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Knowledge Structure Mapping of Second Language Oral Fluency Research in China (2010–2025): A CiteSpace-Based Exploration of Hotspots and Evolutionary Trends

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Abstract This study employs CiteSpace, a visual analytics tool, to conduct a knowledge mapping analysis of research on L2 oral fluency published in Chinese journals between 2010 and 2025. The aim is to delineate the core themes and research frontiers within this domain and to explore its future development trend. The findings reveal a resurgence of interest in L2 oral fluency research in China; however, a stable core group of authors has not yet formed, and scholarly collaboration networks remain relatively sparse and fragmented. Current research hotspots are primarily concentrated on the measurement of oral fluency and pedagogical interventions. Studies predominantly focus on English learners, suggesting a need for broadening the research perspective. Future research should prioritize strengthening academic collaboration, promoting the integration of technology, and fostering synergistic development between theory and practice.

Keywords L2 speaking; fluency; CiteSpace; knowledge mapping analysis

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Oral fluency, a core dimension in second language acquisition and oral proficiency assessment, serves as a critical indicator for evaluating learners' communicative efficiency and language automaticity. It has consistently been a central concern in foreign language teaching and research. Against the backdrop of ongoing advancements in China's foreign language education policies and the increasing demands for international communication, the importance of oral proficiency has become ever more prominent. Particularly in higher education and professional contexts, fluency has emerged as a significant standard for gauging linguistic competence. To understand and track the hotspots and frontiers of L2 oral fluency research in China, this study utilizes CiteSpace, an information visualization software, to construct scientific knowledge maps based on relevant literature published in China from 2010 to 2025. By applying this visual analytics approach, the study moves beyond traditional literature reviews to reveal the current status, hotspots and dynamic trends within the field. The findings not only trace the development of L2 oral fluency research in China but also offer practical insights, serving as a valuable guide for future research priorities and evidence-based teaching improvements.

1. Research Design

1.1 Data Sources

This study utilized the China National Knowledge Infrastructure (CNKI) database as its primary data source. The search was conducted using the subject terms "二语口语流利" (L2 oral fluency), "外语口语流利" (foreign language oral fluency), and "英语口语流利" (English oral fluency). The publication type was limited to journal articles, and the timeframe was set from 2010 to 2025. Conference proceedings, book reviews, and marginally relevant publications were manually excluded from the initial search results. This resulted in a final dataset of 213 articles. These records were then exported in Refworks format for subsequent analysis.

1.2 Research Methods

The exported data were processed and converted using CiteSpace to generate a dataset amenable to visual analysis. The parameters were configured as follows: the time span was set from 2010 to 2025 with a time slicing of one year per slice. Node types were selected as "Author" and "Keyword" to perform a visual analysis on the sample literature. This process generated corresponding knowledge maps and related data for author co-occurrence, keyword co-occurrence, keyword clustering, and keyword burst detection.

2. Results and Analysis

2.1 Annual Publication Trend Analysis

The volume of published research outputs in a discipline, to some extent, reflects the field's research activity and developmental status (Li & Wang, 2023). A statistical analysis of the sample literature was performed using Microsoft Excel. As illustrated in Figure 1, the analysis reveals three distinct developmental phases: (1) Rapid Growth Phase (2010–2013): During this period, the annual publication count increased from 15 in 2010 to a peak of 27 in 2013, with a total of 78 publications. This stage was characterized by a continuous expansion in the scope and scale of research, exemplified by studies such as Yang et al.'s (2011) investigation into pauses within intonation phrases and Yin et al.'s (2010) comparative study on the impact of computer-assisted testing versus face-to-face interviews on oral fluency. (2) Fluctuating Downturn Phase (2014–2018): This stage witnessed a significant decline in the annual number of publications. (3) Stabilization and Rebound Phase (2019–2025): Driven by advancements in speech recognition technology and reforms in educational policy emphasizing oral skills, the publication volume in this period showed signs of recovery. The research scope also broadened, as seen in Zeng et al.'s (2020) study on the effects of different peer feedback modes on oral output in a mobile-assisted language learning environment.

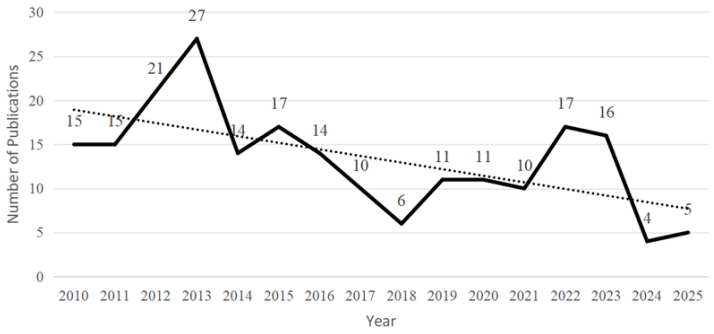

Figure 1: Annual publication trend in L2 oral fluency research in China (2010-2025).

2.2 Author Analysis

The node type was set to "Author" to generate an author co-occurrence map. The results showed a network comprising 253 author nodes and 116 connecting lines, with a density of 0.0036. In this context, the lines represent collaborative relationships between authors, while the density indicates the overall tightness of these collaborations. A quantitative analysis of contributing authors helps to identify the core researchers in the field and assess their influence. Core authors are defined as those who exert a substantial impact within a specific research domain.

Price's Law is widely used to measure the distribution patterns of authors across different research fields. According to the formula for Price's Law:

$M=0.748\times\sqrt{Nmax}$,

where N max represents the highest number of publications by a single author. As shown in Table 1, Yang Meng had the highest publication count (N max=10). Substituting N max=10 into the formula yields M=2.36. Therefore, authors who have published more than 3 articles are considered core researchers in this field. A total of 9 authors met this criterion, collectively publishing 35 articles, which accounts for 16% of the total publications. According to Price's Law, a core author group is considered formed when their collective publications constitute 50% of the total literature. However, the figure of 16% is significantly lower than 50%, indicating that a stable core author group has not yet been established in the field of L2 oral fluency research in China.

Table 1: Publication record of major contributors

No.	Publications	Author	First Pub. Year
1	10	Yang Meng	2011
2	4	Qi Yi	2011
3	3	Li Pei	2023
4	3	Wang Xizhu	2017
5	3	Sui Mingcai	2017

Regarding collaborative relationships among authors, the network density was 0.0036 and the modularity Q value was 0.9796. A Q value greater than 0.3 indicates a significant community structure within the network (Li & Chen, 2022). As illustrated in Figure 2, the connections between core authors are few and relatively dispersed, with a low node density. This suggests that collaborative relationships among authors are fragmented, and the strength of cooperation among scholars in this field needs to be enhanced.

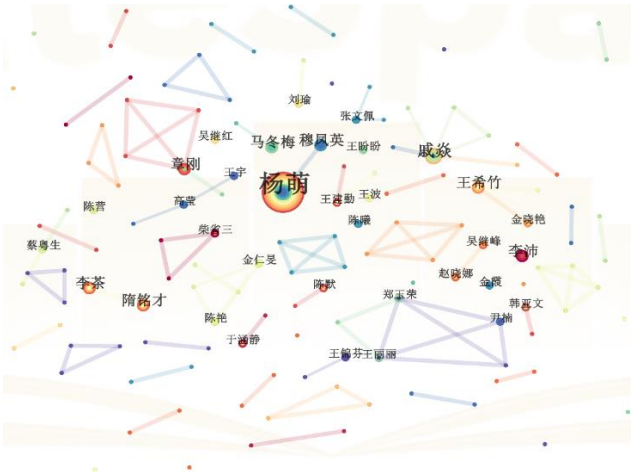

Figure 2: Author Collaboration Network

2.3 Analysis of Research Hotspots

The analysis of high-frequency keywords serves as an effective approach to gain insight into the core dynamics of a research domain. It can clearly reveal current hotspots, indicate future trends, and uncover interrelationships between different research themes. Using CiteSpace, a high-frequency keyword analysis was performed on the literature, resulting in a network of 227 nodes and 317 links. The frequency and centrality of keywords were compiled, and Table 2 displays the top 20 keywords ranked by frequency. As shown in the table, "Oral fluency" ranked first with a frequency of 42, followed by "Accuracy" and "English speaking". From a centrality perspective, keywords such as "English speaking", "Fluency level", "Accuracy", and "Pause" exhibited high centrality values, indicating that these keywords represent the hotspots and core themes of L2 oral fluency research. These research hotspots are substantiated by several representative studies. For instance, the investigation by Ma (2014) into the correlation between pausing features and oral proficiency scores empirically validates the significance of "pauses" as a core indicator of fluency. Research by Yu and Dai (2019) on the dynamic relationship between oral complexity and accuracy reveals a developmental path from competition to synergy, thereby deepening the understanding of these core dimensions. Furthermore, the work of Yu and Zhang (2024) on heterogeneous developmental trajectories of oral fluency exemplifies the latest advancement in this field toward more dynamic and refined inquiry.

Table 2: Keyword frequency and centrality

No.	Keyword	Frequency	Centrality	First Year
1	Oral fluency	42	0.28	2010
2	Accuracy	30	0.23	2010
3	English speaking	28	0.38	2010
4	Fluency level	25	0.32	2010
5	Formulaic Sequence	16	0.15	2010
6	Speaking	15	0.11	2010
7	Pause	14	0.2	2010
8	Accuracy Measure	11	0.04	2015
9	Complexity Level	11	0.05	2015
10	Oral Output	11	0.09	2012
11	Oral Language Teaching	11	0.1	2010

12	Complexity	10	0.03	2010
13	Lexical Chunk	9	0.17	2011
14	Correlation	8	0.04	2010
15	Oral Expression	7	0.06	2010
16	Second Language	7	0.08	2011
17	Oral Proficiency	6	0.12	2011
18	L2 Speaking	5	0.06	2013
19	English	4	0.01	2010
20	Working Memory	4	0.02	2011

Keyword clustering was performed using CiteSpace, resulting in a keyword cluster map with a network density of 0.0124, a modularity Q value of 0.8158, and a mean silhouette S value of 0.9472. The Q and S values reflect the reasonableness of the clustering; a Q value greater than 0.3 indicates a significant cluster structure, and an S value greater than 0.7 suggests a convincing clustering result (Chen et al., 2015). As shown in Figure 3, eleven keyword clusters were identified: #0 English Speaking, #1 Oral Fluency, #2 Accuracy, #3 Pause, #4 English, #5 Formulaic Sequence, #6 Influencing Factors, #7 Chunk-based Instruction, #8 Oral Language Teaching, #9 Oral Proficiency, #10 L2 Speaking, and #11 Inaccuracy. Analysis of the cluster map reveals that the field has developed a well-defined core architecture. "Oral Fluency," "Pause," "Accuracy," and "Inaccuracy" collectively constitute the core measurement and evaluation dimensions of the research. The fact that "Pause" formed a distinct cluster underscores the granularity of micro-level research, highlighting its role as a key indicator of fluency disruption. Meanwhile, "English speaking" as the largest cluster indicates that the research focus remains predominantly on English as the target language.

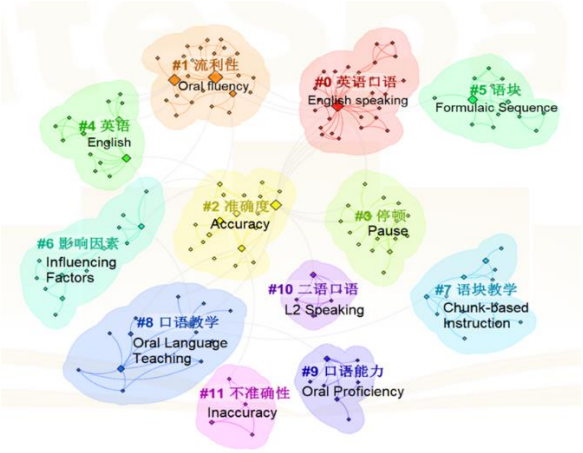

Figure 3 Keyword cluster map

2.4 Analysis of Research Frontiers

A keyword burst detection analysis was further conducted using CiteSpace to identify emerging research frontiers. The top 25 keywords ranked by burst strength were selected for quantitative analysis, and the results are presented in Figure 4.

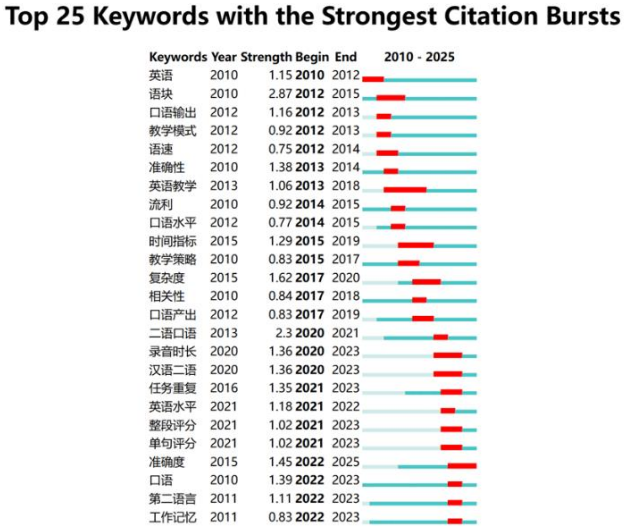

Figure 4: Keyword burst map

The analysis reveals three main findings. First, regarding the starting year of keyword bursts, "English" emerged the earliest, with its burst beginning in 2010. This was followed by "formulaic sequence," "oral output," "teaching model," and "speech rate," all of which started to burst in 2012. In contrast, keywords such as "accuracy," "speaking," "second language," and "working memory" emerged more recently, with bursts starting in 2022.

Second, in terms of the duration of research hotspots, "English language teaching" maintained the longest period of research interest, spanning from 2013 to 2018 for a duration of five years. "Temporal measures" ranked second, sustaining research attention for four years from 2015 to 2019.

Third, with respect to burst strength, "formulaic sequence" ranked first with a strength value of 2.87, indicating that it is widely recognized as a critical pathway for enhancing oral fluency.

In summary, research hotspots in L2 oral fluency are closely associated with high-frequency keywords, and three distinct characteristics are evident. First, the core research themes remain concentrated and stable. Researchers consistently focus on the scientific measurement of oral production quality, with a continued emphasis on the speaking performance of English learners. Second, teaching practice has long been a dominant theme. The highest burst strength of "formulaic sequence" and the longest duration of "English language teaching" demonstrate that academia has persistently concentrated on enhancing fluency through pedagogical methods, particularly by leveraging formulaic sequences to facilitate more fluent expression. Third, emerging directions are beginning to surface. The burst of "working memory" and "second language" in 2022 suggests that research is starting to explore the psychological underpinnings of fluency variations and is attempting to move beyond the exclusive focus on English toward incorporating learners of other languages.

3. Conclusions and Prospects

3.1 Research Conclusions

Oral fluency is a critical component in the assessment of speaking proficiency. This study employed CiteSpace to conduct a knowledge mapping analysis of literature on second language (L2) oral fluency published in China between 2010 and 2025, aiming to elucidate the current research landscape, hotspots, and future development trends in this field. Through analyzing annual publication volume, author collaboration networks, keyword clustering, and burst detection, this research not only delineated the evolutionary trajectory of the domain but also identified core research themes and potential future directions.

The findings indicate that research on L2 oral fluency has undergone three distinct phases: rapid growth, fluctuating downturn, and stabilization and rebound. Nevertheless, a stable core group of authors has yet to emerge, and collaborative networks among scholars remain relatively fragmented, suggesting substantial potential for fostering deeper cooperation and exchange. High-frequency keywords and cluster analysis have revealed that "oral fluency",

"accuracy", and "English speaking" are the core topics, and these topics have shown a stable development trend. Furthermore, "formulaic sequence" is widely acknowledged as a key pathway for enhancing oral fluency, and its high recent burst strength reflects the significance of pedagogical practices in this area.

3.2 Research Prospects

First, it is essential to enhance collaboration among researchers. Given the current insufficiency in collaborative efforts, future studies should promote cross-institutional and interdisciplinary cooperation to jointly explore strategies for measuring and improving L2 oral fluency. Establishing tighter collaborative networks will deepen the understanding of this field and facilitate the practical application of research outcomes.

Second, diversifying research perspectives is crucial. While existing studies have predominantly focused on English learners' oral performance, research on the oral fluency of learners of other languages is equally important amid accelerating globalization. Scholars should broaden their research scope to include learners from diverse linguistic backgrounds, which will enrich theoretical frameworks and practical guidance for L2 oral fluency.

Third, promoting technology-driven pedagogical innovation is imperative. With ongoing advancements in speech recognition technology and artificial intelligence, future research should actively explore how these technologies can be leveraged to refine oral language teaching methods and enhance learners' oral fluency.

In summary, the field of L2 oral fluency research is replete with both opportunities and challenges. By expanding research boundaries, strengthening collaborative networks, and integrating new technologies, this domain can achieve more substantial outcomes, providing a robust theoretical foundation and practical methodological guidance for improving oral proficiency among language learners worldwide.

Conflict of Interest: None declared.

Ethical Approval: Not applicable.

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