to identify research paths across existing research in order to provide a comprehensive overview and develop new knowledge. For this purpose, Bibliometrics is one of the most commonly used techniques. It offers a variety of concepts, models, and approaches that can be utilized to investigate the basis, status, intellectual core, and future study directions; it shows the associations between the main concepts and structure in the field and demonstrates the relationships between subfields as well.

**Data source.** Web of Science is one of the most widely used databases in academics, it is the world's largest and most comprehensive collection of information resources that contains more than 11000 authoritative and high-impact academic journals in various fields (Xu et al., 2022). The data source of this study was the Web of Science Core Collection, the time span was 1900–2020, and the language was English. To identify the key terms of the current study, the evolution of the concept must be taken into consideration.

**Search strategy.** To identify the key terms of the current study, the evolution of the concept must be taken into consideration. In chronological order, the first set of keywords is “unwillingness to communicate”, abbreviated as UNWTC. The concept of willingness to communicate emerged from earlier work by Burgoon (1976) on the unwillingness to communicate in the first language communication literature. To change the negative orientation into positive, McCroskey et al. (1985) renamed the construct “willingness to communicate” and advanced it to reference an individual's general personality orientation towards talking. This makes “willingness to communicate”, abbreviated as WTC, the second set of keywords, and as the term became widely used in the field of second language learning, “willingness to communicate in L2” became the third set of keywords, abbreviated as L2WTC.

As mentioned above, the concept emerged as “unwillingness to communicate” and was advanced as “willingness to communicate (WTC)”. Thus, the search formula was (TITLE-ABS-KEY (“willingness to communicate” OR “WTC” OR “unwillingness to communicate” OR UNWTC OR “Willingness to communicate in English” OR “L2 WTC” NOT “World trade center”)) AND (LIMIT-TO (PUBYEAR > 1900 AND PUBYEAR < 2022)) AND (LIMIT-TO (LANGUAGE, “English”)). The search was conducted on September 26, 2022, and yielded 610 publications, of which 428 published articles were related to willingness to communicate.

**Data analysis.** There are two software programs implied in the study: VOS viewer (Freely available at <https://www.vosviewer.com/>) and Biblioshiny (Freely available at <https://www.bibliometrix.org/>). VOS viewer is widely used because it offers a lot of features for visualizing bibliometric networks and scientific mapping networks. Moreover, it has a unique text-mining tool for visualizing bibliometric networks (Alam et al., 2021). Several bibliometric methods of citation analysis, co-citation analysis, bibliographical coupling, co-author analysis, and co-word



**Fig. 1 Annual scientific productions and citations in WTC research.** The purple bar graph indicates the number of articles published in each year, and the blue line graph represents the number of citations per year.

analysis to visualize the research status as well as the development trend of the WTC research field.

Bibliometrix R package, written in R language, is outstanding in the variety of analysis that can be carried out with it. To reduce the users' threshold of use, Massimo Aria developed the bibliometrics-based Shiny package in the R language and created a web-based online data analysis framework. It provides various kinds of tools that allow researchers to conduct in-depth bibliometric analysis. Biblioshiny can be used to analyze the most influential and productive countries, institutions, authors, journals, and research areas as well as keywords. It can also provide a visualization of the development and evolution of the research field (Aria and Cuccurullo, 2017).

## Results and discussion

**Trends in the annual scientific publication.** The study's trend can be seen by analyzing the distribution of literature volume from the time series. Figure 1 shows the evolution of WTC publications by year, it can be observed that WTC is a relatively new field of study, with the first article being published in 1987. The evolution of WTC research can be divided into three periods: 1987–2000; 2001–2017; 2018–2022. The 1987–2000 period was the initial stage, and Minimal annual publications were published with few variations.

To begin with, Burgoon (1976) introduced the construct in the research field and described the predisposition to choose to stay silent as a chronic tendency to avoid or minimize spoken communication in their first language (L1). Thus, it became essential for researchers to identify dispositions for actual communication behaviors. MacIntyre, (1994) identified some variables closely related to L1 WTC, such as communication apprehension, language anxiety, perceived competence, etc. Furthermore, they extended the concept to the second language communication area and found it became more complicated in

the L2 area. Thus, they proposed a heuristic model to present a large number of variables that have a potential impact on L2 WTC (Macintyre et al., 1998).

The 2001–2017 period was the development stage, and the literature rate showed noticeable growth, which indicated the WTC field attracted scholars' attention. Research on WTC has emerged in various countries, with researchers in each country proposing different factors influencing WTC depending on their own context. For instance, the Japanese researcher, Yashima et al. (2004b) investigated the antecedents of L2 WTC in the Japanese context and proposed a model with an additional variable: international posture. Meanwhile, researchers in China conducted a large-scale investigation of WTC in Chinese EFL classrooms, they identified classroom environment, learner beliefs, and motivation as predictors of WTC (Peng and Woodrow, 2010). Generally, the affective variables were divided into two categories: trait-like variables and situational variables. Trait-like variables are the variables that tend to be more stable and enduring, like personality, self-confidence, motivation, etc. Meanwhile, situational variables tend to be more transient and depend on the specific context (Aiello et al., 2017; Ghonsooly et al., 2012; MacIntyre, 2007; Macintyre and Legatto, 2011; Yashima et al., 2004a, 2004b; Zarrinabadi and Tanbakooei, 2016).

The 2018–2022 period was the expansive stage, the number of publications increased dramatically and peaked in 2021. The same can be said about the average citation distribution of paper per year, for it showed a steady upward trend like the number of publications. This figure demonstrated that WTC research in recent years has been of great importance and practical value. Zhang et al. (2018) concluded the common situational antecedents to be situation cues (i.e., interlocutors, classroom atmosphere, tasks) and situation characteristics (i.e., task-confidence, task-interest, task-usefulness, systematicity of previous studies). A growing number of researchers investigated



**Fig. 2 Tree Map of the subject area.** Different coloured squares represent different field of articles, with the larger squares indicating more relevant articles in that field.

WTC as a dynamic process that fluctuates from moment to moment. This has made the WTC more complex and variable, encouraging researchers to go deeper with more appropriate research techniques.

**Types and research directions.** Figure 2 shows the top ten research directions of publications related to WTC. The most popular research directions are educational research (157) and linguistics (142), which takes up a large proportion of the study. They are followed by language linguistics (47), respiratory system (29), critical care medicine (27), psychology multidisciplinary (27), communication (25), public environmental occupational health (18), environment sciences (13), and psychology social (13). To summarize, the research has been mainly reflected in three areas: education, linguistics, and psychology.

**Most influential articles.** Citation analysis enables fast identification of the most important studies in the field. Numerous significant publications in the WTC study have been published throughout the years. Table 1 shows the ten most frequently cited publications. The Web of Science provided the overall citation count, which represents how many times a specific work has been referenced by all of the journals included in the database. Although higher citation does not fully indicate the quality of the paper, it is a measurement of its impact or visibility. The top-cited paper (both in total citation and total citation per year) is “Conceptualizing Willingness to Communicate in a L2: A Situational Model of L2 Confidence and Affiliation” by MacIntyre, PD, Dornyei, Z, Clement, R, and Noels, KA in 1998. To date, the paper has been cited 643 times in total and 25.72 times per year till September 26, 2022. It is followed by Yashima’s “Willingness to Communicate in a Second Language: The Japanese EFL Context” (2002), with 436 times citations in total and 20.76 times citations per year. On the other hand, the article with the highest normalized total citation is Yashima, T, Zenuk-Nishide, L, and Shimizu, K’s “The Influence of Attitudes and Affect on Willingness to Communicate and Second Language Communication” (2004). These studies, representing the initial research in the field,

are important previous studies that must be referenced by related researchers.

#### **Geographical and institutional distribution and cooperation.**

In order to provide a comprehensive picture of WTC research, this study analyzed the distribution features of key nations. The results showed each country’s influence in the WTC field. In the study, instead of taking into account the nationality of the researchers who wrote the study, a country is related to the organization that publishes a paper. There could be potential gaps that some researchers may move to another country, but it is better to conduct the study this way. For the reason that the main purpose of the study is to find key places where high-quality WTC study is published.

**Major research countries in the field.** Figure 3 shows the ranking of the 10 most contributing countries, it can be observed that Canada (1447 citations) is the top contributing country in the WTC area. China is ranked second (984 citations), Japan (961 citations) third, and the USA (704 citations) fourth. As can be seen from Fig. 4, papers on WTC were published mainly in Asia and Europe. Figure 4 demonstrates the country’s scientific production and Fig. 5 shows the countries’ production over time. It is evident that the United States is the most producing nation in the WTC area. The second most productive country is China, the third is Iran and the fourth is Japan. The UK is in sixth place, followed by Canada in fifth. Australia and Malaysia are ranked seventh and eighth, respectively, and the other nations do not appear to have a significant impact in the field, having only published a small number of publications. From 1995 to 2000, Canada is the most productive country in the WTC area. The number of publications in the USA has increased markedly since the year 2000, and soon outnumbers Canada and becomes the most productive country in the field. However, Canada still continuously being the most influential country in the field although the number of publications tends to be steady after 2003. The number of publications in China has shown a great increment since 2009, and the number is still rising.

**Table 1 Top-cited 10 articles.**

Document	DOI	Year	Local citations	Global citations	LC/GC ratio (%)	Normalized local citations	Normalized global citations
MacIntyre PD, 1998, Mod Lang J	<a href="https://doi.org/10.2307/330224">https://doi.org/10.2307/330224</a>	1998	225	643	34.99	2.97	2.95
Yashima T, 2002, Mod Lang J	<a href="https://doi.org/10.1111/1540-4781.00136">https://doi.org/10.1111/1540-4781.00136</a>	2002	131	436	30.05	10.31	9.01
Peng JE, 2010, Lang Learn	<a href="https://doi.org/10.1111/j.1467-9922.2010.00576.x">https://doi.org/10.1111/j.1467-9922.2010.00576.x</a>	2010	120	205	58.54	3.89	3.59
Yashima T, 2004, Lang Learn	<a href="https://doi.org/10.1111/j.1467-9922.2004.00250.x">https://doi.org/10.1111/j.1467-9922.2004.00250.x</a>	2004	97	281	34.52	14.13	11.87
MacIntyre PD, 2002, Lang Learn	<a href="https://doi.org/10.1111/1467-9922.00226">https://doi.org/10.1111/1467-9922.00226</a>	2002	80	234	34.19	6.30	4.83
Clement R, 2003, J Lang Soc Psychol	<a href="https://doi.org/10.1177/0261927x03022002003">https://doi.org/10.1177/0261927x03022002003</a>	2003	80	185	43.24	9.01	7.20
Cao YQ, 2011, System	<a href="https://doi.org/10.1016/j.system.2011.10.016">https://doi.org/10.1016/j.system.2011.10.016</a>	2011	74	115	64.35	5.26	3.87
MacIntyre PD, 2011, Appl Linguist	<a href="https://doi.org/10.1093/applin/amq037">https://doi.org/10.1093/applin/amq037</a>	2011	68	190	35.79	4.83	6.39
Peng JE, 2010, System	<a href="https://doi.org/10.1016/j.system.2012.02.002">https://doi.org/10.1016/j.system.2012.02.002</a>	2012	62	101	61.39	5.03	4.86
Magintyre PD, 2007, Mod Lang J		2007	60	197	30.46	4.00	3.79

Figure 6 shows the corresponding author’s country in the field, MCP represents inter-country collaboration while SCP represents intra-country collaboration. The figure can be interpreted as follows. The USA is the most productive country, the most of the publications are from intra-country collaboration. Although China ranks second, it has the most inter-country collaboration compared to other countries. The same can be said from Fig. 7, China is at the center of international cooperation. China’s main cooperation countries were Iran, Japan, Canada, and Australia.

**Analysis by journals.** Figure 8 demonstrates the impact of the top ten sources based on the available data. The result shows that System is the most influential journal in WTC research (H-index of 18), it is the core source in the field with 25 related articles and 966 local citations. Followed by modern language journals (H-index of 11), health communication (H-index of 10), and language teaching research (H-index of 9). Based on the number of publications, Fig. 9 displayed the top ten most relevant sources. American Journal of Respiratory and Critical Care published 27 articles; it has the highest number of publications in the database. The system ranked second with 25 articles, which is the most cited source as well. It is an international journal that mainly focuses on the application of educational technology and applied linguistics to foreign language teaching and learning.

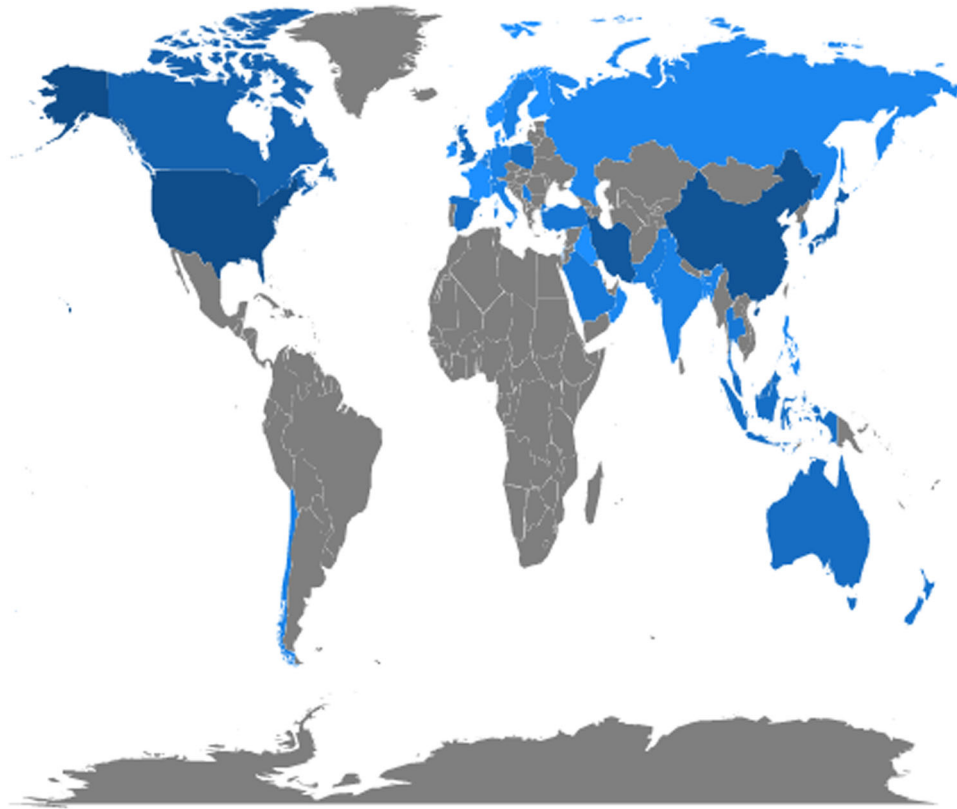
The more frequently two items are quoted together, the greater the likelihood that their content is connected. Co-citation counts are used in co-citation analysis to create measures of similarity between documents, authors, and journals. Figure 10 presents the co-citation analysis diagram of WTC-related literature institutions. Among the total of 3943 sources, 83 sources have met the threshold criteria of minimum citation 20 times. As shown in the finding, they were divided into 6 clusters.

**Analysis by authors.** From 1987–2022, a total of 868 authors published 428 research papers based on the WTC in different publication venues. Among them, 112 of them are single authors, and Co-Authors per Doc was 2.78.

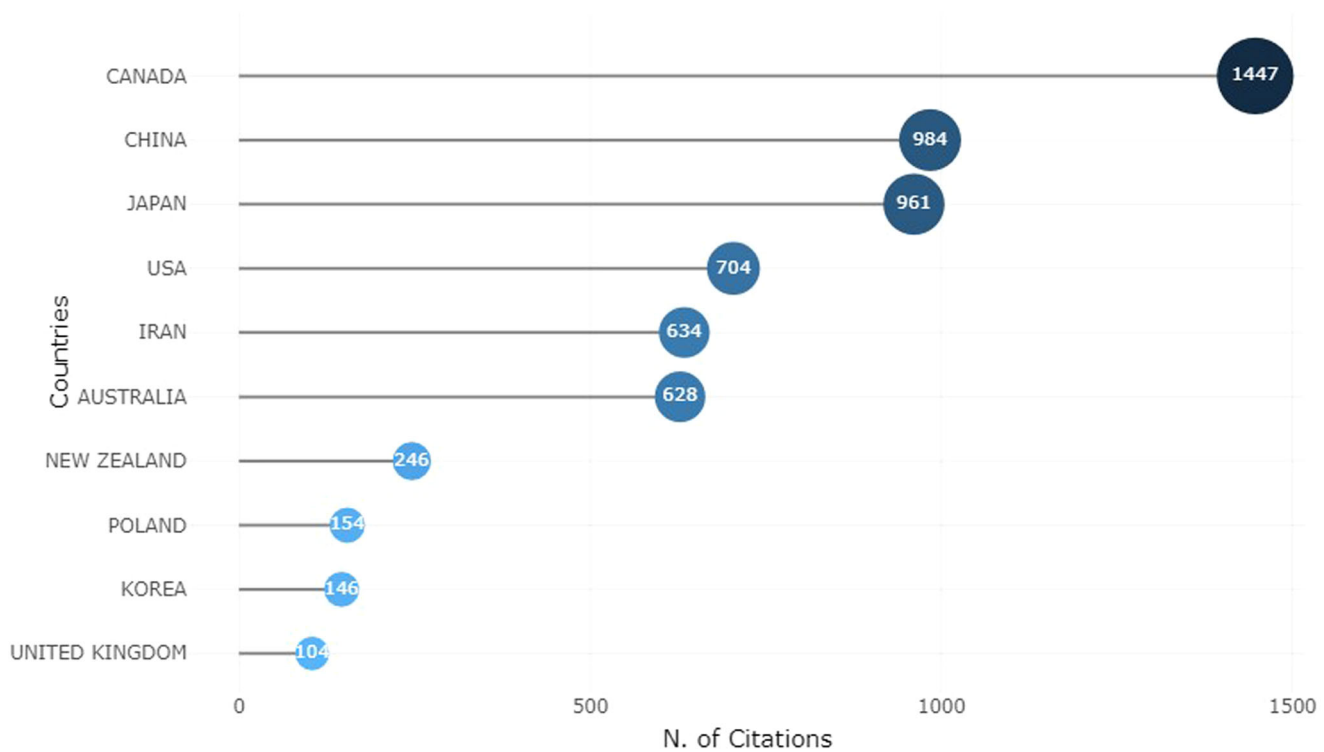
**The most productive authors.** As presented in Fig. 11, MacIntyre PD was the most productive and the most impactful author; he published 19 articles (6.92 fractionalized value) in the field and had 718 local citations. The second most productive author is Nolan. A (1.76 fractionalized value), followed by Lee JS (1.76 fractionalized value) and Prezant DJ (1.61 fractionalized value). Figure 12 shows authors’ production over time, it can be observed that MacIntyre PD has been publishing WTC-related articles since 1995, and his latest work was published in 2022. Another researcher who started a WTC-related study in the early years is Clement R, the researcher started publishing WTC-related articles in the year of 1996 but stopped in 2003.

**The most impactful authors.** Local citations show how frequently an author has been referenced in the WoS database by other documents in the collection, and a higher score of local citation indicates greater relevance of WTC topic. As shown in Fig. 13, MacIntyre PD ranked first with 718 total citations, while Clement R ranked second with 444 total citations.

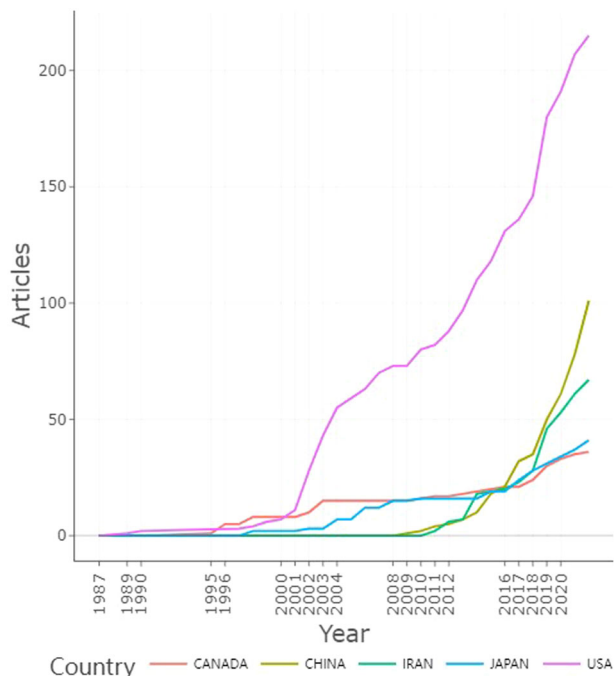
**Authors and their cooperation.** When one document is cited with two documents in common, this is called bibliometric coupling. It indicates that the two documents are bolometrically connected and that they are lined to any topic area. The deeper the relationship between the two articles is, the more their bibliographies overlap. Figure 14 shows the coupling analysis of authors of relevant literature on WTC. Out of 881 authors, only 15 authors



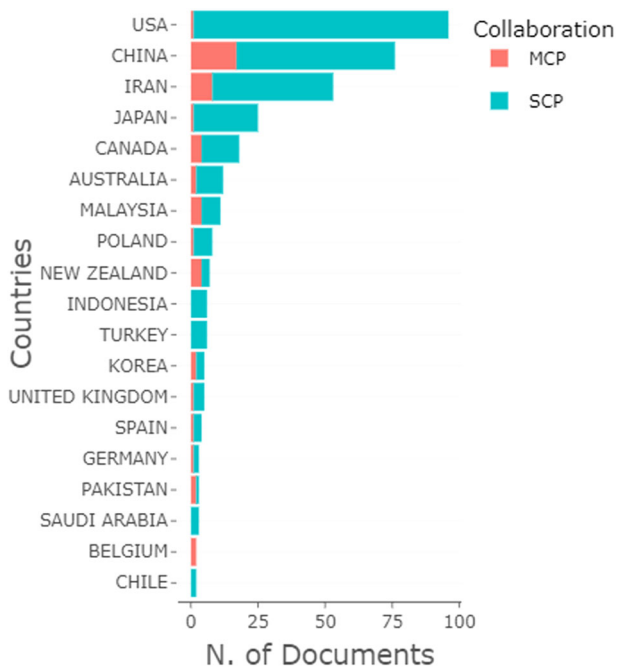
**Fig. 3 Country's scientific production.** The blue areas on the map represent publications by researchers in that country, the more publications the darker the colour. The grey colour indicates that there are very few publications from that location.



**Fig. 4 Most contributing countries.** The number in the circle indicates the number of citations for that country's research, and the country names are listed by citations, with the higher the ranking representing the country's higher impact.



**Fig. 5 Countries' production over time.** The different coloured lines show the dynamics of the number of publications in different countries in different years; the earlier the line rises, the earlier the country started research in the field.



**Fig. 6 Corresponding author's country.** The blue colour represents the number of single-country articles and the red colour reflects the number of international collaborative articles.

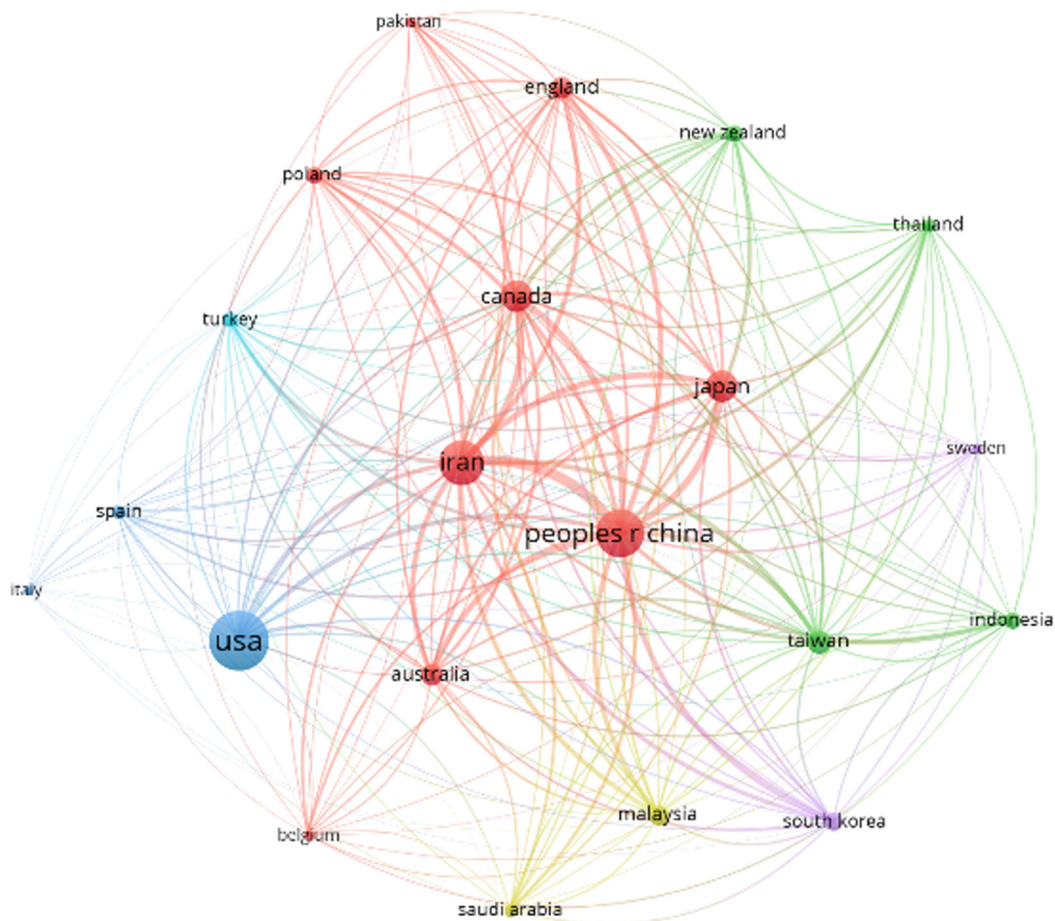
have met the threshold criteria of minimum citation 4 times. They were divided into three clusters, MacIntyre PD, Peng Jian, and the other six authors were in cluster 1, among which MacIntyre. PD's and Lee JS's findings contributed so much that publications on this topic cited their work in couples with 851 link strength.

**Analysis by keywords.** The study of keywords helps to illustrate the topic and concepts attracting the most interest in the research field. Figure 15 shows the most frequent words in the WTC field, the larger the keywords, the more occurrences it has, and vice versa. "2nd-language" is the most often used term by authors in the WTC studies, it has 126 occurrences.

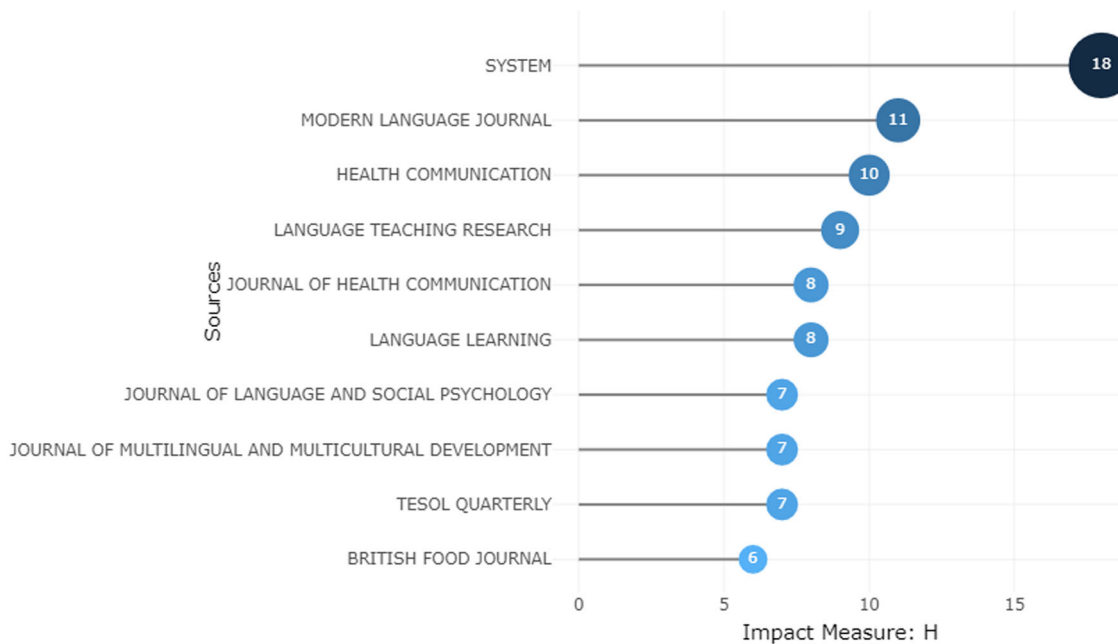
Followed by "model" (120 occurrences), "L2" (108 occurrences), and "attitudes" (101 occurrences). Figure 16's Word cloud further displayed the most relevant keywords in the WTC study, with the size of each keyword proportional to its recurrence frequency in the database. Other keywords in the field included personality, learners, proficiency, and Chinese. Figure 16 revealed the trend topics for each year between 2003 and 2022. Before 2011, the only related topic with a frequency greater than 50 is language anxiety. From 2013 to 2017, the trend topics included behaviors, gender, orientations, willingness, context, and students. Language, immersion, and attitudes were the trending topics in 2018. The three words with the highest frequency are L2, model, and 2nd-language in the year 2019, subsequent by perceptions, learners, and class environment. In recent years, the latest trend topics were enjoyment, learners' willingness, abroad, positive psychology, and emotions. The word cloud in Fig. 17 further showed the most relevant keywords in WTC research more vividly, for the size of the word was based on the frequency of the keywords in the database.

The three-field plot displays hierarchical data as a collection of rectangles nested within one another, demonstrating the relationship between the elements. Each rectangle represented a relevant element regarding WTC research, and a higher rectangle represented the element with the most relations. Meanwhile, the linkages' thickness suggests a substantial information flow between a group of values. In Fig. 18, the left side of the diagram presents the authors' names, the keywords in the middle, and on the right side, the countries. The larger size of the rectangle signifies that the USA performed well with the significant contributions of Nolan A, Prezant DJ, Kwon S, etc. Figure 19 is the illustration of three elements (countries, keywords plus, authors), which visualized the uppermost index keywords plus, such as "model", "second language", "and motivation", which has been utilized mostly by MacIntyre, Lee JS, Kazeros A, etc.

Studying the development of research in the field in terms of themes and thematic revolution is of great importance as well. Figure 20 depicts the diversion of different topics in the field of WTC by describing the flow of different themes in a network over time. The study divided the development of WTC research into five stages and showed the evolutionary paths in different stages. From 1987 to 2006, there are mainly two themes: "attitude", "model". "model" refers to the heuristic model published by Macintyre et al. (1998). It was proposed to extend the WTC construct by involving over 30 variables that may have a potential impact on L2 WTC. The researcher encouraged future researchers to confirm or disconfirm the relations hypothesized in this paper, and to identify additional variables or relationships. From 2007 to 2014, there were four themes: 2nd language, personality, perspective, and anxiety. At this stage, most of the themes were affective variables that may have an impact on WTC. From 2019 to 2020, more themes emerged: 2nd language, context, idiodynamic method, care, acquisition, age. Idiodynamic method was used to study the fluctuations in WTC that occur from moment to moment by Macintyre and Legatto (2011). Since then, WTC has been recognized as a dynamic system that changes over time. In this case, the WTC should be investigated by a continuous curve instead of a single score. Aiming to demonstrate the fluctuation of WTC from moment to moment and to reveal the interconnectedness between dynamic systems, they presented an idiodynamic methodology to capture the fluctuation of WTC and

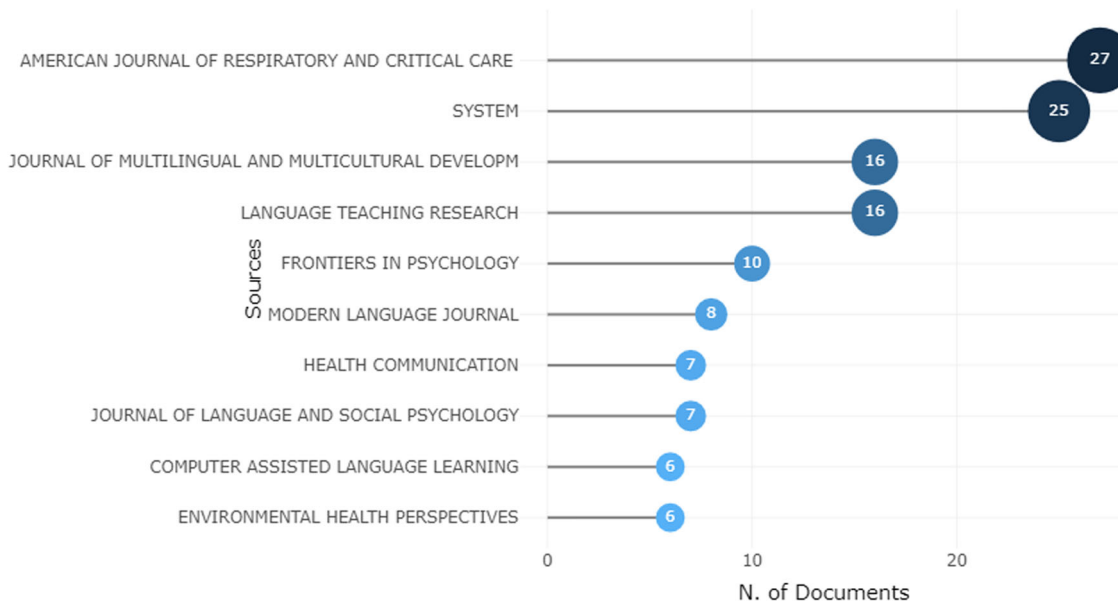


**Fig. 7 Country coupling analysis of literature related to WTC.** The different coloured lines represent different country cooperation clusters, with larger country names indicating greater contributions and bolder lines between countries indicating closer cooperation.

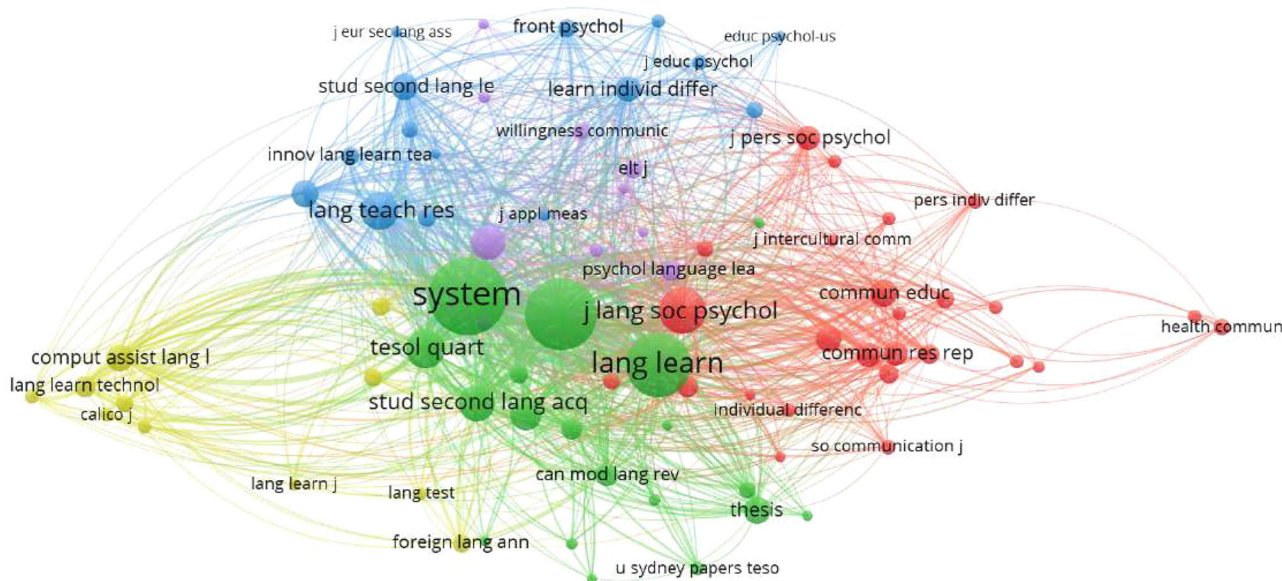


**Fig. 8 Source impact of the top ten sources.** Journals are ranked by citations, with the higher the ranking representing the higher impact of the journal, and the number in the circle representing the number of citations.





**Fig. 9 Most relevant sources.** Journals were ranked by the amount of publications, with the higher the ranking representing the higher production of the journal, and the number in the circle representing the number of publications.

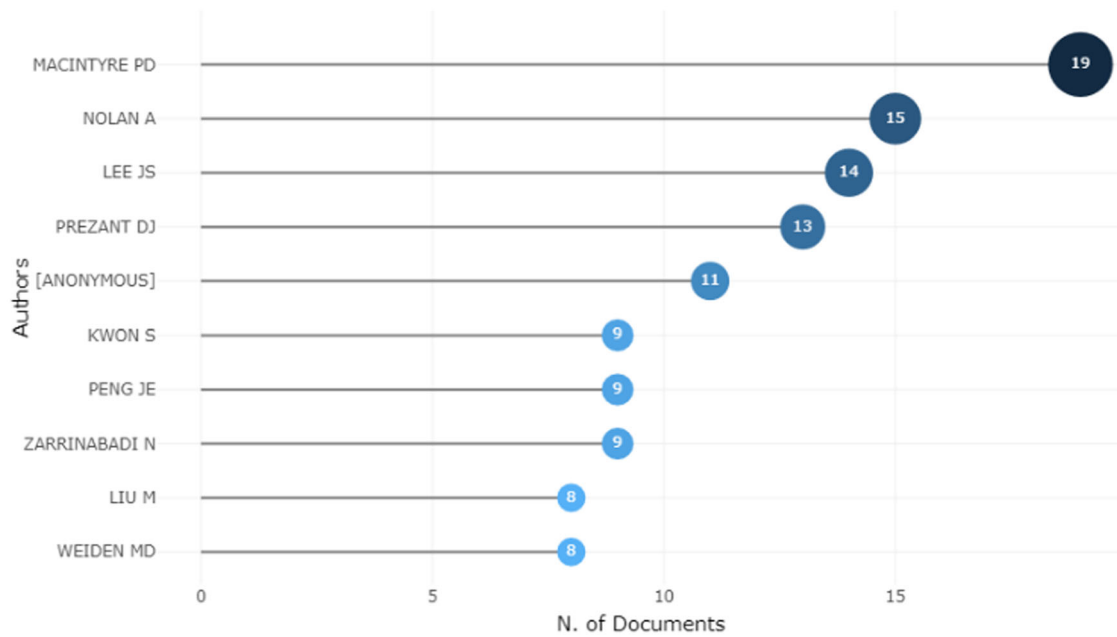


**Fig. 10 Co-citation analysis of WTC-related literature institutions.** The different coloured lines represent different co-citation clusters for different journals, with larger journal names indicating greater influence, and bolder lines between countries indicating more co-citations.

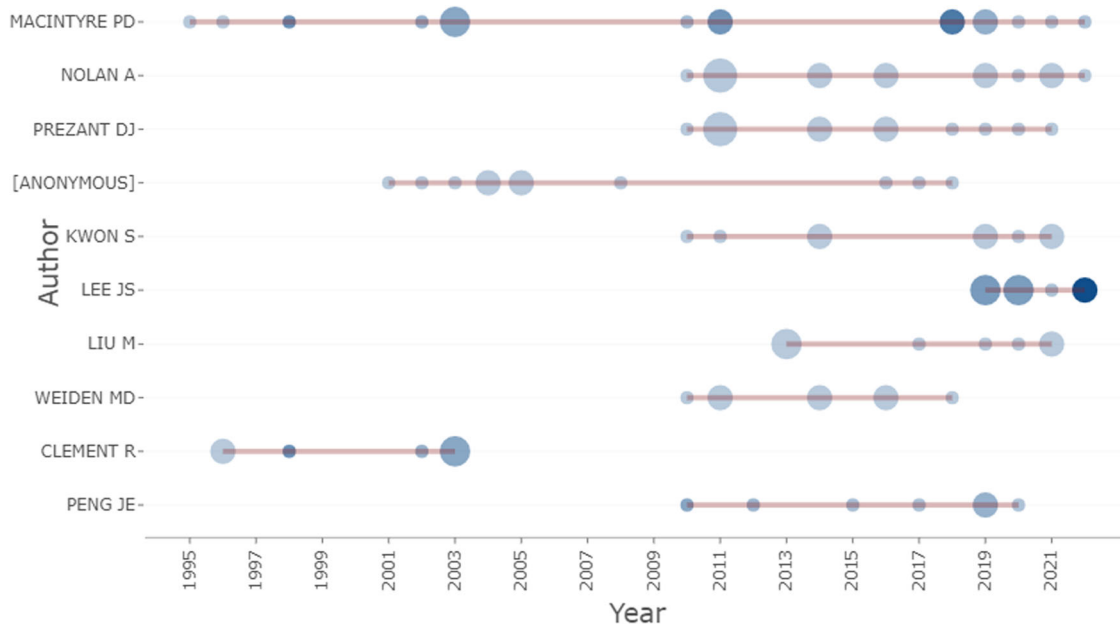
suggested directions for future researchers. The methods they applied were WTC rating and self-report explanations. To avoid bias, they used brief tasks and immediate stimulated recall.

In the most recent years, the themes included model, competence, Chinese, abroad, and teachers. It was a frequently discussed phenomenon that Chinese students tend to be reticent or unwilling to communicate in L2 when they were studying abroad (Cheng, 2000; Liu, 2005b; Zhu and Bresnahan, 2018), it was attributed to the unique cultural value of Chinese people:

Confucianism. Wen and Clément (2003) extended Macintyre et al.’s (1998) heuristic model by reinterpreting some variables from a Chinese perspective. They revealed that Chinese cultural values have a great influence on the learners’ WTC, for those were the dominant force shaping the people’s way of thinking. In their paper, they proposed a theoretical model presenting potential variables and the relationships among them. They recognized two cultural origins of unwillingness to communicate, one was the other-directed self, such as face-protected orientation, and the



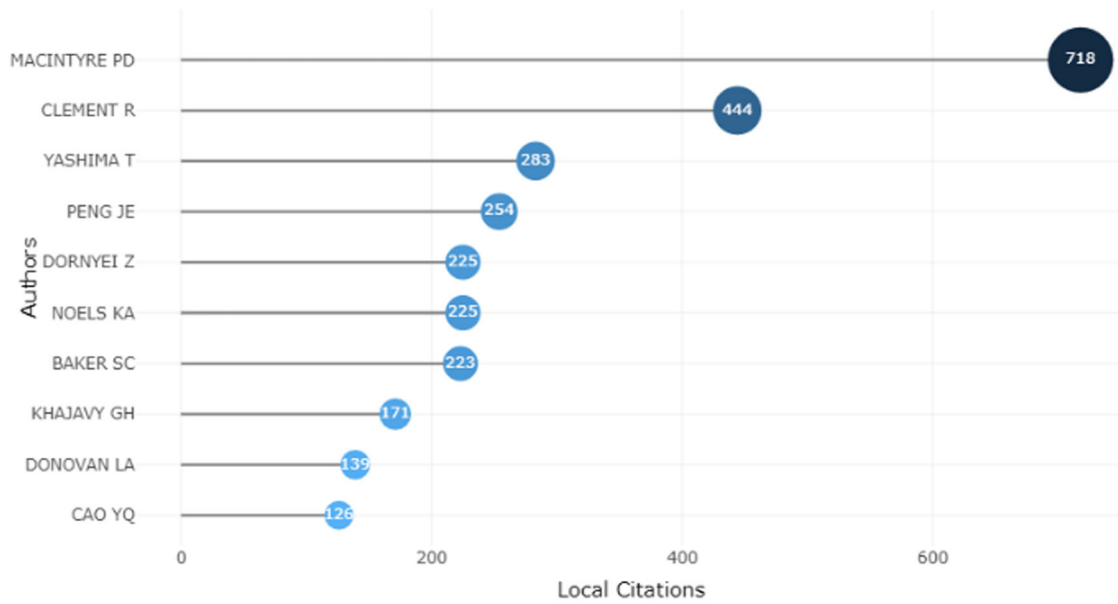
**Fig. 11 Most relevant authors.** Authors were ranked by the number of publications, with the higher ranking representing the higher production of the author, and the number in the circle showing the number of publications by that author.



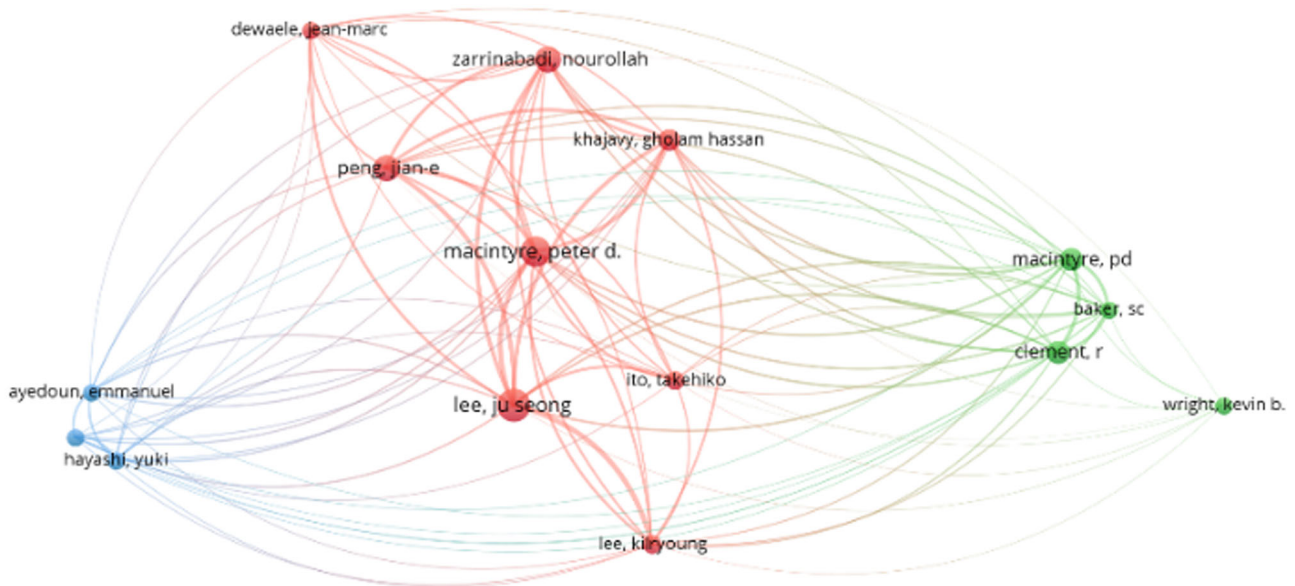
**Fig. 12 Authors' production over time.** The lines in the graph dynamically show the articles published by different authors in different years; the earlier the line appears, the earlier the author started research in the field. The circles on the lines represent the number of publications of the authors, the larger the circle, the more publications.

insider effect, and the other one was a submissive way of learning. Moreover, they proposed additional variables of WTC in the Chinese classroom, such as societal context (group cohesiveness, teacher support), motivation orientation (affiliation, task-orientation), personality factors (risk-taking, tolerance of ambiguity), and affective perceptions (inhibited monitor, positive expectation of evaluation). However, the model they provided was only serving as a theoretical framework, the variables they proposed required further confirmation or disconfirm. Although it was indicated in several studies that teachers do need to address the issue of unwillingness to communicate and attempt to cultivate

active learners (Liu, 2005a; Liu and Jackson, 2009; Murad and Jalambo, 2019), there were also researchers questioned that it was mainly based on the impressions of a small number of teachers (Shao and Gao, 2016). As a result, it remained debatable whether their reticence can be attributed to cultural traditions. “Teacher” was frequently mentioned as an indispensable variable in WTC studies. Previous research showed that teachers’ attitudes, support, and teaching style have a significant impact on learners’ WTC (Shi, 2017; Zarrinabadi, 2014). Zarrinabadi (2014) indicated that teachers’ wait time, error correction, decision on the topic, and support exert influence on learners’ WTC.



**Fig. 13 Most local cited authors.** Authors are ranked by citations, with the higher the ranking representing the higher influence of the author, and the number in the circle representing the number of citations.

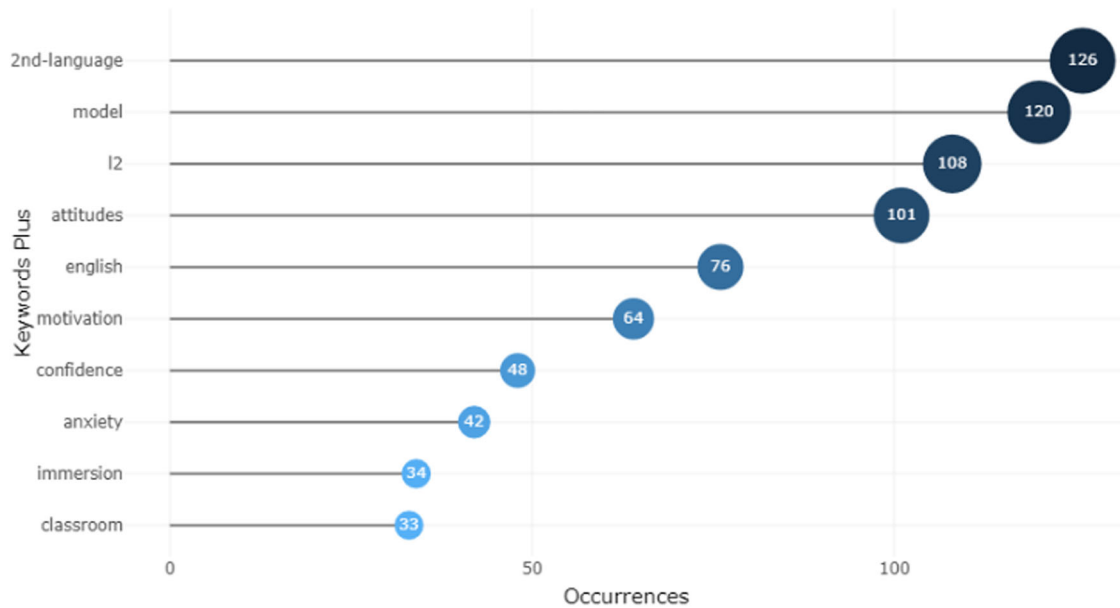


**Fig. 14 Coupling analysis of authors of relevant literature on WTC.** Different coloured lines represent different coupling cooperative groups of articles, with larger article names indicating more citations, and bolder lines between articles indicating a higher number of couplings.

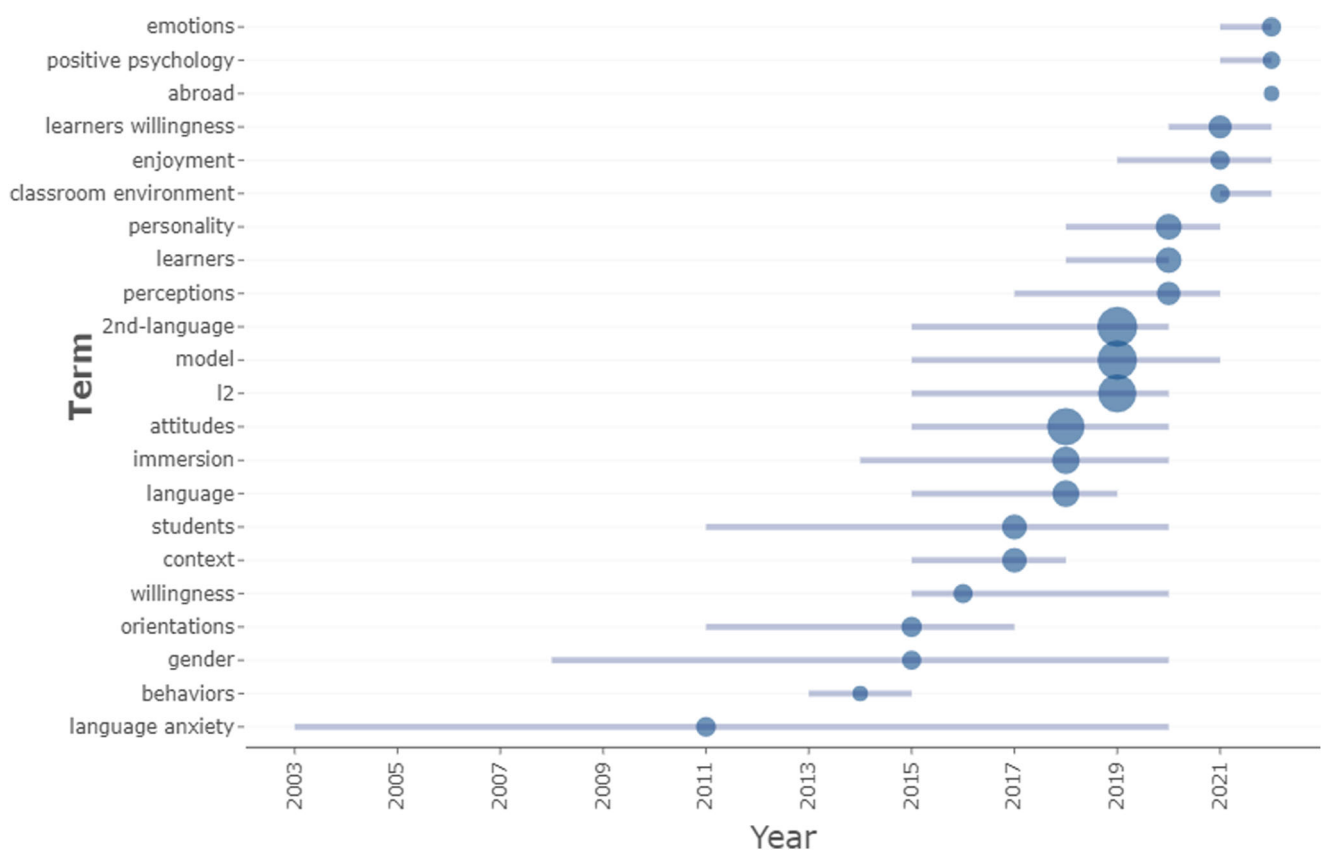
The figure of the thematic evolution of the WTC research visualized the research trend in different stages, which may be helpful for future researchers to find new research topics or paths.

A co-occurrence network graphically represents and visualizes any underlying relationship between words, authors, or documents by grouping them into clusters using any specific unit of documents. The study evaluated 1245 keywords with a minimum frequency requirement of five occurrences per paper, yielding a total of 79 keywords that met the criterion. Figure 21 shows the co-occurrence network of keywords with 6 clusters, 1421 links, and 5279 link strength. Cluster 1 includes 21 items: “2nd-

language”, “affective factors”, “competence”, “English as a foreign language”, “communicate competence”, “English”, “English as a foreign language”, “foreign language”, “gender”, “ideal L2 self” ideal, “L2 self”, “L2 anxiety”, “L2 motivational self-system”, “L2 WTC”, “language proficiency”, “learners”, “self-confidence”, “teacher”, “willingness”, “speaking” “unwillingness”, “willingness to communicate”. In cluster 1, the word “2nd language” has 76 links and 797 link strengths as well as 126 occurrences. It can be observed that WTC attracted great attention in the language education area, for it is proposed as the primary goal of language. Cluster 2 contains 14 items: “Achievement”, “anxiety”, “belief”,



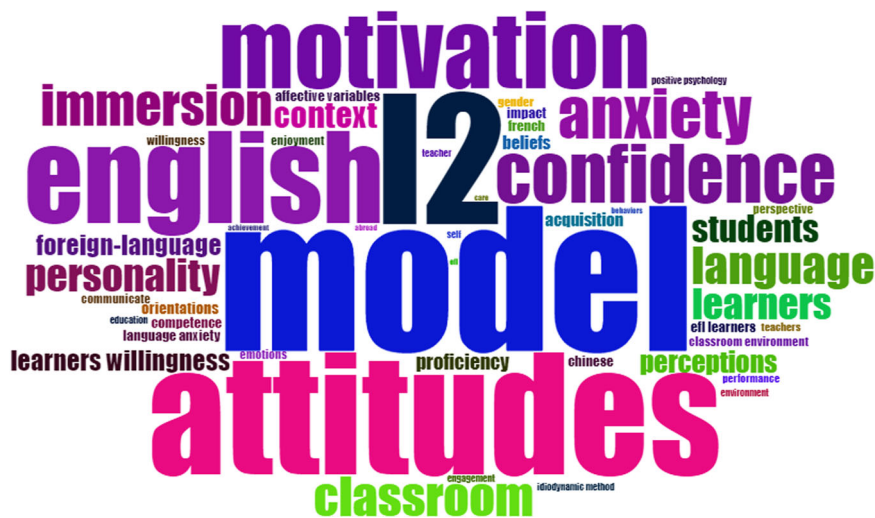
**Fig. 15 Most frequent words.** Keywords are ranked by the number of occurrences; the higher the rank, the more occurrences of the keyword. The number in the circle represents the number of occurrences of the keyword.



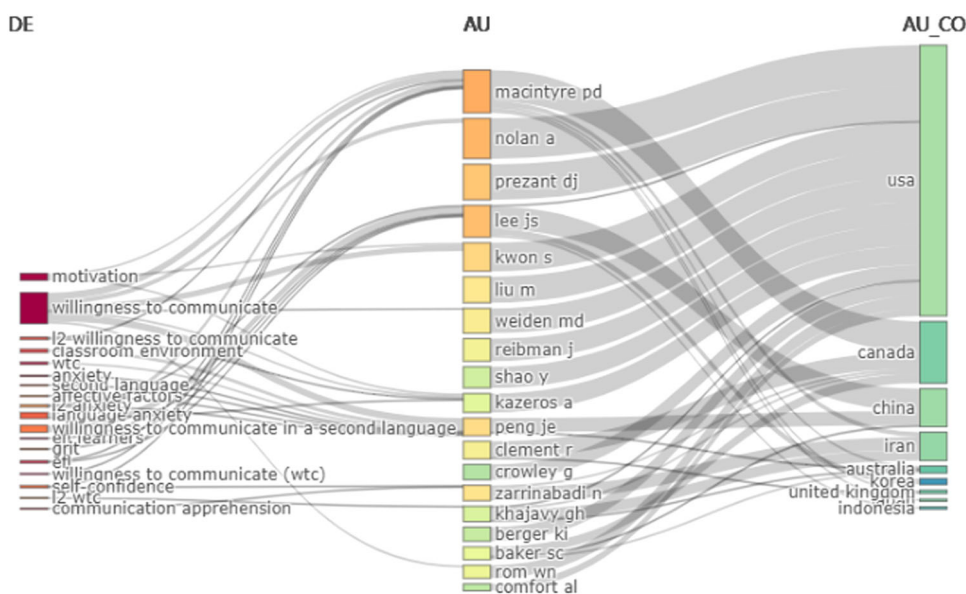
**Fig. 16 Trend topics.** The lines in the graph dynamically show the different trending topics in different years; the earlier the line appears, the earlier the topic appeared in the field of study. The circles on the lines represent the number of occurrences of the topic, with larger circles indicating more occurrences.

“classroom environment”, “EFL”, “emotions”, “enjoyment”, “environment”, “foreign language enjoyment”, “grit”, “idiodynamic method”, “positive psychology”, “visualization”, “willingness to communicate in English”. In this cluster, the keywords are mainly affective variables that may have a direct or indirect

influence on learners’ WTC. Cluster 3 includes 14 items: “Affective variables”, “behaviors”, “care”, “confidence”, “context”, “EFL learners”, “impact”, “language”, “motivation”, “participation”, “perceptions”, “teacher immediacy”, “validation”, “WTC”. Meanwhile, “abroad”, “attitude”, “classroom”, “education”,



**Fig. 17 Word cloud.** The larger the keywords in the graph, the more frequently they appear.



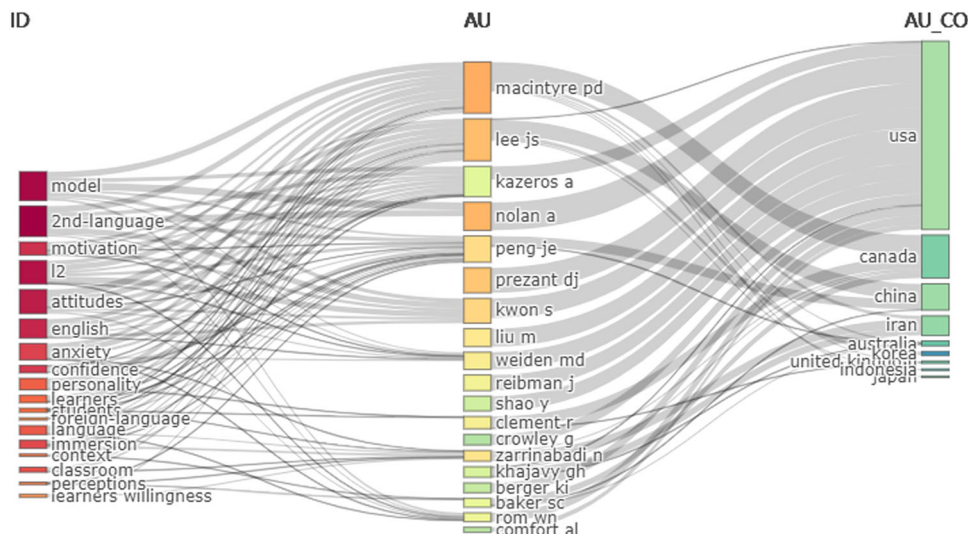
**Fig. 18 Three-field plot (countries, keywords, authors).** The figure shows the relationship among keywords, authors, and countries, and the lines between them reflect their links; the darker the line, the stronger the connection.

“French immersion”, “individual differences”, “L2”, “perspective”, “proficiency”, “second language”, “willingness to communicate” are in cluster 4. This cluster related WTC to abroad education, especially focusing on L2 proficiency. In addition, “emotional intelligence”, “foreign language anxiety”, “performance”, “personality”, “teachers” “communication apprehension”, “language anxiety”, “model” and “predictors” are in cluster 5. Cluster 6 includes “Chinese”, “acquisition”, “engagement” “autonomy”, “L2 willingness to communicate”, “learners’ willingness”, “orientation”, “self-determination” “students”. In this cluster, Chinese learners and Chinese culture are closely related to unwillingness to communicate because of the Confucian thoughts.

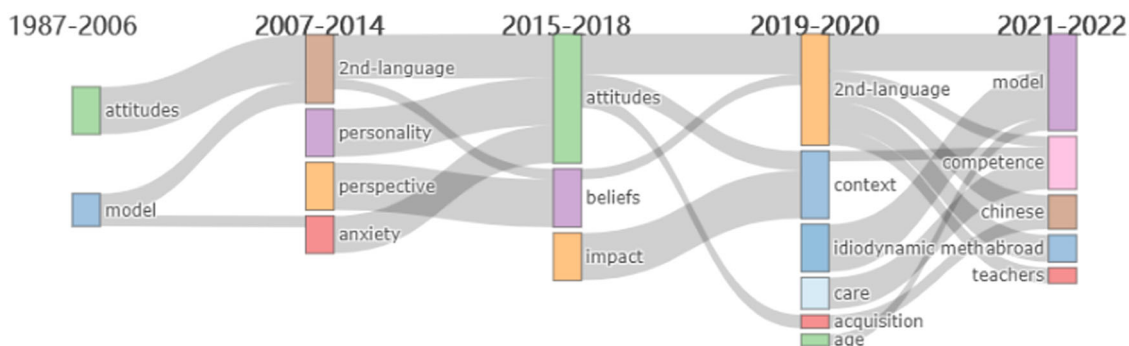
**Conclusions and recommendations**

The present study conducted an exploratory bibliometric analysis of publications in WTC research by reviewing top documents and applying several analyses, such as citation, co-citation, co-occurrence of keywords, the collaboration between authors and

countries, and coupling between sources and authors. It collected records from the WoS database, examined and evaluated the global scientific output in research on WTC, and tried to recognize the current top researchers and visualize their regional distribution as well as publications. The findings showed that WTC-related studies have an annual scientific production growth rate of 10.41%. In 2020, the number of articles reached 41, indicating that the WTC field was receiving increased attention. In terms of research country distribution, the majority of the papers were from Asia and Europe. The USA produced the most publications, whereas Canada had the biggest influence. Regarding the analysis of international cooperation, the majority of studies were independent, with China having the highest level of cooperation with other nations. The most significant keyword is “2nd language” with 126 occurrences, which means WTC studies are highly related to second language. In the year 2022, “abroad” is the most discussed keyword, which makes it a trending topic regarding WTC. The thematic evolution and the annual scientific production and citation of the WTC research can help researchers assess



**Fig. 19 Three-field plot (countries, keywords plus, authors).** The figure shows the relationship among keywords plus, authors, and countries, and the lines between them reflect their links; the darker the line, the stronger the connection.



**Fig. 20 Thematic evolution of the WTC research.** The figure shows the trending themes in the different time periods, and the lines show the connections and evolution among them.

how government policies, technological development, and personal changes impact and drive change in the topic of research (Liu et al., 2021).

The most influential paper on the WTC topic is “Conceptualizing Willingness to Communicate in a L2: A Situational Model of L2 Confidence and Affiliation”. In the paper, MacIntyre et al. (1998) revealed that there are many learners with high linguistic competence who are unwilling to use their second language for communication, whereas some learners appear to be willing to communicate in their second language with quite limited linguistic competence. Thus, in addition to linguistic knowledge and communicative competence, they proposed WTC as the primary goal of language instruction. To display how potential variables affect learners’ WTC in the L2, they presented a heuristic model. The variables are shown in six layers in a pyramid-shaped structure, showing both enduring influences (e.g., inter-group climate, learner personality, communicative competence, etc.) and situational influences (e.g., desire to communicate with a specific person, state communicative self-confidence, etc.) The model has pointed out the direction for the later studies, and it is widely cited in so many studies that it became the second most frequent word in the field. MacIntyre et al. (2002) published another paper that ranked the fourth most cited, which is “Sex and age effects on willingness to communicate, anxiety, perceived competence, and L2 motivation among junior

high school French immersion students”. In the paper, they studied the effects of language, sex, and grade on WTC, anxiety, perceived communication competence, frequency of communication in their L2, and attitude variables at each grade level in a junior high school. Their finding showed that boys appeared more anxiety than girls in grade 9. The second most cited paper is “Willingness to communicate in a second language: The Japanese EFL context” by Yashima (2002). The study confirmed that the heuristic model fits well in the Japanese context and revealed that international posture has an indirect influence on WTC by affecting motivation. Yashima et al. (2004a, 2004b) also published a paper that is the third most cited in the field, which is “The influence of attitudes and affect on willingness to communicate and second language communication”. In the paper, the researchers tested and confirmed that the attitudinal construct of international posture leads to WTC as well as communication behavior by testing the data with structural equation modeling. Peng and Woodrow (2010) published “Willingness to Communicate in English: A Model in the Chinese EFL Classroom Context” that ranked as the fifth most cited paper. Their study investigated WTC in Chinese EFL classrooms and showed classroom environment predicts WTC, communication confidence, learner belief, and motivation. They proposed a hypothesized model to present the interaction among the direct and indirect factors of WTC by using structural equation modeling.



certain keywords. There could be further articles if additional keywords were used. Future research could conduct an analysis of a combination of data from different databases and include book chapters as well as conference proceedings. Another possible future route is to develop more advanced technologies for bibliometric analysis so that more dimensions can be covered and visualized.

### Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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### Author contributions

HM: acquisition, analysis, and interpretation of data for the work. LI: revising the work critically for important intellectual content. NN and ABMR: revising the work critically and final approval of the version to be published.

### Competing interests

The authors declare no competing interests.

### Ethical approval

This study does not involve any human or animal subjects.

### Informed consent

This article does not contain any studies with human participants performed by any of the authors.



**Additional information**

**Supplementary information** The online version contains supplementary material available at <https://doi.org/10.1057/s41599-023-02109-8>.

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