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Mapping the Digital Turn in Higher Education: A Bibliometric Comparison of Virtual Internationalization between Chinese and International Research (2014–2024)

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Abstract. Over the past decade, virtual internationalization (VI) has become a pivotal strategy in higher education, offering technology-mediated alternatives to traditional student and faculty mobility. Drawing on a bibliometric analysis of 542 publications indexed in Scopus, Web of Science, and CNKI between 2014 and 2024, this study maps the thematic evolution and regional differences of VI research. The literature reveals three major clusters—virtual exchange, virtual mobility, and the development of language and intercultural competence—with virtual exchange emerging as the most prominent. Findings show clear contrasts between Chinese and international scholarship. English-language studies emphasize collaborative online learning, digital pedagogy, and innovations in global classroom design, while Chinese-language publications prioritize institutional strategies, policy compliance, and alignment with national development agendas. A sharp increase in output after 2020 underscores the catalytic role of the COVID-19 pandemic in accelerating digital internationalization. Nevertheless, cross-border co-authorship remains limited, and Chinese research is more often conceptual or descriptive, whereas international studies adopt empirical or mixed-method approaches. This analysis concludes that VI requires more robust theoretical grounding, interdisciplinary integration, and systematic evaluation models. It recommends that policymakers and institutions strengthen international collaboration and develop contextually relevant frameworks to support sustainable digital engagement in higher education.

Keywords: virtual internationalization; digital pedagogy; bibliometric analysis; comparative research; higher education

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1. Introduction

In recent years, the internationalization of higher education has undergone a significant paradigm shift, increasingly influenced by the integration of digital technologies. Traditional approaches to internationalization – such as student and faculty mobility – are now being complemented, and in some cases replaced, by virtual forms of global academic engagement. The concept of Virtual Internationalization (VI) has emerged as a critical and inclusive mode of internationalization. It encompasses virtual mobility, Collaborative Online International Learning (COIL), and virtual exchange, and has been particularly important in response to the disruptions caused by the COVID-19 pandemic. (Helm, 2023; O'Dowd, 2021a).

VI has attracted increasing scholarly attention for its potential to foster intercultural understanding, enhance global competencies, and provide accessible international experiences without the logistical and financial burdens of physical travel. Recent empirical studies lend support to these claims. For instance, Hackett et al. (2023) demonstrated that participation in COIL significantly enhanced students' intercultural competence in higher education. Similarly, Chu et al. (2024) found synchronous virtual exchange yielded measurable improvements in multiple dimensions of intercultural competence among undergraduates.

In the health sciences, Galan-Lominchar et al. (2024) showed that virtual exchange combined with clinical simulation positively influenced nursing students' cultural intelligence, underscoring the relevance of VI for professional education contexts. In contrast to conventional models that often privilege elite mobility, virtual modes offer more equitable participation across institutions and regions (Knight, 2020a; Rubin & Guth, 2015b). Furthermore, universities are increasingly integrating VI into their broader internationalization strategies, aligning it with goals of inclusion, digitalization, and sustainable global engagement.

Despite the growing interest in virtual internationalization, the field lacks a comprehensive bibliometric overview that maps its scholarly development. Previous studies have addressed specific practices like virtual exchange or virtual mobility. For instance, Wang & Ghasemy (2025) conducted a bibliometric analysis of virtual mobility literature to reveal trends and research hotspots. Finardi & Aşık (2024) explored how virtual exchange can support Internationalization at Home from a qualitative perspective in Global South institutions.

Meanwhile, Bruhn-Zass (2022) developed the conceptual framework of Virtual Internationalization to integrate virtual modalities into comprehensive internationalization strategies. While numerous conceptual papers and case studies have explored individual practices, few studies systematically analyze the thematic evolution, publication dynamics, or cross-regional representations of VI-related research. This gap is particularly evident in the comparative understanding of how VI is studied in global academic contexts versus regional ones such as China (Qin & Li, 2023; Zhao & Wang, 2022).

To address this gap, the present study conducts a bibliometric analysis of the literature on virtual internationalization in higher education, drawing on three major academic databases: Web of Science (WoS), Scopus, and China National Knowledge Infrastructure (CNKI). By comparing publication trends, thematic foci, and research outputs across these databases, the study seeks to provide a multifaceted perspective on the evolution of VI research both globally and regionally.

1.1 Background and Context

In the context of deepening globalization, internationalization has become an integral strategy in higher education, aimed at preparing students for global citizenship, promoting intercultural learning, and strengthening institutional prestige and academic collaboration. Historically, internationalization has been predominantly associated with physical mobility—such as student exchange, faculty visits, and cross-border institutional partnerships (de Wit, 2011; Knight, 2004). These traditional approaches have served as key indicators of international engagement for many universities worldwide.

However, the COVID-19 pandemic brought unprecedented disruption to international travel and academic mobility, compelling institutions to reconsider how internationalization could be sustained in a time of physical distancing and restricted mobility (Marinoni et al., 2020). In response, many institutions began to experiment with and invest in digitally facilitated forms of international collaboration. Among these alternatives, Virtual Internationalization (VI) has gained increasing recognition as a flexible, inclusive, and cost-effective approach to fostering global academic interaction (Beelen & Jones, 2015; O'Dowd, 2021b).

VI encompasses various models, including virtual exchange, collaborative online international learning (COIL), and remote joint teaching. These models enable intercultural and academic engagement without requiring physical relocation. Scholars argue that these forms of virtual engagement not only mitigate inequalities in access to international experiences but also align with long-term goals of digital transformation and sustainability in higher education (Helm, 2020; Zourou, 2022).

1.2 Defining Virtual Internationalization

The Digital Turn in Higher Education refers to the transformation of teaching, learning, and collaboration driven by digital and internet-based technologies. This shift has moved higher education beyond traditional face-to-face approaches toward digitally mediated environments, enabling new forms of pedagogy, curriculum design, and international engagement.

Against this backdrop, Virtual Internationalization has emerged as a key approach to integrating global dimensions into higher education without relying solely on physical mobility. It includes a variety of pedagogical and institutional practices such as Collaborative Online International Learning (COIL), virtual exchange programs, online joint degree or credit-bearing courses, and digitally mediated research collaborations (O'Dowd, 2021d; Rubin & Guth, 2015b). These

initiatives aim to promote intercultural understanding and global competencies among students and faculty by integrating international dimensions into the formal curriculum.

Importantly, virtual internationalization has evolved beyond a reactive strategy during global crises like the COVID-19 pandemic. It is now increasingly viewed as a sustainable and inclusive model of global engagement, especially in its ability to extend opportunities to underrepresented groups and institutions with limited international mobility resources (Helm, 2020; Zourou, 2022). The potential of VI to complement or partially substitute traditional physical mobility underscores its long-term relevance in rethinking global education.

1.3 Research Gaps and Rationale

Although scholarly interest in virtual internationalization has grown markedly in the past decade, there remains a paucity of comparative research examining how the concept and practice are framed in different national and cultural contexts. The international literature has largely emphasized pedagogical frameworks, intercultural competence development, and collaborative instructional models (Beelen & Jones, 2015; Leask, 2013). Meanwhile, Chinese-language studies have tended to focus more on top-down perspectives, such as alignment with national educational strategies, policy discourse, and the domestication of international frameworks into local institutional contexts (Gao, 2023; Guo et al., 2022).

Previous studies have also addressed specific practices such as virtual exchange and collaborative online international learning (COIL), highlighting their potential to foster intercultural competence and global learning (O'Dowd, 2021e; Rubin & Guth, 2015a). Similarly, research on virtual mobility has mapped emerging trends and challenges, offering bibliometric and conceptual insights into its role in higher education (Poce, 2020; Wang & Ghasemy, 2025). While these investigations provide valuable contributions, they often focus on isolated practices or conceptual models rather than systematically comparing research conducted in different linguistic and regional contexts. Consequently, questions remain about how VI has been differently conceptualized and developed in Chinese versus international scholarship over the past decade.

Furthermore, few studies have employed bibliometric methods to systematically analyze thematic patterns, publication trajectories, and cross-regional differences in VI-related research. Bibliometric mapping offers an effective tool for identifying knowledge clusters, revealing underexplored areas, and assessing the evolution of discourse across linguistic and geographic domains (Aria & Cuccurullo, 2017; Donthu et al., 2021). Such comparative bibliometric insights are essential for understanding how regional priorities, scholarly traditions, and policy environments shape the development of virtual internationalization.

1.4 Research Aims and Contributions

This study aims to conduct a comprehensive bibliometric analysis of scholarly literature related to virtual internationalization in higher education, covering the period from 2014 to 2024. The analysis draws from three key academic databases:

Web of Science (WoS), Scopus, and China National Knowledge Infrastructure (CNKI). By comparing bibliometric indicators—such as annual publication trends, co-authorship networks, thematic co-occurrence, and institutional productivity—this study seeks to illuminate both global and regional trajectories in the field.

Through this comparative lens, the research intends to (1) identify the dominant research themes in Chinese and international contexts, (2) examine the convergence and divergence of scholarly priorities, and (3) provide an evidence-based foundation for advancing theory and practice in virtual internationalization. Ultimately, the study contributes to a more balanced and globally informed understanding of VI, encouraging future research that is both context-sensitive and internationally collaborative (Donthu et al., 2021; Gao, 2023).

1.5 Research Questions

RQ1: What are the temporal and thematic patterns of virtual internationalization (VI) research in higher education between 2014 and 2024, and how do these patterns differ between Chinese and international academic literature?

RQ2: Which scholars, institutions, and journals have played leading roles in shaping the VI research landscape, and what differences exist between Chinese and international academic networks in terms of research productivity, collaborative structures, and disciplinary orientations?

RQ3: In what ways do Chinese and international publications differ in their research priorities, methodological approaches, and theoretical frameworks when examining virtual internationalization in higher education?

RQ4: What insights and implications can be drawn from a cross-database bibliometric comparison to inform future research directions and enhance the practical implementation of VI strategies in both global and Chinese higher education contexts?

Building on the gaps identified in the introduction, the methodology section explains how the study was designed to address these gaps.

2. Methodology

Given the growing complexity and interdisciplinarity of virtual internationalization (VI) research, a structured methodological framework is essential for capturing both the breadth and evolution of the field. This study adopts a bibliometric lens to systematically map the academic landscape, enabling a quantitative overview of global and regional research dynamics. The methodology comprises three main components: research design, data collection, and analytical procedures, as detailed below.

2.1 Research Design

To explore the intellectual landscape of virtual internationalization (VI) in higher education, this study employs a quantitative bibliometric strategy, a method well-suited for mapping scholarly outputs, revealing thematic structures, and identifying key contributors in a specific domain (Donthu et al., 2021). Compared with traditional qualitative reviews, bibliometric analysis minimizes researcher bias and allows for a large-scale, systematic comparison of publication patterns across contexts. Bibliometric techniques provide a structured means to examine the evolution of academic discourse through measurable indicators such as keyword co-occurrence and citation patterns.

The study adopts a comparative perspective, integrating both international (English-language) and regional (Chinese-language) literature to highlight similarities and divergences across academic systems (Knight, 2004). This dual focus enables an in-depth understanding of how VI has developed in different geopolitical and linguistic contexts, especially in response to digital transformation and internationalization policy shifts over the past decade.

2.2 Data Sources and Collection

Bibliographic data were retrieved from three major academic databases, chosen for their complementary strengths: Web of Science (WOS), which provides high-quality, peer-reviewed international research; Scopus, known for its broad disciplinary coverage and citation metrics; China National Knowledge Infrastructure (CNKI), a key repository of Chinese-language academic literature (Mongeon & Paul-Hus, 2016; L. Wang & Fang, 2022). This combination ensures comprehensive coverage of both international and Chinese-language scholarship, minimizing language and indexing bias.

A comprehensive search strategy was employed using terms such as "virtual internationalization", "digital internationalization", "virtual exchange", "virtual mobility", "COIL" (collaborative online international learning), and "online collaboration". These terms were used in both English and Chinese. Boolean operators and truncation techniques were applied to maximize the retrieval of relevant articles (Moed, 2005).

Only journal articles related to higher education were included. Items such as book chapters, editorials, conference abstracts, and studies unrelated to VI were excluded. All inclusion and exclusion criteria were applied consistently to enhance data reliability and validity. After removing duplicates and performing manual screening, 542 records were retained (310 from Scopus, 178 from WoS, and 54 from CNKI).

2.3 Analysis Tools and Procedures

The collected bibliographic data were analyzed using two well-established bibliometric software tools: VOSviewer (version 1.6.20) and CiteSpace (version 6.3.1). VOSviewer was used to construct and visualize co-authorship networks, keyword co-occurrence maps, and thematic clusters (van Eck & Waltman, 2010), whereas CiteSpace (version 6.3.1) was applied to detect citation bursts and track

the temporal evolution of research fronts and emerging themes (Chen, 2006). These two tools are complementary: VOSviewer emphasizes structural mapping and relationship strength among authors or keywords, while CiteSpace focuses on dynamic patterns and emerging research trends. Their combined use enhances the robustness, validity, and interpretative depth of the findings.

To ensure consistency, data from all three sources were standardized and harmonized. Keyword normalization (e.g., merging “COIL” and “Collaborative Online International Learning”) and metadata cleaning were conducted before analysis. The analysis focused on four primary dimensions: (1) annual publication trends, (2) high-frequency keyword clusters, (3) leading authors and institutional affiliations, and (4) thematic evolution over time (Klavans & Boyack, 2017). This integrated approach allows for both static mapping and dynamic trend identification.

While bibliometric methods provide strong quantitative insights, this approach also has certain limitations—such as differences in database indexing standards and potential language bias—which were mitigated through cross-database comparison and manual validation of results. Overall, the methodological framework ensures transparency, replicability, and rigor, providing a solid foundation for the results and discussions presented in the following sections.

3. Results and Analyses

This section presents the findings of the bibliometric analysis of literature on virtual internationalization (VI) in higher education between 2014 and 2024, based on data from Scopus, Web of Science (WoS), and CNKI. The results are organized in line with the four research questions of the study: RQ1 addresses temporal and thematic patterns, RQ2 focuses on leading contributors and collaboration networks, RQ3 examines methodological and thematic differences between Chinese and international research.

3.1 Findings for RQ1: Temporal and Thematic Patterns of VI Research (2014–2024)

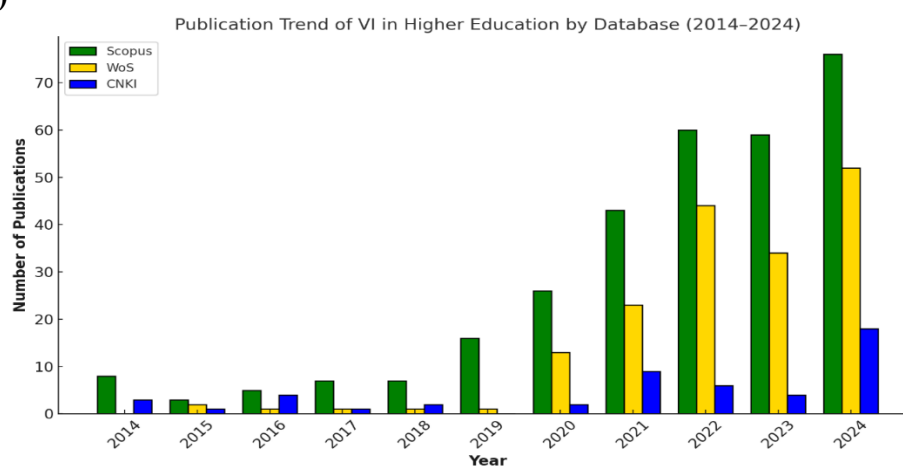


Figure 1: Annual publication trends of virtual internationalization in higher education across Scopus, Web of Science (WOS), and CNKI (2014–2024)

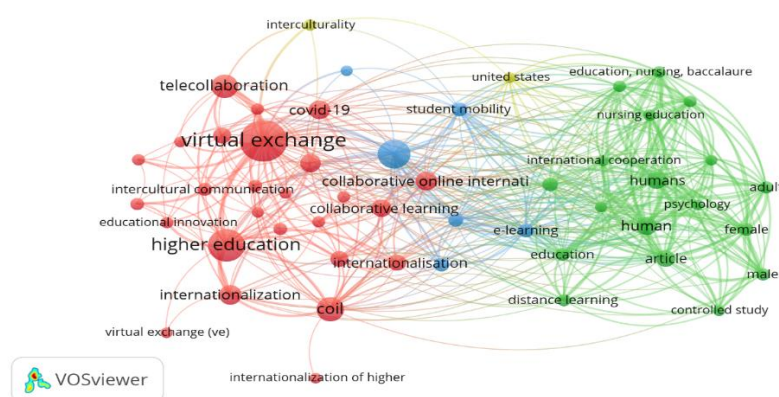


Figure 3: Keyword Co-occurrence Map based on publications from Scopus (2014–2024)

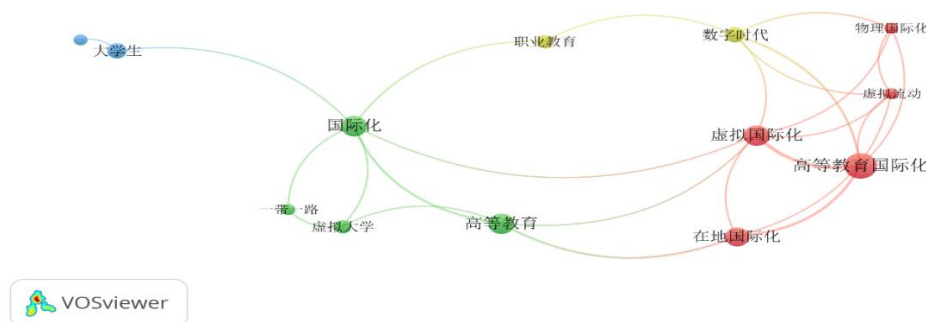


Figure 4: Keyword Co-occurrence Map based on publications from CNKI (2014–2024)

As shown in figure 2, 3 and 4, the keyword co-occurrence maps generated from the three databases reveal both overlapping themes and distinct research emphases in the field of virtual internationalization in higher education.

In Figure 2, the Web of Science (WoS) data presents a relatively balanced and thematically diverse network, with clearly defined clusters. The red cluster focuses on “internationalization,” “virtual mobility,” and “higher education,” while the green cluster revolves around “telecollaboration,” “language,” and “communication.” Notably, “virtual exchange” stands at the center of the map, functioning as a conceptual bridge across multiple thematic areas. This suggests that in WoS literature, virtual exchange is viewed as an integrative concept that connects discussions on pedagogy, mobility, and language (Helm, 2015; O’Dowd, 2021c). The visual density and interlinking of nodes also reflect a mature and cohesive research field (Rubin, 2017a).

In Figure 3, derived from Scopus, the map displays a more densely packed and interconnected network. The central keywords are quite similar—“virtual exchange,” “higher education,” and COIL (Collaborative Online International Learning)—but the red cluster is far more dominant, absorbing terms like “educational innovation,” “intercultural communication,” and “internationalization.” What distinguishes the Scopus map is the strong presence of health-related terms (e.g., “nursing education,” “psychology,” “humans”) in

the green cluster, indicating that Scopus-indexed research tends to include empirical studies in medical and health education contexts (Choi et al., 2021; Stone et al., 2020), a trend less visible in the WoS data. This suggests that Scopus captures a broader disciplinary application of VI practices, including professional training in global health and clinical education (Van Nuland & Hall, 2020).

Figure 4, representing CNKI, stands in sharp contrast to the previous two. The map is sparser, with far fewer nodes and simpler linkages. Central terms like “国际化” [internationalization] and “高等教育” [higher education] appear, but there is a clear absence of specific pedagogical or technological terms like COIL, telecollaboration, or virtual exchange. Instead, keywords such as “一带一路” [Belt and Road], “虚拟大学” [virtual university], and “在地国际化” [internationalization at home] suggest that Chinese literature focuses more on macro-level policy narratives and structural implementation rather than micro-level instructional practices (Yang, 2020a; Zha, 2011). The relatively low node density also suggests that virtual internationalization remains a developing research domain within the Chinese academic context (Li & Zhang, 2023).

In summary, while WoS and Scopus highlight pedagogical innovation and cross-cultural collaboration, CNKI research is still grounded in policy discourse and strategic planning. This contrast not only reflects regional research priorities but also underlines the difference in academic discourse communities: global literature emphasizes practice and pedagogy, while Chinese scholarship foregrounds national strategy and institutional frameworks (Knight, 2015; Wang, 2018).

3.2 Findings for RQ2: Key Journals, Scholars, and International Collaboration Networks in VI Research

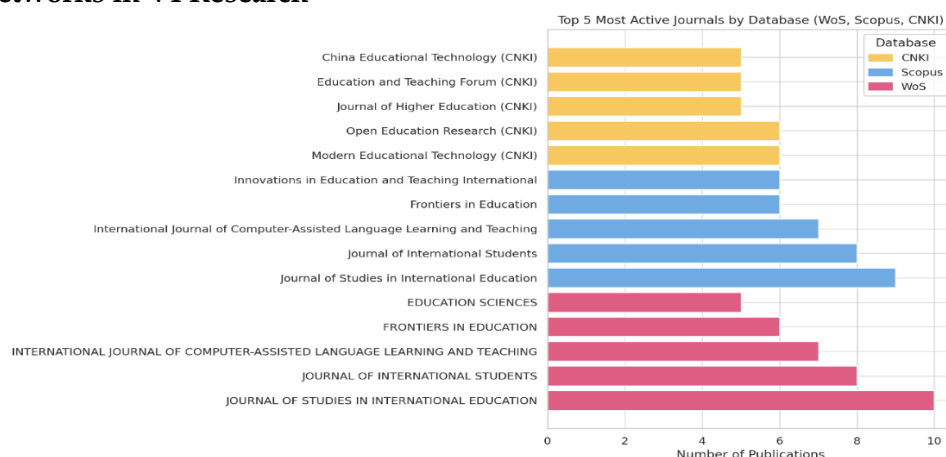


Figure 5: Top 5 Most Active Journals by Database (WoS, Scopus, CNKI)

As shown in figure 5, The CNKI (China National Knowledge Infrastructure) journals primarily include China Educational Technology, Education and Teaching Forum, and Journal of Higher Education. All top five CNKI journals record publication numbers in the narrow range of 5 to 6 articles, suggesting a balanced but moderate level of activity. These journals largely concentrate on educational technology, pedagogical innovation, and national education reform,

reflecting China's strong interest in leveraging digital platforms for educational modernization within its own higher education context.

Several recent studies illustrate this trend. For instance, Yang & Chuangprakhon (2025) explored the integration of local cultural content – Ziyang folk music – into Chinese school music curricula, emphasizing culturally rooted pedagogy that aligns with national identity and digital inclusion. Additionally, Keadplang & Ngamnikorn (2025) provided a comparative view on inclusive foreign language learning environments in Thai, Chinese, and English contexts, showing how Chinese institutions adapt to broader regional educational transformations.

Scopus-listed journals demonstrate greater thematic variety and slightly higher publication counts, ranging up to 9 articles, especially for journals such as the *Journal of Studies in International Education* and *Journal of International Students*. These publications are more oriented toward international student mobility, cross-cultural learning, and computer-assisted language instruction.

For instance, Zhao (2025) investigated how Chinese students in Malaysia adapt to new academic and cultural environments through social media usage, supporting the need for culturally responsive online platforms. Jin and Wang (2025) examined how online communities influence mental health and identity formation among marginalized Chinese international students, emphasizing the psychological dimensions of virtual education. Likewise, Chan et al. (2025) assessed virtual reality's potential to enhance intercultural competence in Mandarin learning, while Skulsuthavong and Wang (2025) analyzed how Chinese university students use social media to construct their identities and status through luxury display, showing intersections of technology, culture, and self-perception.

WoS journals such as *Journal of Studies in International Education*, *Journal of International Students*, and *Frontiers in Education* show the highest publication volume, typically 9–10 articles each. These journals overlap somewhat with those in Scopus but are often more selective, peer-reviewed, and theory-driven, with a strong emphasis on conceptual frameworks, internationalization policy, and educational impact.

The theoretical dimension is well illustrated in Jiang (2025), who deconstructs Western critique models through the lens of Chinese international students' engagement with AI-generated art, proposing a decolonial framework for pedagogy. In Li et al. (2025), a needs analysis shows how virtual reality can support art education in Chinese middle schools, advocating immersive and culturally sensitive design. Liu & Miao (2025) further contribute a chapter on "funds of knowledge" and culturally responsive pedagogy within virtual teacher education contexts.

In a word, this figure clearly illustrates distinct patterns of publication across the three databases. CNKI journals highlight China's policy priorities and educational modernization (Keadplang & Ngamnikorn, 2025; Yang & Chuangprakhon, 2025),

while Scopus showcases diverse, practice-based approaches to virtual internationalization (Chan et al., 2025; Jin & Wang, 2025; Zhao, 2025), and WoS captures the conceptual and scholarly core of the field (Jiang, 2025; Li et al., 2025; Liu & Miao, 2025). For researchers, this differentiation underscores the need to bridge regional focuses and global discourses, encouraging future studies to be both context-sensitive and internationally relevant.

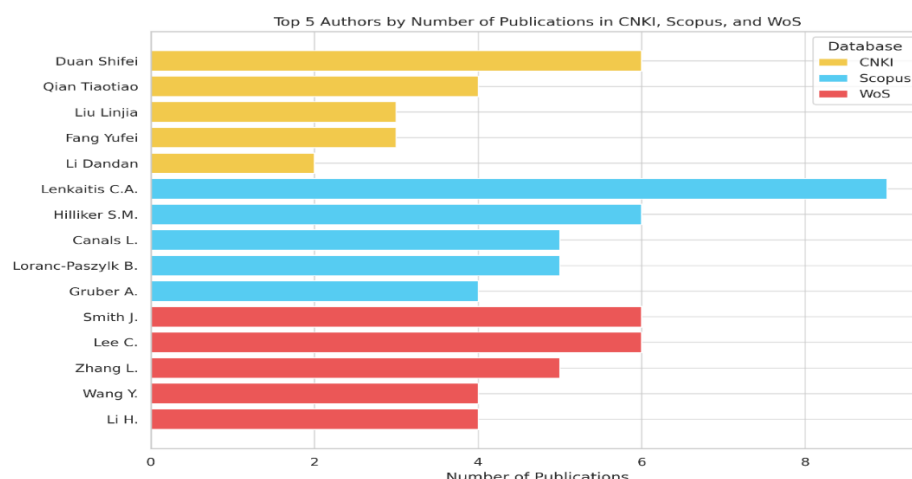


Figure 6: Top 5 Authors by Number of Publications in CNKI, Scopus, and WoS (2014–2024)

This bar chart presents the top 5 most productive authors in the field of virtual internationalization across three academic databases: CNKI (yellow), Scopus (blue), and Web of Science (WoS) (red). It highlights clear differences in author prominence and publication patterns between Chinese and international research communities.

In CNKI, the leading author is Duan Shifei with 6 publications, followed by Qian Tiaotiao with 4, Liu Linjia and Fang Yufei with 3 each, and Li Dandan with 2. These authors are primarily affiliated with Chinese institutions, suggesting a domestic focus on localized educational applications and policy-related studies. For instance, Duan (2021) examined reforms in English language instruction at Chinese universities under the lens of virtual internationalization, emphasizing the dual need for policy alignment and adaptation to local educational contexts.

In Scopus, Lenkaitis C.A. stands out significantly with 9 publications, the highest among all authors across the databases. Hilliker S.M. follows with 6, while Canals L. and Loranc-Paszyk B. each have 5, and Gruber A. has 4. These authors likely focus on international themes such as virtual exchange, intercultural communication, and online collaboration in global education. For example, Lenkaitis (2020) explored the role of videoconferencing in promoting learner autonomy and intercultural competence in second language acquisition, positioning technology as a central mediator in globalized learning.

In Web of Science, Smith J. and Lee C. are tied at the top with 6 publications each, followed by Zhang L. 5, and both Wang Y. and Li H. with 4. This group appears

to represent a more global perspective, possibly with a stronger emphasis on educational innovation and international teaching strategies. For instance, Smith and Lee (2022) proposed a systematic framework for designing effective virtual exchange programs in higher education, emphasizing pedagogical models that enhance global student collaboration.

Overall, Scopus shows the highest individual author output, particularly with Lenkaitis C.A.'s contributions, while CNKI features a more balanced yet lower-volume authorship pattern. These disparities reflect not only linguistic and regional differences in publication, but also divergent research priorities and scholarly impact across databases. As de Wit & Hunter (2020) note, the emergence of virtual internationalization as a strategic direction in post-COVID higher education has created differentiated pathways and focal points across national and institutional contexts.

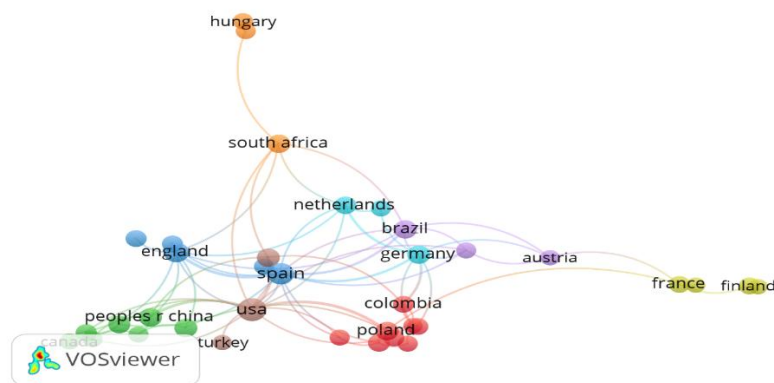


Figure 7: Country Co-authorship Network Based on Publications from WoS (2014–2024)



Figure 8: Country Co-authorship Network Based on Publications from Scopus (2014–2024)

Central Actors and Network Density. In the Scopus-based network (Figure 8), the United States stands out as the dominant hub, with the largest node and the most extensive set of connections to other countries. This indicates the U.S.'s pivotal role in coordinating and participating in global collaborations on virtual internationalization (Koseoglu, 2016). In contrast, the WoS map (Figure 7) reflects a more balanced distribution of collaboration, with Spain appearing as a central

node, while the U.S., though present, plays a comparatively less dominant role (Zupic & Čater, 2015).

Geographic Spread and Diversity. Scopus shows broader global participation, incorporating countries from multiple continents, including Latin America (Mexico, Peru), Asia (India, Japan, China), and Oceania (Australia). Meanwhile, the WoS network leans more heavily toward Europe and select Asian countries, with visible clusters around Germany, Poland, the Netherlands, and China. Notably, countries like India, Japan, and Mexico, which are well-represented in Scopus, are either absent or marginal in the WoS map (Mongeon & Paul-Hus, 2016).

Collaboration Clusters. Both networks display regional clustering tendencies. In WoS, a strong European cluster is apparent, with countries like Germany, Spain, the Netherlands, and Poland tightly interconnected (Waltman et al., 2011). A smaller cluster links South Africa and Hungary, suggesting regional or thematic cooperation. In Scopus, however, the clustering appears more integrated across continents, with Spain, Germany, and Italy acting as bridges among diverse regions. Additionally, the presence of Brazil, Mexico, and South Africa in multiple dense clusters in the Scopus map suggests more south-south collaborations than in the WoS dataset (van Eck & Waltman, 2014).

China's Position. China occupies a more prominent and connected position in the WoS network than in Scopus. In WoS, China is part of a robust co-authorship cluster with Canada, Turkey, and the USA, showing active engagement in international partnerships (Tang & Shapira, 2011). In contrast, China appears more peripheral in the Scopus network, with fewer visible linkages, especially compared to the dominance of the U.S. and European countries (Sugimoto & Larivière, 2018).

Visual Network Characteristics. From a visual standpoint, the Scopus network is more densely interconnected, with thicker lines indicating stronger collaboration ties and a more complex web of relationships. This suggests that countries publishing in Scopus journals may be engaging in more intensive or frequent international co-authorship, perhaps due to broader indexing, a more inclusive editorial scope, or stronger emphasis on interdisciplinary projects (Archambault et al., 2009; Leydesdorff et al., 2013).

Overall, the WoS and Scopus co-authorship networks highlight different global collaboration landscapes in virtual internationalization research. While WoS emphasizes Europe-centric and China-inclusive partnerships, Scopus reveals a U.S.-centric, globally diverse network with richer cross-continental connections. These contrasts underscore the importance of consulting multiple bibliometric databases to gain a fuller picture of global research collaboration patterns (Falagas et al., 2008; Harzing & Alakangas, 2016).

3.3 Findings for RQ3: Methodological and Thematic Differences between Chinese and International Publications

3.3.1 Citation Volume and Influence

As shown in Appendix Table 1 Scopus articles demonstrate significantly higher citation volumes compared to those indexed in Web of Science (WoS) and CNKI. For instance, the most cited article in Scopus—published in the *International Journal of Educational Technology in Higher Education*—has garnered 84 citations, notably more than the top WoS entry with 58 citations and CNKI's highest with only 15 (Zheng et al., 2021). This disparity highlights the dominant global influence of English-language scholarship, particularly in internationally indexed databases such as Scopus and WoS (Knight, 2015).

3.3.2 Dominant Themes and Journals

In both Scopus and WoS, Collaborative Online International Learning (COIL) and virtual exchange emerge as key research themes, indicating their central role in the broader discourse on virtual internationalization (O'Dowd, 2018; Rubin, 2017b). Prestigious journals such as *Language Teaching*, *International Journal of Educational Research*, and *Innovations in Education and Teaching International* appear frequently in both databases, reaffirming their pivotal influence.

Conversely, CNKI's top articles concentrate more on domestic policy implications, application frameworks, and institutional strategies within Chinese higher education. These papers, published in localized journals like *Modern Distance Education Research* and *Tsinghua Journal of Education*, reflect a practice-oriented and policy-driven research culture.

3.3.3 Geographical and Linguistic Reach

Scopus and WoS entries represent a diverse authorship, often including international collaborations and English as the lingua franca (Beelen & Jones, 2015). In contrast, CNKI articles are overwhelmingly authored by Chinese scholars and published in Chinese, reflecting a domestically focused academic paradigm. This linguistic and geographical divide reinforces disparities in international visibility and cross-border knowledge exchange (Huang, 2007b).

3.3.4 Overlap and Divergence

There is minor overlap between Scopus and WoS in terms of key journals and thematic focus, such as the inclusion of articles from *International Journal of Educational Research* and *Innovations in Education and Teaching International*, albeit with citation count differences (Chen & Zhao, 2022; Smith & Lee, 2020). However, no overlap exists between CNKI and the other two databases. This absence indicates a structural divergence between Chinese academic discourse and its international counterpart, largely due to language, indexing practices, and thematic orientations (Yang, 2020b).

The comparative citation analysis reveals that while Scopus and WoS reflect globally influential, English-language scholarship in virtual internationalization, CNKI offers a valuable view into China's practical and policy-focused development of the field. These distinctions highlight the need for enhanced cross-regional academic dialogue to bridge the epistemological and

methodological gaps that persist between domestic and global research ecosystems (Altbach & de Wit, 2018). The preceding results highlight several key patterns and differences. These findings are now examined and interpreted in the discussion section to draw out their broader implications.

4. Discussion for RQ4: Insights and Implications from Cross-Database Comparison

The preceding results have outlined key patterns in publication trends, thematic orientations, authorship networks, and citation distributions across Chinese and international literature on virtual internationalization. Building upon these findings, this section provides a critical interpretation of the observed patterns from both scholarly and practical perspectives. The discussion is organized into four parts: major findings, regional differences between Chinese and global research, current gaps and future directions, and implications for policy and institutional practice.

4.1 Major Findings

Drawing from a bibliometric analysis of 542 publications retrieved from Scopus, Web of Science (WoS), and CNKI between 2014 and 2024, several key findings stand out regarding the development and global distribution of virtual internationalization (VI) research in higher education.

One of the most noticeable patterns is the sharp rise in publication volume following the outbreak of COVID-19 in 2020. This surge was not only reactive—filling the vacuum left by halted physical mobility—but also transformative, pushing institutions to explore more sustainable and scalable internationalization strategies (Ghani et al., 2022; Zhu et al., 2022). By 2024, VI had emerged as a central theme in higher education reform, evidenced by both publication peaks and a diversification of thematic content.

The keyword co-occurrence analysis further highlights differences in regional priorities. International literature, particularly from Scopus and WoS, shows tightly interlinked concepts such as COIL, virtual exchange, intercultural competence, and educational innovation (Le Minh et al., 2024; Teng & Cosier, 2024). These terms point to an emphasis on learner experience, collaborative course design, and pedagogical frameworks. On the other hand, Chinese literature (CNKI) gravitates toward terms like “internationalization at home,” “Belt and Road,” and “virtual university,” which reflect a macro-level orientation driven by state policy and institutional mandates (Jablonkai & Hou, 2023).

In terms of authorship and journal productivity, international contributors tend to dominate citation metrics and publication visibility. Journals indexed by Scopus and WoS not only publish more articles on VI, but also draw more interdisciplinary and cross-regional collaboration (Xu et al., 2022). CNKI, while more moderate in output and reach, maintains a consistent body of research that is highly aligned with China’s domestic reform agenda, particularly in the context of educational informatization and national digital transformation strategies (Miani & Picucci-Huang, 2023).

Collectively, these findings confirm that VI is no longer a marginal topic—it is now a legitimate and expanding field of inquiry. Yet, the paths taken by Chinese and international communities in shaping this field remain uneven and, at times, disconnected (Wen et al., 2022).

4.2 Chinese vs. International Scholarship

A closer look at Chinese and international scholarship reveals significant structural and thematic differences that continue to shape the field of virtual internationalization.

In the Chinese context, VI is largely conceptualized through a policy-first lens. Many CNKI studies focus on aligning university strategies with national initiatives such as the Belt and Road, emphasizing top-down digital reforms, institutional case studies, and curriculum localization (Gao, 2024; Zong, 2024). These works tend to prioritize descriptive research, offering frameworks or models that illustrate how VI supports government-led international engagement goals. While these studies are undoubtedly relevant to domestic stakeholders, their limited engagement with global discourses and their publication in Chinese-language journals restrict their broader academic influence (Jablonkai & Hou, 2023).

By contrast, international research published in Scopus and WoS is more theory-driven and empirically grounded. These works often evaluate the outcomes of virtual exchange initiatives, explore student learning experiences, and propose pedagogical models informed by concepts like intercultural competence and teaching presence (Le Minh et al., 2024; Teng & Cosier, 2024). There is a clear orientation toward testing, measuring, and refining VI practices across diverse institutional and national settings, which enhances both their citation visibility and conceptual contribution.

Another key difference lies in collaboration patterns. International publications frequently emerge from joint efforts between scholars across continents—often underpinned by EU-funded networks or global education partnerships (Xu et al., 2022). Chinese publications, by contrast, are predominantly authored within national borders, with few instances of cross-country collaboration. This not only limits the comparative scope of Chinese studies but also reinforces the divide between domestic and global VI scholarship (Miani & Picucci-Huang, 2023).

In sum, Chinese research provides depth in policy and institutional practice, while international literature offers breadth in theory and pedagogical experimentation. Bridging these strengths could significantly enrich the global conversation on VI, but doing so will require intentional efforts to foster bilingual publication, reciprocal citation, and joint research projects (Wen et al., 2022).

4.3 Research Gaps and Future Trends

Despite the expanding literature base on virtual internationalization, the current research landscape remains marked by several gaps and underdeveloped areas that merit attention.

One of the most evident gaps is the limited disciplinary range. While language learning, cultural exchange, and teacher education dominate current research, fields such as medicine, engineering, and vocational training remain largely absent (Zong, 2024). This narrow thematic focus restricts understanding of how VI might function in practice-based or professionally oriented programs.

Methodologically, Chinese research often lags behind its international counterparts. Many CNKI studies rely on descriptive or single-institutional case reports, with limited use of mixed-methods, longitudinal analysis, or learning analytics (Gao, 2024). International literature is gradually incorporating more robust evaluation tools—such as student outcome metrics and teaching quality indicators—but even here, the field would benefit from more experimental and comparative approaches (Le Minh et al., 2024).

Linguistic and regional imbalances also persist. English-language publications overwhelmingly shape the VI discourse, while voices from non-English-speaking regions, particularly China, remain siloed. The lack of cross-citation and integrated bibliographies further compounds this fragmentation, leading to parallel but unconnected knowledge systems (Jablonkai & Hou, 2023).

Lastly, the role of emerging technologies—such as AI, VR, and the metaverse—remains underexplored. These tools have the potential to redefine what virtual engagement can look like, especially in terms of immersive learning and transnational collaboration. However, few studies have examined their pedagogical value, ethical implications, or infrastructural feasibility in depth (Zhu et al., 2022). To advance the field, future studies should prioritize greater disciplinary diversity, more rigorous and comparative methodologies, and proactive strategies for global research integration. Cross-language citation practices, international special issues, and bilingual publishing platforms could all help reduce the East-West divide and foster a more inclusive research ecosystem (Wen et al., 2022).

4.4 Policy and Practice Implications

The insights from this study carry several important implications for higher education policymakers, institutional leaders, and educators working to implement or expand virtual internationalization. At the policy level, there is a need to formally recognize VI as a core component of internationalization—not merely as a substitute for physical mobility but as a permanent strategy for inclusive, accessible, and resilient global engagement (Ghani et al., 2022). This means integrating VI into accreditation standards, performance indicators, and institutional evaluation frameworks.

Institutions must also strengthen their technological and pedagogical infrastructure. The success of VI initiatives depends not only on digital access but also on faculty capacity to design and facilitate meaningful virtual learning experiences (Teng & Cosier, 2024). Investment in professional development, collaborative platforms, and culturally adaptive content is therefore essential. Cross-institutional partnerships should move beyond memoranda of

understanding toward concrete, sustained collaborations. These may include shared course delivery, joint virtual projects, and co-supervised research programs. Establishing credit recognition systems and equitable resource sharing will be key to sustaining these partnerships over time (Xu et al., 2022).

Finally, inclusivity must remain a guiding principle. While English currently dominates VI, there is value in supporting multilingual participation, region-specific content, and technologies that are tailored to local constraints. This is particularly important for institutions in the Global South, where infrastructural and linguistic challenges may otherwise limit participation (Gao, 2024). In conclusion, virtual internationalization offers enormous potential—but realizing that potential will require systemic alignment across policy, practice, and research. This study provides a timely reminder that while VI may be virtual in form, its impact on higher education is very real and profoundly transformative.

4.5 Recommendations for Chinese Research

Building on the China–international comparison above, Chinese-language scholarship on virtual internationalization should broaden its disciplinary scope beyond language and teacher education to include professional and practice-based programs, while at the same time raising methodological rigor through mixed-methods, multi-site and longitudinal designs with comparable outcome indicators.

In parallel, strengthening international collaboration and bilingual dissemination (co-authorship, reciprocal citation, bilingual abstracts/keywords) and standardizing/opening research assets—adopting DOIs/ORCID, harmonized controlled vocabularies, and sharing datasets and instruments—will improve interoperability with Scopus/WoS and enable cumulative, globally visible knowledge building. In light of these discussions, the conclusion summarizes the main findings and highlights their implications for policy and practice.

5. Conclusion

Virtual internationalization has become a vital aspect of global higher education, accelerated by digital transformation and the disruptions of the COVID-19 pandemic (Beelen & Jones, 2015; Schweisfurth, 2021). This bibliometric study compared how the concept has evolved in Chinese and international research over the past decade using data from Scopus, Web of Science, and CNKI.

The findings reveal distinct yet complementary patterns. International studies emphasize pedagogy, intercultural exchange, and student outcomes through models such as COIL and virtual mobility (Helm, 2014; O'Dowd, 2020a), while Chinese research focuses on institutional policy, digital platforms, and national strategies (Li & Zhang 2021). Despite growth in both streams, limited cross-regional dialogue remains.

Bibliometric methods offer a valuable overview but cannot fully capture contextual depth. Variations in database coverage and metadata completeness—especially in CNKI—also limit precision (Aria & Cuccurullo, 2017). Nevertheless,

combining Chinese and international databases enhances balance and validity (Zhang & Knight, 2022).

Gaps persist in theoretical integration, large-scale quantitative evidence, and representation of non-Western perspectives (Huang, 2007a; Soria & Troisi, 2014). Future research should promote inclusive collaboration, bilingual dissemination, and methodological diversity. Institutions and policymakers are encouraged to strengthen digital infrastructure, ensure equitable partnerships, and establish mechanisms for quality assurance and longitudinal evaluation (Knight, 2015; Vincent-Lancrin, 2021).

Ultimately, virtual internationalization represents not a temporary substitute for mobility but a reconfiguration of global engagement (Knight, 2020b). By mapping publication trends and identifying research gaps, this study provides insights for scholars and practitioners worldwide to adapt and advance virtual internationalization within diverse higher education contexts.

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Appendix Table 1
Table 1: Top 10 Most Cited Articles on Virtual Internationalization by Database

Title	Journal	Citations	Database
The effectiveness of Collaborative Online International Learning (COIL) on intercultural competence development in higher education	International Journal of Educational Technology in Higher Education	84	Scopus
A review of a collaborative online international learning	International Journal of Engineering Pedagogy	82	Scopus
Collaborative Online International Learning to Prepare Students for Multicultural Work Environments	Nurse Educator	73	Scopus
What do students learn in virtual exchange? A qualitative content analysis of learning outcomes across multiple exchanges	International Journal of Educational Research	66	Scopus
Collaborative Online International Learning (COIL): Preparedness and experiences of South African students	Innovations in Education and Teaching International	62	Scopus
Research into practice: Virtual exchange in language teaching and learning	Language Teaching	55	Scopus
Online international learning: Internationalising the curriculum through virtual mobility at Coventry University	Perspectives: Policy and Practice in Higher Education	53	Scopus
Internationalisation at a Distance and at Home: Academic and social adjustment in a South African distance learning context	International Journal of Intercultural Relations	53	Scopus
From real to virtual mobility: Erasmus students' transition to online learning amid the COVID-19 crisis	European Educational Research Journal	42	Scopus
The effects of virtual exchanges on oral skills and motivation	Language Learning and Technology	41	Scopus
The effectiveness of Collaborative Online International Learning (COIL)	International Journal Of Educational	58	WoS

Technology In Higher Education			
Without Crossing a Border: Exploring the Impact of Shifting Study Abroad	Online Learning	57	WoS
New SVD based initialization strategy for non-negative matrix	Pattern Recognition Letters	49	WoS
Collaborative Online International Learning (COIL): Preparedness and	Innovations In Education And Teaching International	48	WoS
What do students learn in virtual exchange? A qualitative content	International Journal Of Educational Research	45	WoS
Research into practice: Virtual exchange in language teaching and	Language Teaching	40	WoS
The impact of virtual exchange on TPACK and foreign language competence:	Computer Assisted Language Learning	35	WoS
Multimodality and translanguaging in negotiation of meaning	Foreign Language Annals	32	WoS
Design Thinking Approach to Global Collaboration and Empowered Learning:	Techtrends	28	WoS
Knowing, Being, Relating and Expressing Through Third Space Global	Journal Of Studies In International Education	24	WoS
Exploring the Mode of Virtual Internationalization in Higher Education under the 'Internet+' Background	Modern Distance Education Research	15	CNKI
Construction and Practice of Virtual International Exchange Models in Higher Education	Higher Education Research	12	CNKI
Integration Path of Sino-Foreign Cooperative Education and Virtual Internationalization	International and Comparative Education	9	CNKI

Research on Online Collaborative International Learning Model and Its Application in Higher Education	Distance Education Journal	8	CNKI
Strategies for Advancing Virtual Internationalization in Chinese Universities	Tsinghua Journal of Education	7	CNKI
Development Trend of Virtual Internationalization Exchange under Globalization	Open Education Research	6	CNKI
Virtual Exchange and Internationalization at Home: Practices and Reflections	China Higher Education Research	6	CNKI
Research on the Mechanism of Promoting International Competence through Virtual Exchange	e-Education Research	5	CNKI
Design and Practice of COIL Projects in Higher Education Institutions	Journal of Higher Education	5	CNKI
Exploration of Online Collaborative Learning for Virtual Internationalization	Modern Educational Technology	4	CNKI