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A BIBLIOMETRIC ANALYSIS OF THE EVOLUTION AND INNOVATION OF DIGITAL EFL INSTRUCTION AT THE TERTIARY LEVEL IN CHINA

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Abstract

In recent years, digital technology has significantly influenced EFL (English as a Foreign Language) instruction at the tertiary level in China. While empirical studies have explored various digital tools and pedagogical strategies, there remains a lack of comprehensive, long-term analyses that map the evolution of this research field. This study aims to provide a bibliometric overview of research trends, thematic focuses, and emerging topics in digital EFL instruction at the tertiary level in China from 2005 to 2024. This study analyzes a total of 32 academic articles retrieved from two major databases—Web of Science and Scopus. Utilizing CiteSpace (version 6.3.R1), the research employs advanced bibliometric visualization techniques to construct keyword co-occurrence and citation network maps. These visualizations facilitate the tracking of thematic evolution over time and the identification of emerging research trends. The analysis reveals five distinct research phases, with peak publication activity in 2018. Four main thematic clusters were identified: professional identity, data mining, pedagogy, and innovative teaching models. Recent research emphasizes teacher development, mobile learning, and student-centered approaches, while earlier studies focused more on autonomous learning and blended instruction, etc. This study fills a notable gap in the literature by offering a systematic, time-sliced visual map of the intellectual structure of digital EFL research in Chinese higher education. It provides both theoretical and practical insights for future research and educational policy-making in the context of digital transformation. The study relies on only two databases and one bibliometric tool, which may limit the scope and completeness of the findings.

Keywords: Chinese higher education; Digital technology; EFL teaching; Research trends; Visualization analysis

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Abstrak

Sejak beberapa tahun kebelakangan ini, teknologi digital telah memberi kesan yang signifikan terhadap pengajaran EFL (English as a Foreign Language) di peringkat pengajian tinggi di China. Walaupun pelbagai kajian empirikal telah meneliti penggunaan alat digital dan strategi pedagogi, kajian jangka panjang yang menyeluruh bagi memetakan perkembangan bidang ini masih terhad. Sehubungan itu, kajian ini bertujuan untuk menyediakan gambaran bibliometrik tentang trend penyelidikan, fokus tematik dan topik baharu yang muncul dalam pengajaran EFL digital di institusi pengajian tinggi di China dari tahun 2005 hingga 2024. Sebanyak 32 artikel akademik yang diperoleh daripada pangkalan data Web of Science dan Scopus telah dianalisis. Dengan menggunakan perisian CiteSpace (versi 6.3.R1), kajian ini membangunkan peta kejadian bersama kata kunci dan rangkaian sitasi bagi menjejak evolusi tema penyelidikan serta mengenal pasti trend yang sedang berkembang. Dapatan menunjukkan lima fasa penyelidikan yang berbeza, dengan kemuncak penerbitan pada tahun 2018. Empat kluster tematik utama dikenal pasti, iaitu identiti profesional, perlombongan data, pedagogi dan model pengajaran inovatif. Kajian terkini menekankan pembangunan profesional guru, pembelajaran mudah alih dan pendekatan berpusatkan pelajar, manakala kajian terdahulu lebih menumpukan pembelajaran kendiri dan pengajaran teradun. Kajian ini menyumbang kepada literatur dengan menyediakan peta visual sistematik tentang struktur intelektual penyelidikan EFL digital di China, di samping menawarkan implikasi teori dan praktikal untuk penyelidikan serta penggubalan dasar pendidikan. Namun demikian, penggunaan dua pangkalan data dan satu alat bibliometrik sahaja mungkin mengehadkan keluasan dapatan kajian.

Kata kunci: Analisis visualisasi; Pendidikan tinggi di China; Pengajaran EFL; Teknologi digital; Trend penyelidikan

1.0 INTRODUCTION

The focus of English education in China has transitioned from merely improving students' writing abilities, overall English proficiency, and creativity to a more nuanced approach that includes conducting thorough research and addressing specific concerns. These concerns encompass linguistic challenges, media influences, the role and structure of educational institutions and programs, the rise of online courses, teaching methodologies, and curriculum development. These insights demonstrate how the Belt and Road Initiative has reshaped English education policies in China and outline future research directions (Hu, Li & Luo, 2024).

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The landscape of English as a Foreign Language (EFL) teaching at the tertiary level in China has undergone substantial transformation over the past two decades, driven by advancements in technology and innovative pedagogical approaches. This evolution reflects a broader global trend towards the integration of digital tools and data-driven methodologies in education.

The early 2000s marked a significant shift with the introduction of the College English Teaching Reform by the Ministry of Education (MOE) in 2004. This reform aimed to enhance students' practical English skills, focusing more on listening and speaking rather than traditional grammar and translation methods. The pandemic accelerated the adoption of online learning platforms and virtual classrooms. EFL teaching in Chinese higher education has increasingly adopted fully online or hybrid models, incorporating flipped classrooms and leveraging digital platforms and resources to enhance student engagement and learning efficiency (Kong, Li & Guo, 2024). Recent empirical evidence suggests that digital educational games can significantly enhance students' motivation for learning by increasing their learning engagement, particularly within immersive digital leaning environments (Li, Chen & Deng, 2024). Ongoing research in EFL teaching methods has continued to influence practices in Chinese higher education. Innovations in pedagogy, such as flipped classrooms and the use of artificial intelligence in language learning, are being explored and implemented (Hu, Li & Luo, 2024).

Digital teaching has become an integral component of EFL instruction, particularly in the context of higher education in China. Digital literacy is crucial for both teachers and students in modern education. Teachers equipped with digital skills can effectively integrate technology into their teaching practices, which improves the overall quality of education (Zhang, 2023). According to Feng (2023), digital literacy among students is positively correlated with their enjoyment of learning and self-efficacy in online education environments. These tools make learning more interactive and enjoyable, which can lead to better learning outcomes. Digital technologies enable personalized learning experiences tailored to individual student needs. Through data analytic and adaptive learning systems, educators can track student progress and customize instruction to address specific learning gaps. It has been shown to improve learning efficiency and effectiveness (Guo, Wang & Ortega-Martín, 2023).

Although a growing number of bibliometric analyses and systematic reviews have examined educational research in China such as Xu's (2024) review on teaching Chinese as

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a foreign language in higher education and Wang and He's (2022) study on technology integration in tertiary education—these works largely focus on specific languages (e.g., Chinese) or broader educational levels. Meanwhile, empirical studies on digital EFL instruction in Chinese higher education have increased, but many remain fragmented, emphasizing isolated tools or strategies (Feng & Sumettikoon, 2024; Sun & Zou, 2024), and lacking a holistic understanding of how research themes and technologies have evolved over time. Moreover, few reviews adopt bibliometric approaches to systematically map the intellectual structure of the field, identify thematic clusters, or detect citation bursts. These gaps limit our understanding of how scholarly interest has responded to educational reforms and technological shifts.

To address these gaps, this study conducts a bibliometric review using CiteSpace (version 6.3.R1) based on records published from 2005 to 2024. Specifically, it aims to identify dominant research themes, trace their temporal evolution, and uncover emerging research frontiers in technology-enhanced EFL education in Chinese higher education through bibliometric and visualization techniques. The findings are expected to provide valuable insights for future empirical research and policy-making in this field.

2.0 LITERATURE REVIEW

In the last several years, digitalization has accelerated dramatically and completely changed the teaching strategies used by universities. Higher education is moving decisively toward a digital future (Kopp, Gröblinger & Adams, 2019). The report from the 20th National Congress of the Communist Party of China advocates for advancing the digitalization of education. Action Plan for Educational Digitalization 2.0 was introduced by the Chinese Ministry of Education (MOE) in 2018. This strategy, which builds on previous instructions from the State Council and the Central Committee of the Communist Party of China, intends to accelerate the digital transformation of the education system and move Chinese higher education into a more advanced stage of digitalization (Xiao, 2023). Moreover, China has entered the 14th five-year development period (2021-2025), higher standards are proposed for digital instruction in higher education. In 2022, Chinese MOE released a publication titled "Digital Literacy of Teachers", which outlined five essential qualifications for teachers. In Chinese higher education, digital instruction is becoming increasingly significant. Numerous studies demonstrate the increasing focus on digital education (Xiao, 2019, 2023).

Numerous studies have demonstrated that EFL students significantly benefit from

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digitally integrated classrooms, as these environments leverage a variety of technological tools to enhance language learning outcomes. Digital tools, such as multimedia applications and mobile-assisted language learning platforms, not only promote engagement but also support personalized learning and improve language acquisition across multiple skill areas (Bećirović, Brdarević-Čeljo & Delić, 2021; Garzón, Lampropoulos & Burgos, 2023; Lai et al., 2022; Stockwell, 2021). Some other studies showed that digital technology may enhance EFL students in many ways by offering flexible learning possibilities beyond regular classroom settings (Lo, 2023; Meirbekov et al., 2024; Nikolopoulou, 2023).

Pikhart, Klimova and Al-Obaydi (2024) and Zhang (2022) have shown that digital technologies have a considerable positive impact on student engagement through the facilitation of social connection, the promotion of self-directed learning, and the active participation in language-related tasks. With the use of interactive activities like vocabulary practice, group projects, and real-time feedback, these technologies support students' language learning more successfully and provide an environment that is both dynamic and inspiring for learning.

However, previous research on the application of digital technology in Chinese EFL instruction have mostly examined how digital tools affect language acquisition (Cao, Rasul & Omar, 2023; Wang, 2024). A longitudinal analysis that tracks the evolution of themes and technologies over time is scarce. This review employs Citespace, a prominent science mapping tool, to reveal trends and connections in the field of digital EFL teaching by mapping co-citation patterns from academic publications and their bibliographic data. This approach enables the visualization of relationships among articles, constructing a synthesized network that illustrates the domain's intellectual landscape and highlights key research contributions and thematic developments (Chen, 2006). Present study tries to address the following research questions:

1. What is the overall publication volume and distribution of research on digital EFL teaching?

2.What are the predominant research areas, and how have they evolved over time?

3.What emerging research trends and directions can be identified in this field over the past two decades?

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3.0 MATERIALS AND METHODS

The researchers investigated the dynamics of research and development trends in the field of digital EFL teaching in Chinese higher education through the use of visualization technologies and bibliometric analysis. The scientometric tool CiteSpace was utilized to construct and analyze knowledge graphs, thereby elucidating the evolution of themes and identifying research hotspots within the field.

CiteSpace (version 6.3.R1) was chosen over other well-known tools like VOSviewer and Bibliometrix to perform the bibliometric analysis in this study because of its unique advantages in exposing the temporal dynamics and intellectual structure of a research domain. CiteSpace effectively supports the monitoring of evolving trends in digital technology-enhanced EFL instruction through its capacity to identify citation bursts, which serve as key indicators of emerging themes and academic shifts (Chen, 2006). Furthermore, CiteSpace supports time-sliced co-citation analysis, enabling researchers to examine how research themes emerge, evolve, or decline across specific time intervals, a flexibility that VOSviewer and Bibliometrix offer to a much lesser extent (Chen, 2017). Unlike traditional modularity-based clustering algorithms, CiteSpace combines log-likelihood ratio (LLR) with latent semantic indexing (LSI) for cluster labeling, producing more interpretable and semantically rich clusters (Chen, Ibekwe-SanJuan & Hou, 2010). Additionally, the tool measures betweenness centrality to identify intellectual turning points in the literature, revealing important research that span many subdomains (Chen, 2004). With its advanced analytical capabilities, CiteSpace is particularly well-suited for mapping the research landscape of digital technology integration in Chinese higher education EFL instruction.

The data were retrieved from the Web of Science Core Collection (WoS) and Scopus databases. To ensure comprehensive and relevant coverage, topic searches were conducted using the following query sets:

“digital teaching” OR “computer assisted teaching” OR “online teaching” OR “virtual teaching” OR “cyber teaching” OR “electronic teaching” OR “internet-based teaching” OR “digital education” OR “E-learning”;

“higher education” OR “college” OR “university” OR “tertiary”;

“teaching English*” OR “English teaching”.

Boolean operator AND was used between the sets of search terms. The timespan for data collection was set from 2005 to 2024, as the College English Teaching Reform was

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officially introduced by the Chinese MOE in 2004.

Initially, a statistical analysis of the collected literature is conducted to provide an overview of the "basic situation" of the field. Researchers can understand the amount of publications, distribution patterns, and trends in scholarly production across time by taking this step. Subsequently, Document Co-Citation Analysis (DCA) and thematic clustering are utilized to determine the "primary focus areas and evolvement" within the research domain. DCA, first introduced by Small (1973), is a bibliometric technique that identifies how frequently two documents are cited together by later works, thereby revealing the intellectual structure of a research field. In this study, DCA was implemented through CiteSpace, which enhances this technique by integrating network visualization and modularity-based clustering methods (Chen, 2004). Thematic clustering, supported by algorithms such as Log-Likelihood Ratio (LLR), allows the identification and labeling of major thematic areas based on co-citation patterns, facilitating the interpretation of key research topics (Chen, Ibekwe-SanJuan & Hou, 2010). This approach facilitates the examination of the interrelationships among publications and the emergence of thematic clusters, thereby elucidating the field's knowledge structure and its developmental progress. The next step is to apply burst detection techniques to find "emerging trends", which are publications or subjects that have a notable increase in citations or academic prominence over particular time periods. This stage attempts to identify the quickly developing hot topics in research of this domain. In the final stage, the results from the previous analyses are combined to discuss the "basic situation", "primary focus areas and development" and "emerging trends" in the field.

To summarize, this study employed CiteSpace (version 6.3.R1) to conduct DCA based on a time-sliced approach covering 2005 to 2024 (1-year per slice). The unit of analysis was set to "Cited References", and term sources included titles, abstracts, author keywords, and keywords plus. The g-index scale factor (k) was set to 25, and the Top N = 50 citation threshold was applied in each slice to retain the most frequently cited references. No pruning algorithm (e.g., Pathfinder) was applied; all other settings were left at their default values.

Despite the absence of pruning, the network was refined through threshold-based node selection, which effectively filtered low-frequency nodes and emphasized significant contributions. This strategy ensures thematic clarity in the resulting knowledge map and aligns with established bibliometric research practices (Chen, 2006; Chen, Ibekwe-SanJuan & Hou, 2010).

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4.0 RESULTS AND DISCUSSION

The literature search was conducted using two major academic databases, WoS and Scopus, resulting in a total of 44 records, with 12 retrieved from WoS and 32 from Scopus.

All articles were initially screened based on their titles and abstracts. In cases of uncertainty, the first and third authors reviewed the full text and discussed its relevance according to the set criteria. To ensure the relevance of the articles for this study, which focuses on publications related to digital language learning and teaching over the past two decades, the following criteria were applied in Table 1.

Table 1: *Inclusion and Exclusion Criteria*

Inclusion criteria	Exclusion criteria
· Published between 2005 and 2024	· Publication period is not between 2005 and 2024
· Thematic relevance to digital EFL teaching at the tertiary level in China	· Did not focus on digital EFL teaching in Chinese higher education
· Peer-reviewed articles	· Not peer-reviewed articles (e.g. books, dissertations, conference proceedings, review articles and reports)
· Written in English	· Articles in languages other than English

After applying screening procedures, duplicate removal, and inclusion/exclusion criteria, a total of 32 articles were retained for the final review. Although this review did not formally adopt the PRISMA 2020 guidelines (Page et al., 2021), the process was inspired by the general structure of PRISMA's principles, aiming to ensure transparency in the literature screening and selection process.

The retrieved bibliometric data, including authorship, titles, institutional affiliations, language, source publications, funding details, abstracts, and references, were first imported into CiteSpace. Guided by the research questions, the study employed descriptive statistics, document co-citation analysis (DCA), and burst detection to examine the data. Chen (2006) developed the CiteSpace software to extend the application of DCA, enabling the visualization and cluster analysis of scientific literature using this tool. As a bibliometric method for revealing relationships between articles, DCA constructs a knowledge network by identifying articles that are cited together within the same research article (i.e., co-citation). It then analyzes the knowledge structure and dynamic development of a specific research field. Chen, Ibekwe-

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SanJuan and Hou (2010) discussed the specific application of the two key metrics of DCA to evaluate clustering quality: modularity and silhouette value. Modularity assesses how well a network can be divided into independent sub-networks, with higher values indicating clearer citation relationships. The silhouette value measures cluster consistency, where 1 indicates perfect clustering and -1 indicates poor clustering. These metrics help ensure accurate clustering in DCA. Chen (2016) stated that the most reliable algorithm in DCA is the Log-Likelihood Ratio (LLR), as it consistently produces the best outcomes for uniqueness and coverage. Burstness detection is employed to identify landmark and influential publications. As a metric that tracks the rate of change, burstness serves as a valuable tool for tracing the evolution of research focus (Chen, Ibekwe-SanJuan & Hou, 2010).

4.1 Results

4.1.1 The overall publication volume and distribution of research on digital EFL teaching

As shown in Figure 1, the publication trend can be categorized into three major phases: an initial low-output stage (2005–2012), a growth and peak stage (2013–2018), and a post-peak stabilization stage (2019–2024).

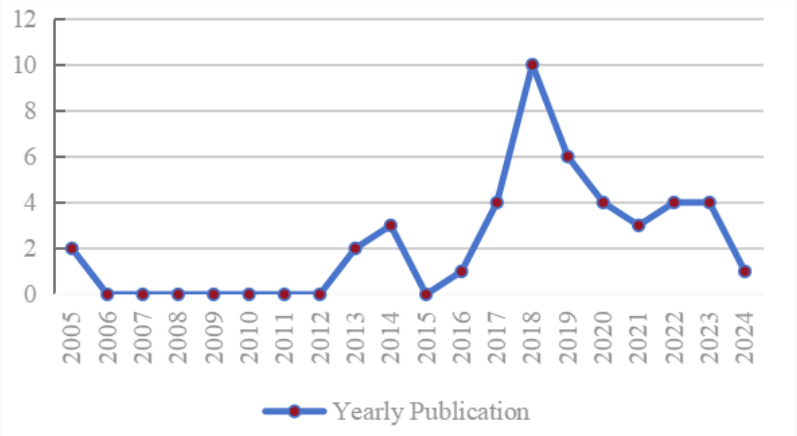

Figure 1: Annual publications on digital EFL teaching in China (2005–2024)

The number of yearly publications was relatively low and stable in early years, with minimal variation. This suggests limited research activity or interest in the field during this period. Starting around 2013, there is a noticeable increase in publication volume. This upward trend continues, peaking significantly in 2018. This rise indicates growing academic interest and a surge in research activities within the field. The peak in 2018, with 10 publications, marks

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the highest level of research output during the observed period. This peak could be attributed to heightened academic focus or external factors such as increased funding or technological support in higher education. Following the 2018 peak, there is a marked decline in publication numbers in 2019 and 2020. The decrease might suggest a saturation of research topics or shifting interests to other emerging areas. From 2021 onwards, the number of publications stabilizes at a moderate level, fluctuating between 3 and 4 publications annually. This stabilization indicates a sustained, yet moderate, ongoing interest in the field.

4.1.2 The predominant research areas and their temporal evolution

Figure 2 visualizes the co-occurrence relationships between keywords in research on digital EFL at the tertiary level in China (2005–2024). The size of each node represents the frequency of the keyword, while the thickness of the connecting lines indicates the strength of co-occurrence between keywords. Notably, the color of each node reflects the average publication year of the documents in which the keyword appears, with light green indicating more recent topics and green to blue shades denoting earlier research areas.

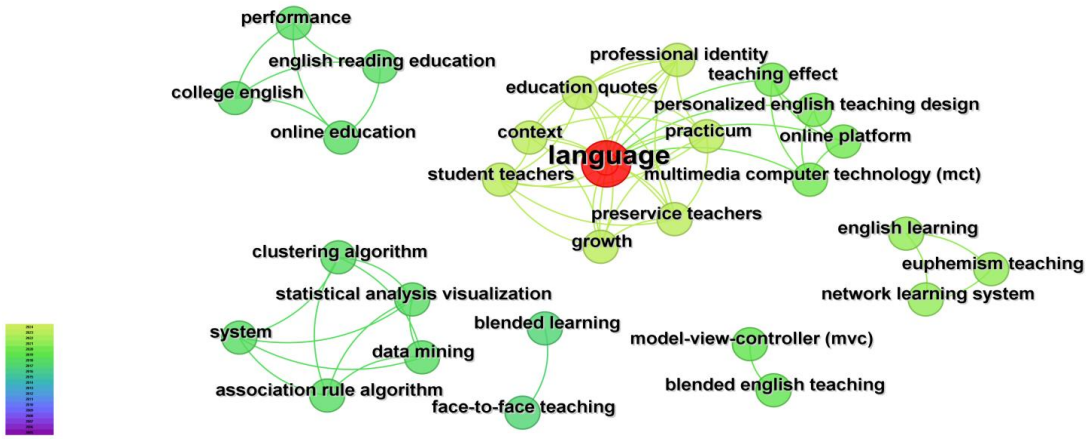

Figure 2: Co-occurrence of keywords

For example, “language” occupies a central position in the co-occurrence network, with strong links to keywords such as “preservice teachers” (light green), “education quotes” (light green), and “online platform” (green), indicating frequent thematic overlaps in the literature. Simultaneously, the overlay visualization shows that keywords like “practicum”, “student teachers”, and “professional identity”—all marked in light green—have more recently emerged (around 2020–2022), reflecting a growing research focus on teacher identity construction, practice-based training, and the contextualization of digital EFL instruction in higher education.

The keywords around “online education” and “college English” are mostly green,

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indicating that these research directions received more attention in earlier stages.

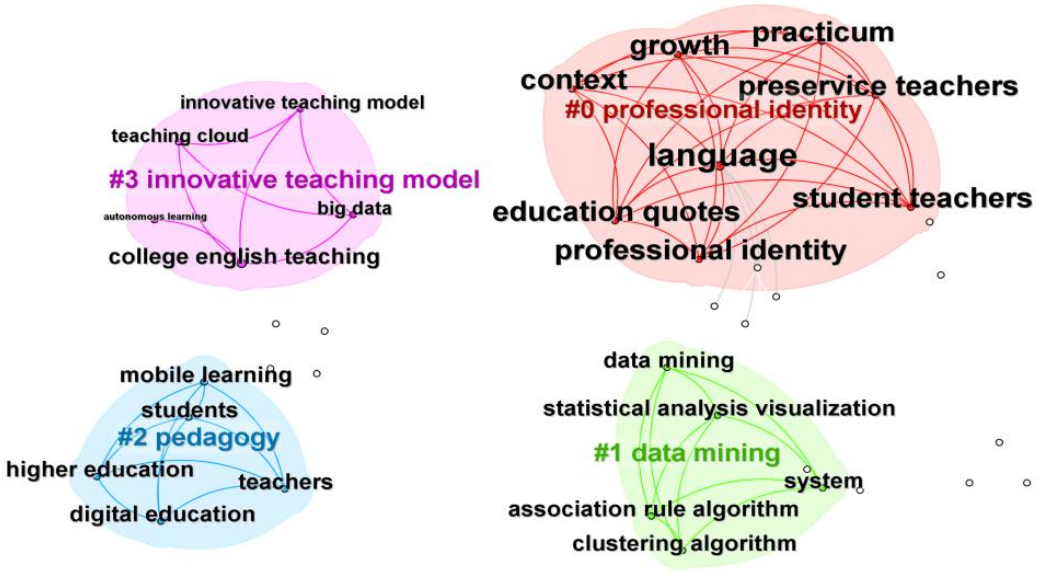

Figure 3: Co-citation network of digital EFL teaching research in China from 2005 to 2024 (Modularity=0.789, Silhouette=0.9841)

Keywords highly summarize the content of the article, and keyword clustering can scientifically describe the research hotspots in related fields (Chen, 2006). The Modularity (Q) value and Silhouette (S) value are the basis for judging the effect of the map drawing. The Q value represents the module value, and the S value represents the average profile value. Chen (2004) believes that the value range of Q is [0,1]. When Q > 0.3, it means that the clustering structure shown in the map is more significant; when the S value is more than 0.5, it indicates that the clustering result of the experimental data is more reasonable. If the S value is 0.7, it means that the clustering effect of the experimental data has high reliability. In this study, Q = 0.789, greater than 0.3; S = 0.9841, greater than 0.5. Therefore, the clustering structure of the experimental data is reasonable, the clustering results are also reasonable.

The most prominent cluster in the diagram is the “#0 professional identity” cluster in red. This cluster is centered on “language” and includes keywords such as “professional identity”, “education quotes”, “preservice teachers”, and “student teachers”, indicating that this cluster focuses on language education and the development of teachers’ professional identity. It reflects research on teachers’ professional identity, especially the roles and development of pre-service teachers and student teachers in language education.

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Cluster “#1 data mining” is represented by green, and contains keywords such as “data mining”, “statistical analysis visualization”, and “clustering algorithm”, focusing on the application of data analysis and mining technology in education. It emphasizes the research on improving educational effects through data technology.

Cluster “#2 pedagogy” is represented by blue, and contains keywords such as “mobile learning”, “higher education”, and “digital education”, focusing on the application of educational methods and technologies in higher education, especially the application of mobile learning and digital education in higher education, showing how to improve educational methods through new technologies.

Cluster “#3 innovative teaching model” is shown by purple, and contains keywords such as “innovative teaching model”, “big data”, and “college English teaching”, studying innovative teaching methods and the application of big data in teaching.

The linking lines between keywords indicate how often they co-occur in the same study. The thicker the line, the higher the co-occurrence frequency. For example, in the “#0 professional identity” cluster, there are more lines between “language” and “professional identity”, indicating that they often appear together in research.

The distribution of clusters highlights both the interconnection and the distinctiveness of various research directions. For example, the red “#0 professional identity” cluster and the green “#1 data mining” cluster are relatively independent, while the blue “#2 pedagogy” cluster and the purple “#3 innovative teaching model” cluster show a certain connection.

These research hotspots highlight key concerns in digital EFL teaching at the tertiary level in China, such as teacher professional identity, data technology integration, pedagogical innovation, and the use of big data. They reflect both the diversity of research in this field and the interconnections among its main directions.

4.1.3 Emerging research trends and directions in this field over the past two decades

As shown in Figure 4, the development trend of different research hotspots between 2005 and 2024, lists the occurrence and duration of each keyword in chronological order, and distinguishes different research topics by color.

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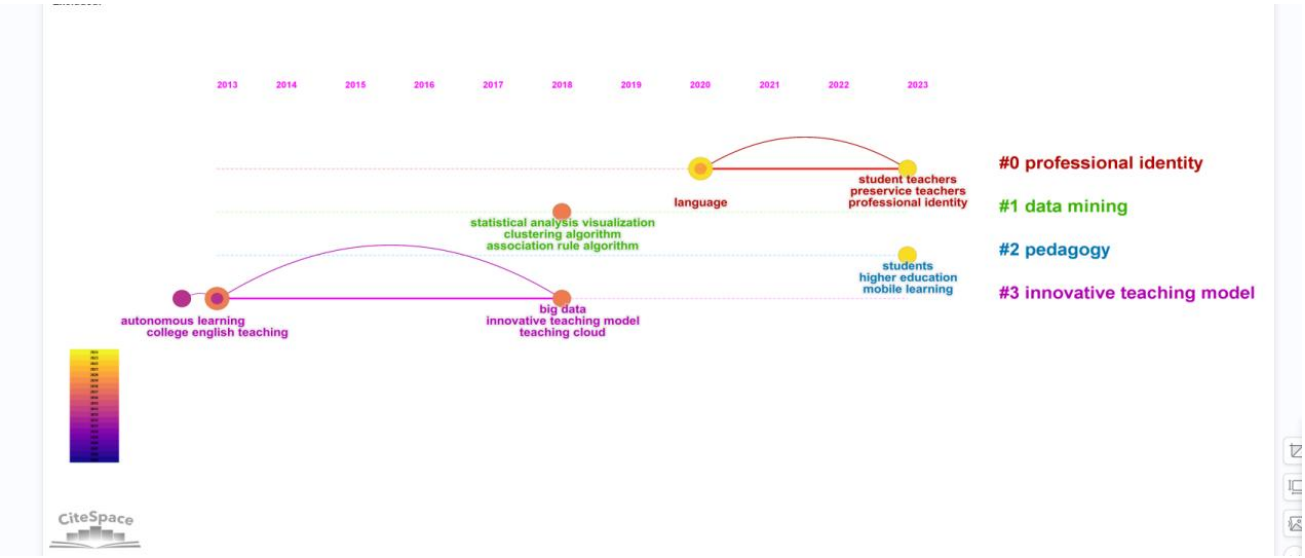

Figure 4: Timeline of research in this field

The study of the cluster #0 Professional Identity began to increase gradually in 2020, peaked in 2021, and remained active in the following years. This research hotspot has received more attention in recent years, especially the research on the professional identity of pre-service teachers and student teachers in language teaching. The cluster #1 Data Mining began to appear in 2013, peaked in 2017, and then gradually decreased. The cluster #2 Pedagogy began to appear in 2016 and peaked in 2020 and 2021. The study of pedagogical methods, especially mobile learning and students, has become very important in recent years, showing the impact of the development of educational technology on teaching methods. The cluster #3 Innovative Teaching Model started in 2013, peaked in 2015, and then gradually decreased. Innovative teaching models, including self-directed learning and the application of big data in university English teaching, were very active between 2013 and 2015, showing an early exploration of innovative educational methods.

To summarize, professional identity and pedagogical methods have become research hotspots in recent years, showing a continuing focus on teachers' professional development and the application of educational technology. Data mining and innovative teaching models were very active between 2013 and 2017, after which they were gradually replaced by new research hotspots. The changes in these research hotspots reflect the development of educational technologies and methods, as well as the changes in academic concerns over different time periods.

Figure 5 is the keyword time-zone chart which shows the evolution of research

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keywords and their relationships in the field of “college English teaching” from 2005 to 2024. Each node represents a research keyword, and the size and color of the node reflect the research popularity and time distribution of the keyword. The connection between nodes represents the association and co-occurrence relationship between different keywords. The thicker the line, the stronger the association between the keywords.

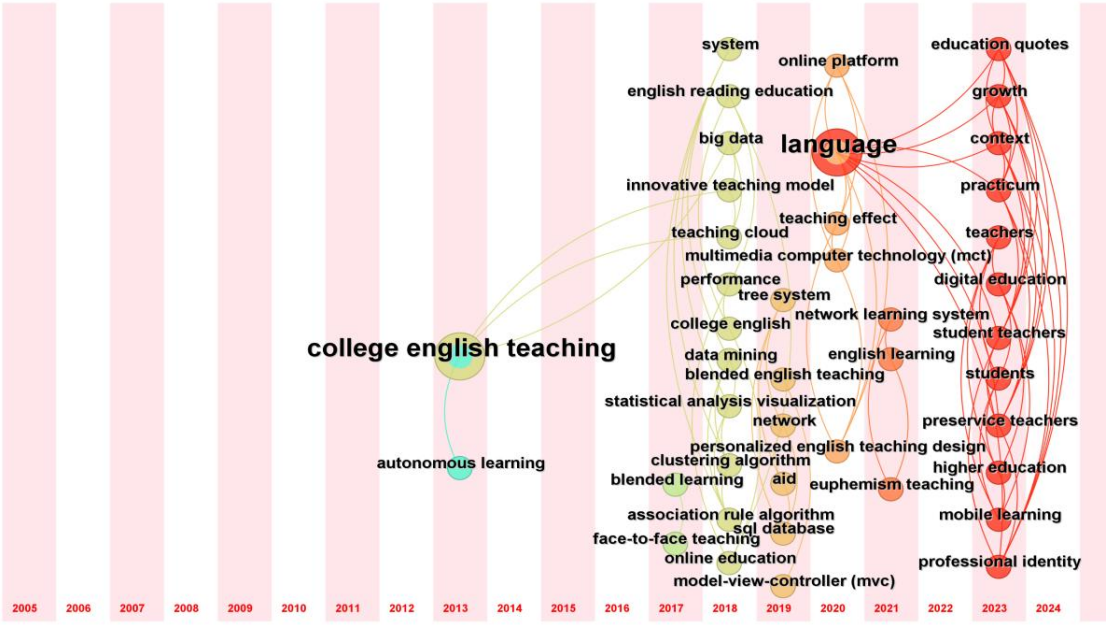

Figure 5: Keyword time-zone visualization showing the temporal evolution of research themes in digital EFL teaching in Chinese higher education

Keywords are arranged from left to right in the graph over time, and some research hotspots and changes in direction can be seen. In the early days (2005-2013), the keywords focused on “college English teaching” and “autonomous learning”. Since 2017, more emerging keywords such as “blended learning”, “data mining”, “multimedia computer technology”, etc. have begun to appear.

The central location and large nodes represent the hot keywords that have been studied in the current or past few years. For example, keywords such as “language” and “education” take center stage in the graph, showing their importance in research. Hot keywords in recent years include “digital education”, “mobile learning”, “network learning system”, etc., reflecting the development and application of educational technology. Multiple topic clusters can be seen in the diagram, which represent a combination of certain related keywords. For example, in the cluster near the right, keywords such as “digital education” and

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“mobile learning” are clustered together, indicating the relevance of research on these topics in recent years.

As can be seen from the figure, the focus of research has gradually shifted from the early basic teaching theory to the usage of technology and innovative teaching methods. For example, in recent years, there has been an increasing focus on “big data” and “personalized English teaching design”. Through this keyword time zone chart, we can clearly see the hot spots and trends in the field of college English teaching and research and help researchers understand the development trends and future research directions of this field.

4.2 Discussion

This study aimed to explore the research landscape of digital EFL instruction at the tertiary level in China through a bibliometric analysis of publications from 2005 to 2024. Three research questions guided the investigation, focusing on publication volume, thematic focus areas, and emerging research trends.

4.2.1 Research Trends

The analysis of publication volume revealed three major phases: an initial low-output stage (2005–2012), a growth and peak stage (2013–2018), and a post-peak stabilization stage (2019–2024). The surge in publications around 2018 may reflect policy shifts such as the 2017 release of the College English Teaching Guidelines, which emphasized the integration of information technology into English teaching. The subsequent decline could be attributed to topic saturation or disruptions caused by the COVID-19 pandemic. Nonetheless, the steady output in recent years suggests a continued interest in digital EFL research in China. These research phases illustrate the maturation of the field, transitioning from initial experimentation with tools to more structured applications of digital methods in pedagogy. This shift echoes broader institutional developments observed in Chinese higher education, where digital transformation has progressed from fragmented pilot projects to more integrated, strategic implementations (Xiao, 2019).

4.2.2 Thematic Concentration and Evolution

Keyword co-occurrence and clustering analyses revealed four main thematic areas: (1) professional identity, (2) data mining, (3) pedagogy, and (4) innovative teaching models. This finding aligns with prior empirical studies. For instance, Chen and Zhao (2018) and Wu (2022) demonstrate how data mining techniques have been applied to optimize college English

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instruction, leading to measurable improvements in student outcomes and data-informed instructional strategies. The “professional identity” cluster has gained prominence in recent years, particularly in relation to pre-service and student teachers. This trend reflects a growing interest in how digital environments shape EFL teacher development and professional identity formation (Chien, 2023).

Earlier dominant themes such as “college English teaching” and “autonomous learning” have gradually given way to more complex, technology-integrated concepts like “blended learning”, “mobile learning”, and “big data” applications. This transition marks a shift from focusing on tools in isolation to exploring integrated, pedagogically grounded applications of educational technology. This shift may be due to advancements in technology and changing instructional needs, which have driven researchers’ interest in new areas like blended learning and big data (Graham, 2006; Picciano, 2012). Innovating college English teaching models through digital technologies, such as big data, mobile internet, and online collaboration platforms, can enhance students’ autonomous learning abilities and improve teaching effectiveness (Huang & Jin, 2018; Liang & Pang, 2019; Wang & Pan, 2024). However, aligning these pedagogical innovations with assessment practices, especially in mobile technology environments, remains a significant challenge, as highlighted by Zhang and Yu (2023).

4.2.3 Emerging Trends and Novel Contributions

The timeline and keyword time-zone analyses highlight the dynamic transformation of research focuses over time. While themes such as “data mining” and “innovative teaching models” dominated in the mid-2010s, recent years have seen a growing emphasis on professional development, mobile learning, and personalized instruction. This demonstrates a shift from tool-based innovation to more holistic educational frameworks. These findings echo the ongoing shift toward flipped, blended, and intelligent teaching models in higher education (Li et al., 2023).

In summary, unlike some prior bibliometric reviews that focus primarily on overall digital education (Wang & He, 2022) or language instruction outside the EFL context (Xu, 2024), this study contributes a domain-specific mapping of digitalization within EFL teaching at tertiary level in China. Additionally, the chronological mapping of thematic transitions—particularly the emergence of “professional identity” and the pedagogical integration of big data and mobile learning—offers fresh insights into the evolving priorities of the field. These time-sliced analyses reveal subtle changes not captured in previous reviews, thereby extending the

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current understanding of digital pedagogical development in the EFL context.

5.0 CONCLUSION

Over the past two decades, research on digital EFL teaching at the tertiary level in China has undergone notable growth and transformation. The evolution of themes experienced three periods. In early period (2005-2014), research focused on autonomous learning and the improvement of traditional college English teaching methods. In mid-term (2015-2019), big data, teaching cloud and innovative teaching models became the focus of research, reflecting the importance of digital technology in education (Bai, Lu & Liu, 2021; Fan, 2023). While in recent period (2020-2024), professional identity and teaching effectiveness became the focus of research, especially research on teacher professional development (Gu & Ding, 2022).

The study identified four major research themes. The first one is professional identity. In recent years, research on the professional identity of teachers and student teachers has increased significantly, involving teachers' professional development, educational internship and career growth. The second one is data mining. The application of data mining technology in education continues to increase. Researchers use these technologies to analyze teaching effects and student performance to optimize teaching methods. Pedagogy is the third research focus with emphasizing on mobile learning, higher education and digital education. It explores how to use digital technology to improve teaching effectiveness and student learning experience. Innovative teaching model is the last research theme. Research involves the application of big data, teaching cloud and multimedia technology in teaching, and explores how to improve college English teaching through advanced technology (Bai, Lu & Liu, 2021; Fan, 2023; Gu & Ding, 2022).

Overall, the development of digital EFL research at the tertiary level in China reflects a shift from foundational pedagogical approaches to more data-driven and technologically innovative paradigms. The evolution of research topics and methods reflects the rapid development and application of educational technology. With the development of technology, future studies are likely to delve deeper into emerging areas such as personalized learning, AI-enhanced instruction, and assessment-driven teaching models, providing increasingly robust guidance for tertiary English education.

However, this study is limited by its reliance on only two databases (WoS and Scopus) and a single bibliometric tool (Citespace), which may affect the scope and triangulation of

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findings. Future research should consider integrating multiple data sources and analytical platforms.

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