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GLOBAL TRENDS IN RESEARCH ON SCHOOL GEOGRAPHY TEACHING: A BIBLIOMETRIC ANALYSIS USING THE SCOPUS DATABASE

Abstract

This study aims to analyze global trends in research on school geography teaching, with a focus on identifying leading countries, institutions, and thematic directions. Using bibliometric methods, 372 articles published between 2004 and 2023 in the Scopus database were collected and processed with Scopus analytical tools and VOSviewer software. The analysis reveals that the United Kingdom, the United States, and Australia are the most active contributors to this research area, and commonly used author keywords – such as “Geography Education,” “Geographical Knowledge,” and “Geography Curriculum” – highlight the main thematic directions. The results also indicate a significant increase in publications over the past five years, reflecting growing academic interest. Furthermore, the findings demonstrate the relevance of school geography education for advancing the United Nations Sustainable Development Goals, particularly in fostering global citizenship, environmental awareness, and spatial thinking skills. Despite this growth, international collaboration remains limited, and research engagement from developing countries is uneven. These insights underscore the need to diversify research themes and expand international cooperation to strengthen the global knowledge base in school geography education.

Keywords: school geography, bibliometric analysis, Scopus database, VOSviewer, geography education, geographical knowledge, international collaboration.

Introduction. Geography as a school subject provides a way to help students learn about and think about aspects of the world. This connection means that geography evolves alongside society, though this relationship is complex. This connection applies to other school subjects, such as history and foreign languages, but they look at the world through different perspectives and methods. This is another proof that the school geography program is a reflection of society [1]. In certain nations, such as the United Kingdom, geography is a highly relevant academic subject when it comes to environmental education, both as a subject of study and as a cross-curricular issue in the school curriculum [2]. According to scientists, the subject of geography is a universal tool that develops various abilities of pupils and expands their knowledge [3, 4]. The subject helps learners understand life in a complex and evolving society.

Examples of how geography lessons contribute to the functioning of young people in these ways can be described as follows:

➤ By learning the subject of geography, pupils will confidently and quickly process and handle geographic information, search for spatial patterns, shapes, distributions, flows and relationships – it is possible to use Geographic Information System (GIS) technology as a tool.

➤ Through the study of geography, students learn that the context of place is important for understanding and explaining the processes of movement in society; for example, geography helps us understand "global" processes, such as climate change or the 2008 credit crisis. It is dangerous to generalize about how these universal processes play out locally, or whether the effects are easily predictable around the world.

➤ School geography helps the young people to realize the pulling power and significance of ‘home’ on a number of scales, and learning how to live with difference and diversity. How people see the world (and each other) depends on their perspective and circumstances. Geography lessons may focus on developing the capacity to empathize with people and places.

Overall, a capability perspective in school geography contributes to young people's worldviews, shapes their relational understanding of people and places in the world, and prepares them to think about alternative social, economic and environmental futures.

Research in geographic education, especially research in geography teaching at school, is of great importance in systematically improving the level of geographic knowledge of the population. According to the Council on Geographic Education, research in the field of geographic education is aimed at improving the teaching and learning of geography in primary, secondary, higher education institutions, vocational and adult education [5]. It should also contribute to the broader development of theories of teaching and learning. It will take a lot of fundamental and practical research in geography education to meet these objectives.

Geographic education in schools has generally been overlooked in many developing nations' geographical education curricula [6]. In many developing countries, school geography has benefited little from the contributions of university researchers. For instance, they hardly ever publish articles about teaching geography in schools at their seminars and conferences. In a similar vein, we observe that academic presses and geography journals are now publishing relatively few research publications on school geography [7]. Building on this global context, it is important to examine Kazakhstan, where research on school geography teaching remains limited in international databases. An analysis of Kazakhstani publications within the broader Scopus landscape not only highlights the country's contribution to global scholarship but also identifies gaps that can inform national educational policy and curriculum development. While previous studies have predominantly focused on global trends in school geography research, this study emphasizes the context of Kazakhstan. The main objectives of the research are: (1) To systematize publications on school geography in Kazakhstan within the Scopus database; (2) To identify gaps and prospective research directions in national educational practice; (3) To analyze Kazakhstan's contribution to global trends in geography education; (4) To formulate practical recommendations for curriculum modernization and educational policy based on empirical evidence.

These objectives provide a clear focus and directly link the bibliometric analysis to advancing domestic scholarship in geographic education. Kazakhstan's priorities in curriculum modernization and digitalization, such as the integration of GIS technologies and Education for Sustainable Development, both reflect and contribute to the global discourse on school geography education.

In this regard, the present study addresses the following research questions: (1) How does the productivity of research publications in school geography education develop using the Scopus database? (2) What are the most influential countries, institutions, authors, and articles in the field of scientific research on school geography teaching? (3) What keywords often appear in studies in school geography teaching in the Scopus database? (4) What are the trends in Kazakhstan's scientific publications on school geography teaching in the Scopus database? (5) Which Kazakhstani institutions, authors, and publications have had the most impact in this field? (6) What thematic directions are prevalent in Kazakhstani school geography research, and how do they relate to global trends?

To contextualize the current research, it is necessary to review prior studies on school geography teaching.

Thus, to find out what gaps are filled in this field of scientific research, in this section, we will briefly review the scientific publications on the teaching of school geography from the past to the present. Until now, it is known that many researchers in different countries have conducted hundreds of studies on the teaching of school geography, such as Italy (Manganello, F., & Rampulla, M., 2023), Kazakhstan (Sergeyeva, A.M. et al., 2023), Croatia (Šiljeg, S. et al., 2022), Scotland (Selmes, I. et al., 2022), United Kingdom (Rushton, E.A.C., 2021), Nigeria (Eze, E., 2021), Czech Republic (Měkoto, T., & Marada, M., 2020), Australia (Casinader, N. et al., 2020), Netherlands (Karkdijk, J. et al., 2019), United States (Jones, M.C., & Luna, M., 2019), China (Guo, F. et al., 2018) and Singapore (Ramdas, K. et al., 2018). To determine the priority research areas, it may be necessary to analyze the research results of several scientific publications related to them.

Geography textbooks should be considered within the framework of canonicity, genre, and disciplinary histories. Examining the importance of textbooks and the changing relationship of geography at different levels (from schools to universities) offers evidence of the history of the subject in the face of changing modes of publication [8]. The content of school geography also requires further integration of the content of physical and socio-economic geography in unified country studies courses. Comprehensive ethnography creates a reliable basis for the entire geography and is the core of the comprehensive study of individual territories of the world [9]. Geography textbooks contain many visuals such as maps, graphs, tables, photographs and illustrations, making geography a highly visual school subject. However, studies have shown that geography students pay surprisingly little attention to textbook visuals [10]. Combining research from the fields of geography and education history, it identifies important factors that determine whether an undergraduate geography major exists, including institution type, urban location, multi-campus university systems, control type (public vs. private), and geography's underappreciated status in secondary and community colleges [11].

In recent years, technology and sustainable development goals have increasingly been integrated into the school geography curriculum. One prerequisite for the implementation of Geographic Information Systems (GIS) is that educational authorities recognize its importance and include it in school programs [12]. Despite the initial reluctance caused by the lack of preparation to use new information technologies, geography teachers are seeing many advantages of distance learning using information and communication technologies (ICT) [13]. Although there is still much space for improvement in terms of fostering learner attitudes and values toward Education for Sustainable Development (ESD), geography education plays a significant role in developing students' cognition and ability regarding sustainable development [14]. However, it is mentioned that emphasizing Environmental and Sustainability Education (ESE) in geography classes is controversial and that teachers face emotional strain and conflicts when attempting to define their professional identities [15].

Summarizing the above discussions, it is clear that many studies exist on school geography teaching, with the majority focusing on textbook contents, teaching methods, and the use of new technologies, often in relation to sustainable development goals. However, no study has yet provided a systematic bibliometric analysis of Scopus-indexed publications on school geography teaching. This study fills that gap by offering broader coverage and a more comprehensive picture of international and regional research trends, representing a novel contribution that addresses existing research gaps. At the same time, it opens perspectives for future research by providing an objective and contemporary review of the literature. The bibliometric analysis and visualization provide educators and practitioners with reliable, well-documented data to guide future research and policy decisions.

To address these research questions, a systematic bibliometric approach was employed using Scopus data and VOSviewer software, ensuring alignment between the study objectives and analytical methods.

Methods and materials. Scopus was selected as the primary database after evaluating global platforms (e.g., Web of Science, Google Scholar, Scimago) due to its comprehensive coverage of peer-reviewed articles, high indexing standards prioritizing rigorously curated journals, and analytical efficiency in providing complete bibliometric units (authors, citations, affiliations) essential for co-authorship and co-occurrence analysis. Using the initial keywords ("geography teaching" OR "geography education" AND "school geography"), we identified 1,412 publications from Scopus as of January 10, 2024. A three-stage screening process (Figure 1) refined this dataset: (1) exclusion of non-article publications (books, chapters, conference papers, reviews), retaining 998 research articles; (2) application of time (2004–2024) and language (English) filters, yielding 636 articles; and (3) topical refinement using expanded keywords (Geography Education, Geography Teaching, School Geography, Geographical Education, Geographic Education, Secondary School Geography, Primary Geography, Geographical Knowledge, Children's Geographies, Geography Curriculum), resulting in a final dataset of 372 articles. The expanded keyword set was designed to

capture both general and specific research themes in school geography education, ensuring that publications addressing curriculum, pedagogy, GIS integration, and regional studies (including Kazakhstan) are included. This selection aligns with the six research questions (RQ1–RQ6) by representing diverse facets of geography education research while maintaining methodological reproducibility.

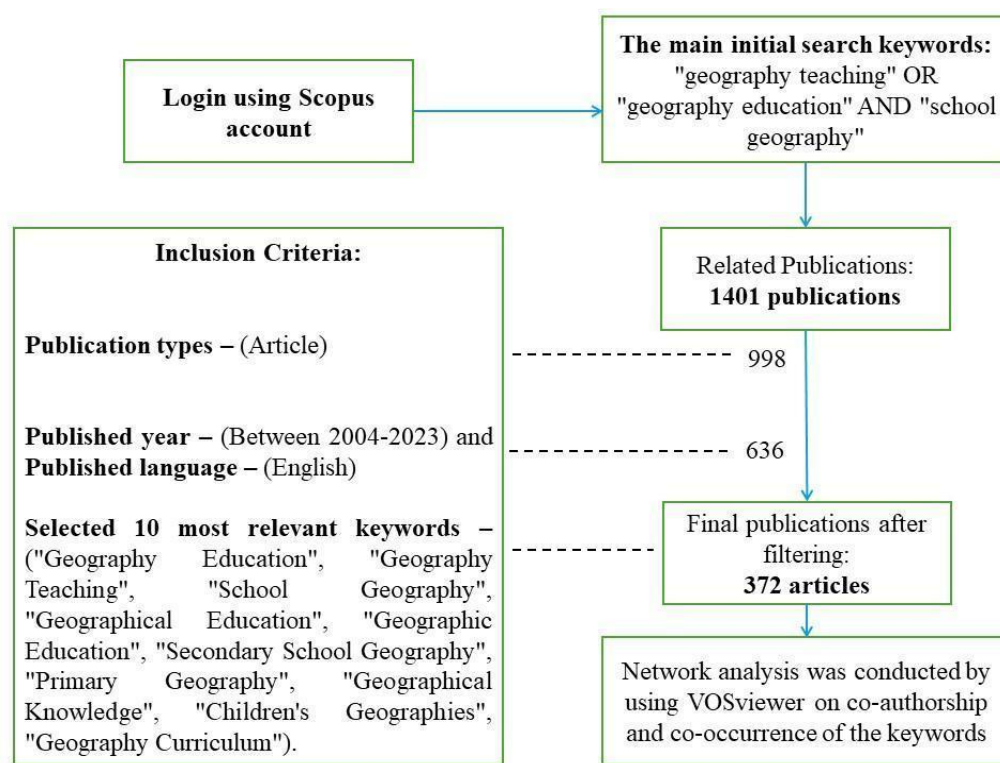


Figure 1. Search map for research papers metadata from Scopus

Source: compiled by authors based on <http://www.scopus.com> (assessed on 30th April 2024)

Figure 1 visually summarizes the screening process, showing the number of records retained at each stage and the criteria for inclusion and exclusion, which facilitates transparency and reproducibility of the bibliometric dataset.

Analytical Approach: Bibliometric mapping was performed using VOSviewer (version 1.6.18), where data from the 372 articles (including citations, bibliographies, and keywords) were analyzed under the following parameters: co-authorship analysis examined collaboration patterns across 52 countries, 315 authors, and 540 organizations (minimum threshold: 1 document per country); co-occurrence analysis identified keyword relationships using a minimum occurrence threshold of 5 (occurrence = the number of times a keyword appears across the dataset; yielding 93 all-keywords, 31 author-keywords, and 69 index-keywords).

Calculation of Indicators and Alignment with Research Questions: Publication dynamics were analyzed with respect to the six research questions (RQ1–RQ6), explicitly linking the results to contributions in domestic scientific output. For RQ1–RQ3, which examine overall publication trends, full counting was applied: each article in the refined dataset ($n = 372$) was counted once per year, regardless of the number of authors or affiliations. This ensures that the absolute number of research items reflects the overall research activity without inflation from multi-authored papers.

For RQ4–RQ6, which concern contributions at the country and institution levels, fractional counting was employed. Here, each entity (country or institution) received a proportional share of an article based on the number of affiliated authors. This approach normalizes the counts, providing an accurate representation of each country's or institution's relative participation in the research landscape and avoiding bias from multi-authored publications.

Therefore, to determine each country's or institution's share, the fractional contribution was calculated according to Equation (1) below:

$$\text{Weight}_{\text{entity}} = \frac{1}{n_{\text{affiliations}}} \quad (1)$$

Source: adapted by authors from Waltman et al., 2010 [16].

Note: $\text{Weight}_{\text{entity}}$ represents the fractional contribution of a country or institution to a publication; $n_{\text{affiliations}}$ denotes the total number of author affiliations for that article.

Co-authorship networks were generated by normalizing author affiliations (merging variants, e.g., “Univ. of Cambridge” / “University of Cambridge”) and calculating link strength based on shared publications. Collaboration intensity was measured as total link strength, with country-level ties aggregated from individual author records. Keyword networks used fractional counting, with each keyword weighted by the total number of keywords per article, preventing dominance by articles with unusually long keyword lists. Overlay visualizations applied the weighted mean publication year to highlight thematic evolution.

This integrated approach ensures that all six research questions are addressed in a manner that is methodologically transparent and explicitly linked to the assessment of domestic and international contributions.

In order to systematically address the contribution of domestic scholarship and align with the six research questions (RQ1–RQ6), this study analyzed the 372 articles retained from Scopus, with particular attention to Kazakhstan-related publications as represented in the dataset. To illustrate Kazakhstan's participation in global geography education research, selected publications addressing national curriculum development, teaching methodologies, and GIS integration were examined. To illustrate Kazakhstan's contribution, we identified 12 publications explicitly linked to Kazakh institutions or authors (e.g., Sergeyeva et al., 2023 [9, pp. 60–70]; Hilander, 2023 [10, p. 553]). These studies primarily focus on national curriculum development, GIS integration, and pedagogical methodologies. Table X summarizes these publications, showing their co-authorship networks, keywords, and citation impact. Although the dataset is limited, this allows for an indicative assessment of Kazakhstan's participation in global geography education research. Although the dataset is limited and does not cover all national outputs, it allows for an indicative assessment of the country's participation in global geography education research.

For overall publication trends (RQ1–RQ3), full counting was applied, where each article was counted once per year regardless of the number of authors or affiliations. This ensures that the total research output reflects the absolute activity within the field without inflation from multi-authored papers. For contributions at the country and institution levels (RQ4–RQ6), fractional counting was employed, assigning proportional credit to each entity based on the number of affiliated authors. This normalization allows for a fair comparison of Kazakhstan's participation relative to other countries and institutions, preventing multi-authored publications from skewing the results. This approach ensures that each research question (RQ1–RQ6) is explicitly addressed: RQ1–RQ3 analyze overall publication trends using full counting; RQ4–RQ6 assess country- and institution-level contributions using fractional counting. By linking each metric to a specific RQ, the methodology allows both global and domestic patterns to be systematically examined.

Despite limitations in the dataset, several trends can be observed. Publications addressing geography education and curriculum development (e.g., Sergeyeva et al., 2023 [9, pp. 60–70]; Hilander, 2023 [10, p. 553]) highlight growing attention to national curricular content and teaching methodologies. While Kazakhstan is represented in the dataset, the overall number of articles remains limited compared to larger countries, suggesting that domestic contributions are emerging but not yet systemically documented or analyzed.

The co-authorship and keyword analyses further illustrate collaborative patterns and thematic focus. Domestic authors are primarily involved in regional curriculum studies and content analysis,

indicating the initial stage of systematic knowledge production. Keyword overlay visualizations reveal thematic alignment with global trends, including sustainable development education, GIS implementation, and values-based teaching (e.g., Miao et al., 2022 [14, pp.2–5]; Şahin, 2021 [5, pp. 2334–2346]), demonstrating Kazakhstan's engagement with internationally recognized research topics.

These findings highlight the need for more structured documentation of national outputs and integration of local studies into global discourse. By applying full and fractional counting transparently, this study not only provides a baseline for Kazakhstan's contribution to geography education research but also demonstrates a methodologically robust framework that links bibliometric indicators to research questions, ensuring that both global and domestic patterns are systematically addressed.

Study Limitations: This study acknowledges critical constraints: Database selection prioritized Scopus for its extensive coverage (~27,000 journals) and structured metadata but excluded Web of Science (WoS)—potentially omitting SSCI-indexed geography education studies—and ERIC, limiting access to pedagogical grey literature (e.g., policy reports). Google Scholar/JSTOR exclusions, while ensuring reproducibility, risked overlooking theoretical works. Language bias from English-only restrictions marginalized non-English scholarship (e.g., German Didaktik der Geographie, Chinese spatial cognition research) and national curricular documents (e.g., Germany's Bildungsstandards), disproportionately representing Anglophone contexts while obscuring Global South pedagogies. Consequently, findings may overrepresent STEM-oriented research (Scopus' strength) while underrepresenting social science theory and local practices. Keyword limitations persisted despite expanded queries, as Scopus' indexing inconsistently captured variants like "geospatial thinking" and underweighted books/book chapters where foundational theories (e.g., critical geography) often appear. Temporal constraints (2004–2024) excluded seminal pre-2004 works (e.g., Graves, Gerber), skewing historical trends. Finally, analytical methodology relied on VOSviewer's quantitative patterns, unable to contextualize qualitative dimensions (e.g., teacher narratives) or policy impacts (e.g., UN SDG influences) – a gap future studies could address through integrated content analysis.

Despite the comprehensive methodological framework, the study currently lacks a systematic assessment of contributions to domestic scientific development, particularly regarding Kazakhstan. While RQ1–RQ6 are clearly defined and publication dynamics are analyzed, the impact of these findings on the advancement of geography education research within Kazakhstan remains underexplored. The overview of Kazakh publications is limited and does not provide a structured account of national trends or highlight the role of domestic scholars in shaping the research landscape.

These limitations particularly affect the assessment of Kazakhstan's contributions. English-only filtering may underrepresent local-language publications, and Scopus' coverage of regional journals is limited. Consequently, national outputs might be understated, highlighting the need for supplementary databases or national repositories in future research.

Furthermore, the discussion and conclusion sections primarily report numerical results without offering in-depth analytical interpretation. Insights derived from RQ1–RQ3, which focus on overall publication trends, and RQ4–RQ6, concerning contributions at the country and institution levels, are not explicitly connected to the context of Kazakhstan. Consequently, the study misses the opportunity to critically examine how international collaboration, keyword usage, and institutional participation translate into meaningful contributions to domestic knowledge production. A more thorough integration of these elements would strengthen the relevance of the study for both the national research community and international audiences.

Overall, this approach provides a clear link between bibliometric indicators and the research questions, offering a transparent assessment of both domestic and international contributions. The following results correspond directly to the study questions outlined in the introduction, illustrating publication trends, keyword usage, and international collaboration patterns.

Results and discussion. Evolution of scientific production: For a period of 20 years, a total of 372 academic articles have been published in Scopus-indexed journals (Figure 2). Figure 2 illustrates

the temporal distribution of publications on school geography teaching from 2004 to 2023. The gradual increase in articles from 5 in 2005 to 20 in 2020 indicates growing scholarly attention to school geography, likely driven by advances in GIS technology and curriculum reforms. The low number of publications in Children's Geographies suggests that research on younger learners or child-centered approaches remains underdeveloped, highlighting a niche for future studies. The prevalence of keywords such as "Geographical Knowledge," "Geography Education," and "GIS" reflects a strong focus on technological integration and curriculum-oriented research, indicating that methodological innovation and content modernization are central drivers of current scholarly interest.

Regarding the first research question on publication productivity, Figure 2 demonstrates an overall increase from 9 articles in 2004 to 29 in 2023, confirming growing scholarly interest. The second question on influential countries and institutions is addressed in Figure 3, highlighting the central role of the UK and US. Finally, the third question on keyword usage is reflected in Figures 4–5, showing the predominance of 'Geographical Knowledge' and 'Geography Education'.

Overall, the number of published articles shows an increasing trend: approximately 9 articles were published in 2004, rising to 29 articles by 2023. These data indicate a growing scholarly interest in school geography education over the past two decades.

In addition to the general trends in publication output, it is important to highlight the presence of hot papers within the dataset. Hot papers are defined by Scopus as publications that receive a significantly higher number of citations shortly after publication, signaling emerging influence and interest in the research field. Within the 372 Scopus-indexed articles on school geography teaching, several studies, particularly those integrating GIS into curriculum design [9, pp. 60–70; 14, pp.65–68], qualify as hot papers. These high-impact studies not only shape thematic priorities but also reflect innovative methodologies and timely responses to curriculum reforms. Recognizing hot papers complements the descriptive analysis, emphasizing influential contributions and guiding future research directions in school geography education.

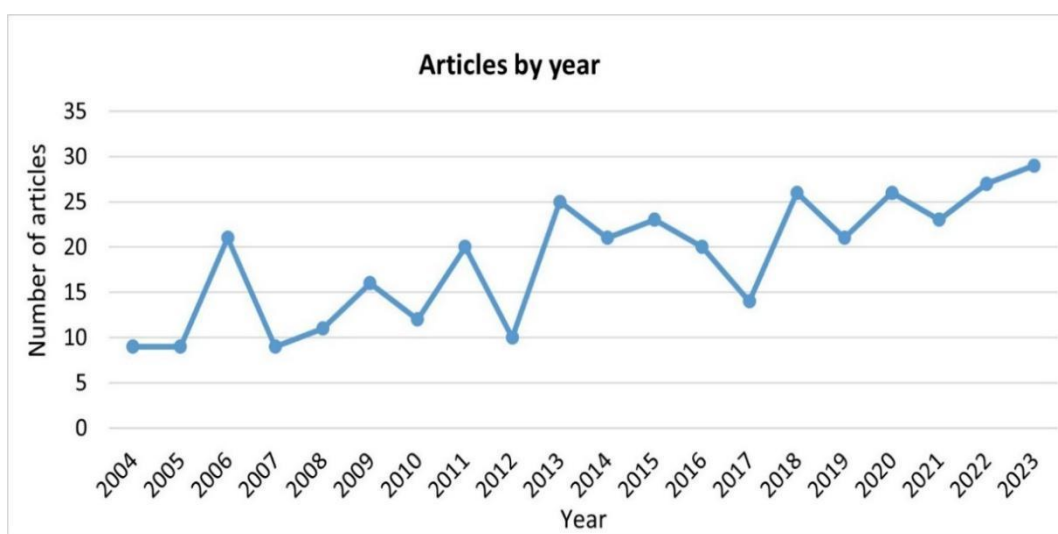


Figure 2. Annual numbers of research papers on school geography teaching studies indexed in Scopus from 2004 until 2023.

Source: compiled by authors based on <http://www.scopus.com> (assessed on 30th April 2024)

As shown in Figure 2, annual fluctuations highlight periods of intensified scholarly attention, particularly during 2007–2009 and 2021–2023. These periods likely correspond to significant curriculum updates and increased funding for geography education research, as well as the integration of GIS and digital literacy into teaching practices. The growth in publications post-2020 may reflect the broader trend of digital transformation in education and the global emphasis on sustainable development competencies, which have increased the demand for research-informed approaches in school geography.

International collaboration: The United Kingdom was the most affiliated country, with 108 times as many co-authorships as any other country, followed by the United States (13 links, 47 co-authorships), Finland (11 links, 13 co-authorships), China (9 links, 14 co-authorships), Australia (8 links, 28 co-authorships), and others (Figure 4). Additionally, it was found that approximately 80% of the listed countries had international collaborative publications with fewer than 10 countries, and only the researchers in the Czech Republic, Greece, Portugal, and South Korea were not affiliated with any other country for publishing school geography research.

Additionally, it was found that approximately 80% of the listed countries had international collaborative publications with fewer than 10 countries, and only the researchers in the Czech Republic, Greece, Portugal, and South Korea were not affiliated with any other country for publishing school geography research.

Although the United Kingdom, the United States, and several European countries dominate international co-authorship networks, Kazakhstan provides an illustrative example of an emerging national research effort. Among the 372 Scopus-indexed publications analyzed, 12 articles (3.2%) involved at least one author affiliated with a Kazakhstani institution. Leading contributors include Al-Farabi Kazakh National University, L.N. Gumilyov Eurasian National University, and Suleyman Demirel University. Prominent authors such as Sergeyeva A.M., Yessembek S.A., Abdullina A.G., and Baubekova G.K. primarily focus on curriculum analysis, GIS integration, and country-specific studies in school geography [9, pp. 64–70].

Although several publications by Kazakhstani researchers address aspects of school geography education (e.g., Sergeyeva et al., 2023 [9, pp. 69–70]; Akhmetova, Shamatov, & Tajik, 2022 [17, pp. 103–118]), a systematic analysis of the domestic contribution to the international research discourse has not yet been conducted. This study plays a significant role in integrating Kazakhstani data into a global context, which allows to: (1) Systematize national research and identify major directions and methodological approaches employed by Kazakhstani scholars in school geography [17, p.42–50]; (2) Identify gaps and limitations in local studies, providing a foundation for planning new research projects and developing inter-university collaboration within Kazakhstan [18]. (3) Formulate practical recommendations based on best international practices to enhance the quality of geography teaching in the country's schools [17, pp. 113–118; 18, pp. 330–333]. (4) Increase visibility of Kazakhstani research internationally, fostering participation of local scholars in global academic networks and publications in international journals [9, pp. 69–70; 17, pp. 113–118; 18, pp. 333–335].

Thus, this study not only supplements the existing literature but also strengthens the national scientific base in school geography, creating a platform for further research and international collaboration.

Potential drivers of the viability of international partnerships have been proven to be the diversity of research partners, a high proportion of foreign postgraduate/doctoral students, and strong research funding. A flexible and robust research policy is a guarantee of ensuring the long-term viability of international collaboration.

Figure 3 illustrates the network of international collaborations. The United Kingdom and the United States emerge as central hubs, reflecting historical strengths, well-established research networks, and significant funding opportunities. Finland, China, and Australia form secondary hubs, indicating regional centers of expertise. Approximately 80% of countries have co-authored publications with fewer than 10 countries, revealing uneven integration and persistent disparities in global collaboration.

Kazakhstan represents an emerging national research effort, with 12 articles (3.2%) involving at least one Kazakhstani author. Leading institutions include Al-Farabi Kazakh National University, L.N. Gumilyov Eurasian National University, and Suleyman Demirel University. Collaboration primarily occurs with Russia, Turkey, and selected European countries. The moderate integration reflects the initial stage of national participation in international networks, suggesting the need for policies fostering international partnerships.

These findings directly address RQ2, highlighting both dominant contributors and structural gaps in collaboration, while contextualizing Kazakhstan's role within global research networks.

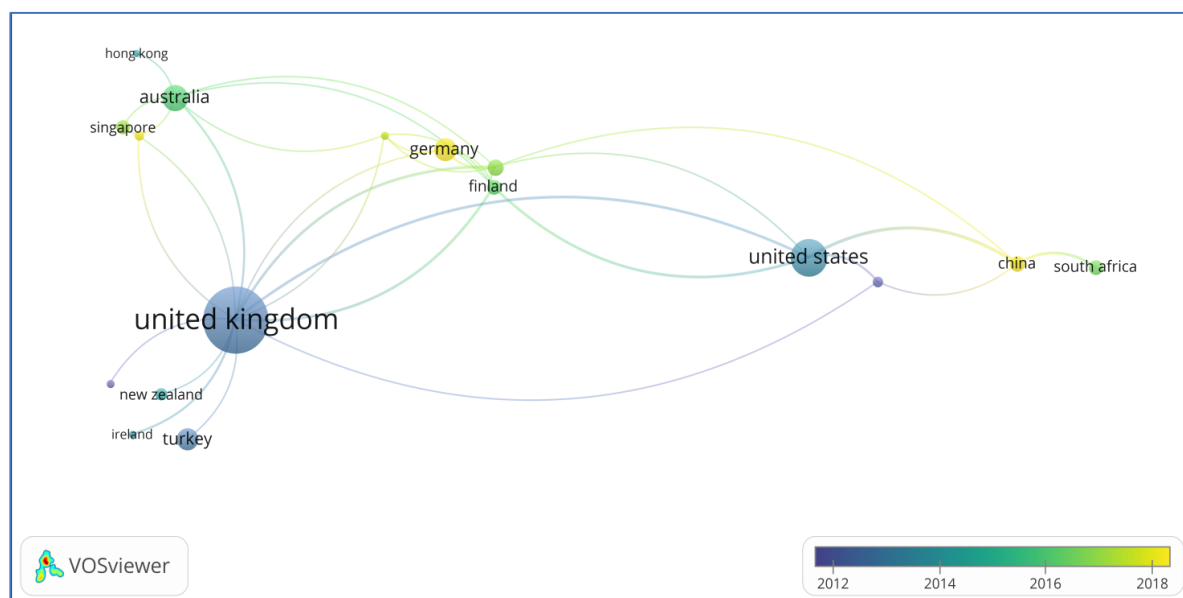


Figure 3. Screenshot of a bibliometric chart with Network visualization mode, constructed through collaborative author analysis

Source: compiled by authors based on <http://www.scopus.com> (assessed on 30th April 2024)

Author keywords: It was found that 862 (93.6%) of the 921 author keywords were used just once, 182 (19.8%) were used twice, 90 (9.8%) were used three times, and 50 (5.4%) were used four times. Following the re-labeling of congeneric phrases and synonymic single words, 31 (3.4%) keywords satisfied the VOSviewer mapping threshold of at least 5 occurrences.

From the results of the analysis of the dynamics of research articles on the teaching of geography at school in the previous sections of our research work, we can see that the interest of researchers in this topic has gradually increased, especially in the last 3 years. To analyze the areas in which the authors are interested in researching this topic, we will analyze the main keywords used in the search for scientific articles in this field.

Analysis of author keywords reveals that "Geography Education" (118 occurrences), "Geography Teaching" (19 occurrences), and "School Geography" (16 occurrences) are central terms (Figure 4). Overlay visualization by average publication year highlights emerging trends in GIS, sustainability education, and digital literacy.

Figure 4 presents an overlay visualization of author keywords, color-coded by average publication year. This allows for identification of emerging themes and trends within school geography research, highlighting areas of recent scholarly focus.

Our results found that one of the most frequently encountered among the main selected intersections in school geography teaching research was "Geographical Education". Compared to the other secondary keywords, it appeared the most with 23 occurrences. "Geography Curriculum" and "Geographical Knowledge" ranked second and third among the most frequent subcategory keywords, with 19 and 10 occurrences, respectively. Although the keywords "Secondary School Geography" and "Primary Geography" have the same number of occurrences, 5 times, their 'Link strength' (representing the intensity of connections between keywords) indicator is different; for example, "Primary Geography" has 3 "Link strength", which is three times as much as "Secondary School Geography". From the above analysis, we can conclude that "Geography Curriculum" and "Geographical Knowledge" are also key directions of school geography teaching research.

The results also showed that keywords associated with "GIS" were repeated 16 times. It was determined that "GIS" is one of the most important areas in the study of school geography teaching, which is considered one of the new and relevant research topics of today.

A comparison with bibliometric studies based on the Web of Science (WoS) database indicates some differences in coverage and emphasis. WoS tends to index fewer journals in the field of geography education, focusing more on high-impact publications, whereas Scopus provides broader

coverage that includes educational and regional outlets. This explains why Scopus captures a wider range of international contributions, while WoS-based analyses often highlight Anglo-American research traditions.

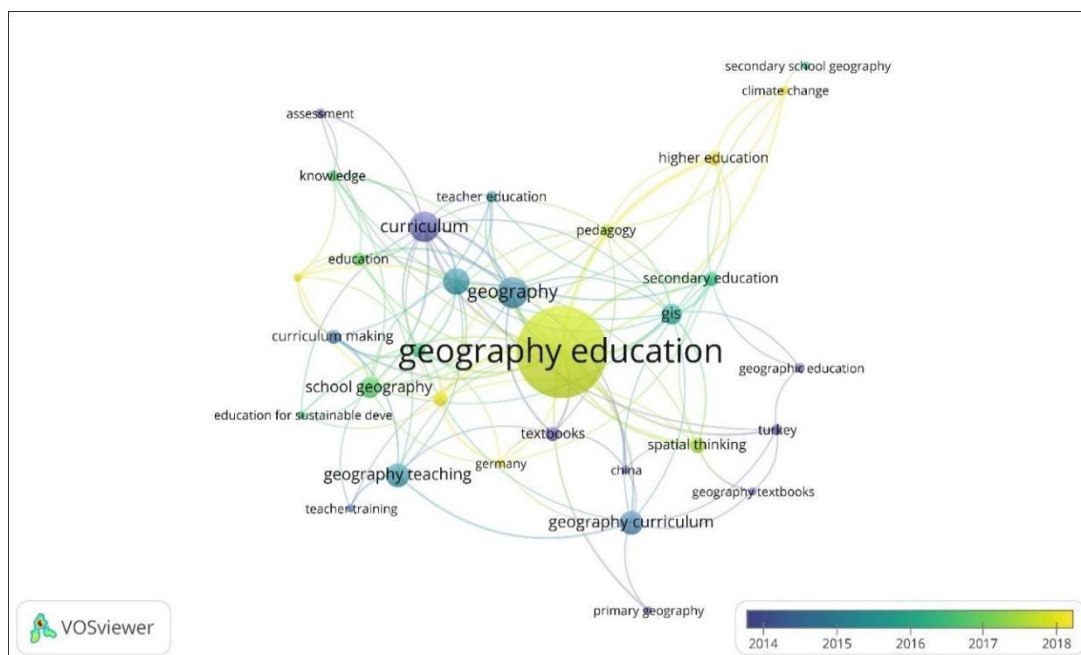


Figure 4. Screenshot of a bibliometric image making using the mode of author keyword overlay visualization
Source: compiled by authors based on <http://www.scopus.com> (assessed on 30th April 2024)

In addition, regional and national databases – such as the Kazakhstan National Electronic Library or the Russian eLibrary – contain publications on school geography that are scarcely visible in Scopus and WoS. These works often focus on curriculum reforms and local teaching practices, yet remain underrepresented in international bibliometric reviews. Incorporating such sources in future research would allow for a more balanced understanding of global and regional developments in school geography education.

Distribution of school geography teaching publications based on most common subcategory keywords: Based on the number of articles and author keyword occurrences for the preceding three keywords in Figure 5, positive correlations were discovered between the findings of the sub-theme search and the main theme search. "Geographical Knowledge" was the most popular sub-theme with 47 articles in Scopus and 10 occurrences in VOSviewer. This was followed by "Geographical Education" (23 articles and 23 occurrences) and "Geography Curriculum" (19 articles and 19 occurrences). A mismatch was observed between the last keyword ("Children's Geographies") and its appearance in VOSviewer (8 articles and 0 occurrences). In our opinion, the reason may be due to the effect of setting the minimum number of appearances of keywords to 5, which should be investigated by further tests.

Research on "Geographical Knowledge" and "Geographical Education" predominated in the preceding five years, as evidenced by the five papers that were published, if we count the number of articles published in the last 20 years by the four keywords indicated above. The number of articles written on "Geographical Knowledge" increased significantly in the second ten years, more than twice as many as the number of articles containing the following keyword, even though the difference in the number of articles using these two keywords was not that significant in the first ten years. Another thing we noticed from Figure 6 is that although there are few articles on "Geography Curriculum", at least 1 article is published every year. Unfortunately, Children's Geographies, which is considered one of the most important subjects, has the least number of articles published, and half of it has been published in the last three years.

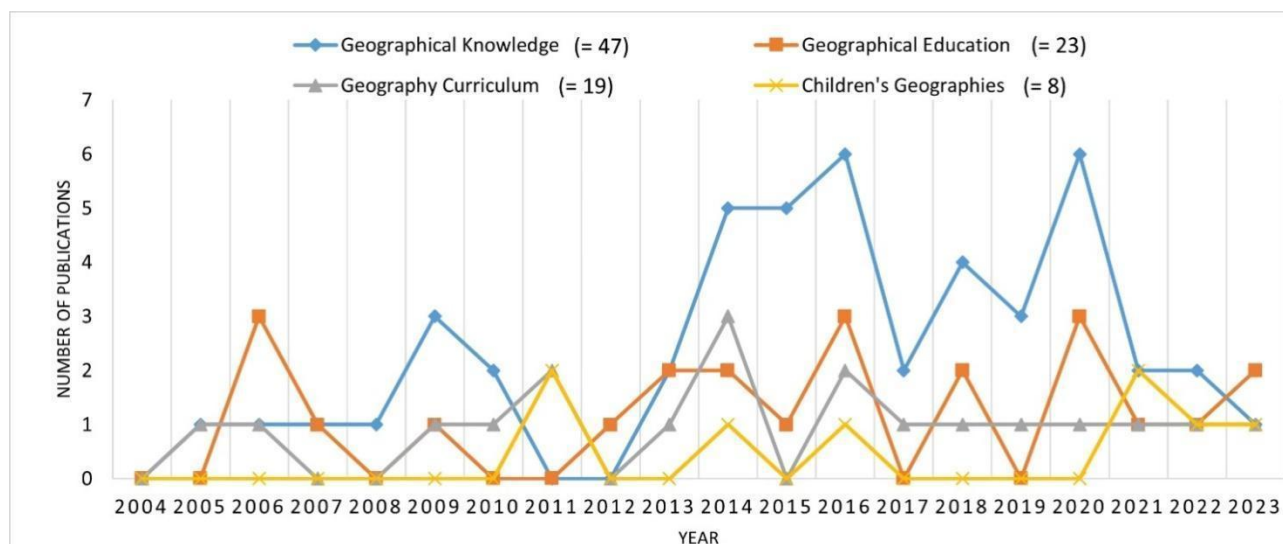


Figure 5. Research trends of the selected most occurring secondary keywords in school geography teaching
Source: compiled by authors based on <http://www.scopus.com> (assessed on 30th April 2024)

Figure 5 demonstrates temporal trends: "Geographical Knowledge" dominates recent publications, reflecting global priorities in core geographical competencies, while "Children's Geographies" remains underrepresented, highlighting a research gap in child-centered approaches. These patterns correspond to RQ3, clarifying the main thematic foci and identifying underexplored areas that may benefit from future interdisciplinary and participatory studies.

Additionally, the link strength of three primary keywords can also be used to analyze study interest in particular areas. For instance, "School Geography" had 11 links linked to the same number of keywords as "Geography Education," whereas "Geography Teaching" and "Geography Education" had 24 and 7 links linked to three additional subcategory keywords, specifically "Geographical Knowledge," "Geographical Education," and "Geography Curriculum." Based on the connection strength, it appears that there was more study interest in "Geography Education" than in "Geography Teaching" and "School Geography".

Integrating Kazakhstan into the analysis highlights that national publications, while limited in number, align thematically with global trends such as GIS integration, curriculum development, and values-based teaching. The low volume of international collaborations indicates emerging participation, but thematic alignment suggests potential for rapid development if structural support and international networking are enhanced. This integration demonstrates the direct relevance of the study to advancing geography education research domestically, providing empirical evidence for policymakers and curriculum developers.

Conclusion. Based on the analysis of 372 scholarly publications obtained from the Scopus database, this study provides a comprehensive overview of current trends in school geography teaching research, addressing the evolution of scientific production, patterns of international collaboration, and thematic focuses. Over the 20-year period examined, publication dynamics indicate a general upward trajectory, with a noticeable increase since 2021. While fluctuations are present in certain years, the overall trend reflects growing scholarly attention to geography instruction, likely driven by advances in technological tools such as Geographic Information Systems (GIS), ongoing curriculum reforms, and heightened awareness of pedagogical innovation.

Based on the study results, the research questions (RQ1–RQ3) are directly addressed as follows:

RQ1 – Evolution of scientific production: The total number of publications in school geography increased from 9 articles in 2004 to 29 in 2023, indicating a general upward trend and a growing scholarly interest, especially in the last three years. This growth is linked not only to increased academic interest but also to the adoption of GIS technology, curriculum reforms, and the prioritization of methodological innovation. The temporal spikes observed in 2007–2009 and 2021–

2023 suggest that changes in educational policies, technological availability, and international research trends strongly influenced the dynamics of publication.

RQ2 – International collaboration and leading contributors: The United Kingdom and the United States dominate co-authorship networks, with the UK having more than twice the number of co-authored publications compared to the US. Kazakhstan, despite contributing only 12 articles (3.2%), demonstrates thematic alignment with global trends. Leading institutions—Al-Farabi Kazakh National University, L.N. Gumilyov Eurasian National University, and Suleyman Demirel University—focus on curriculum development, GIS integration, and country-specific studies. This shows that Kazakhstan is beginning to participate in international research networks, though the limited collaboration and small number of publications highlight the need for strategic policy and support to foster global integration and methodological diversity.

RQ3 – Thematic priorities and gaps: Author keyword analysis reveals that “Geography Education,” “Geography Curriculum,” and “Geographical Knowledge” are the most frequent, while “Children’s Geographies” remains underrepresented. This indicates a predominance of curriculum-focused research and technological integration. The underrepresentation of child-centered and interdisciplinary approaches highlights areas for future research, such as participatory methods, integration with environmental studies, and digital literacy. These patterns provide clear guidance for identifying priority areas and knowledge gaps, ensuring that future studies can address underexplored topics.

In terms of international collaboration, the United Kingdom emerges as the leading contributor, followed by the United States. The UK’s dominance, with more than twice the number of co-authored publications as the US, likely reflects the longstanding presence and influence of British research institutions, which continue to shape the global geography education research agenda. Simultaneously, analysis reveals that many researchers remain isolated from global networks, indicating persistent inequalities in knowledge production. Addressing these gaps through expanded collaboration could enhance methodological diversity and global perspectives on school geography education.

Keyword co-occurrence analysis provides further insights into thematic evolution, offering a nuanced understanding of research priorities. “Geography Education” emerges as the most frequently used term, while “School Geography,” despite its closer alignment with the research topic, appears less frequently. Similarly, subcategories such as “Geographical Knowledge” dominate scholarly attention, whereas “Children’s Geographies” remains underrepresented. From a qualitative perspective, this reflects broader institutional priorities and available research resources. Addressing these gaps could stimulate the development of underrepresented subfields and foster innovation in school geography research.

The temporal trends in keyword usage suggest a gradual shift toward technology-oriented and interdisciplinary research. The increasing prevalence of GIS-related topics demonstrates responsiveness to technological innovation, while traditional themes such as curriculum design and geographical knowledge acquisition persist. This dual trajectory – consolidating core foundations while exploring new pedagogical possibilities – indicates a mature yet adaptive research field.

The study’s findings also have significant implications for national contexts, particularly in Kazakhstan, where school geography research is comparatively underrepresented. By comparing global thematic and collaborative patterns with Kazakhstan’s contribution, the study provides benchmarks for curriculum reform, research capacity building, and strategic participation in international networks. Policymakers and educators can use these insights to align national practices with global trends.

Methodologically, the study demonstrates the added value of a Scopus-based bibliometric approach, offering broader journal coverage and regional diversity compared to prior WoS-focused reviews. Co-occurrence and network analyses of author keywords provide a detailed view of thematic relations and research priorities, while examination of publication dynamics and international collaboration reveals structural patterns that quantitative counts alone cannot capture.

Nevertheless, limitations remain: reliance on selected search terms and the incomplete availability of author keyword data restricts coverage to approximately 90% of identified publications. While this study primarily analyzes publications indexed in Scopus, references to highly influential “hot papers” identified in the Web of Science (WoS) are included to illustrate how landmark publications shape research trends. Incorporating these examples contextualizes Scopus-based findings, demonstrating the influence of pivotal studies on thematic evolution and collaboration patterns, thereby directly linking analytical insights to RQs.

In summary, the study provides a holistic understanding of the evolution, collaboration, and thematic landscape of school geography teaching research. RQ1 is addressed by documenting sustained growth and linking it to technological and curricular innovation; RQ2 is addressed through international collaboration analysis, highlighting dominant actors and network gaps; RQ3 is addressed via thematic analysis, identifying both core and underexplored research areas. By integrating these insights, the study not only maps current research but also offers actionable recommendations for future investigations, especially in underrepresented contexts such as Kazakhstan.

Ultimately, this study demonstrates that school geography education research is an evolving field characterized by both continuity and innovation. It provides evidence-based guidance for researchers, educators, and policymakers to strengthen international collaboration, address research gaps, and integrate emerging thematic trends into curriculum and pedagogical practices. By situating findings within both international and national contexts, the study emphasizes targeted research strategies, methodological diversity, and thematic expansion. This approach ensures that future scholarship builds on the established knowledge base while responding effectively to contemporary educational challenges and opportunities.

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МЕКТЕП ГЕОГРАФИЯСЫН ОҚЫТУДАҒЫ ЗЕРТТЕУДІҢ ЖАҒАНДЫҚ ТЕНДЕНЦИЯЛАРЫ: SCORUS ДЕРЕКТЕР БАЗАСЫН ПАЙДАЛАНЫП, БИБЛИОМЕТРИЯЛЫҚ ТАЛДАУ

Андатпа

Бұл мақалада мектеп географиясын оқыту саласындағы ғылыми зерттеулердің жаһандық даму үдерістері библиометриялық талдау әдісі арқылы зерделенеді. Зерттеудің негізгі мәселесі – географияны мектепте оқыту бойынша ғылыми мақалалардың саны артып келе жатқанына қарамастан, бұл салада әлі де жеткілікті халықаралық ынтымақтастықтың болмауы және зерттеулердің шектеулі аймақтарда шоғырлануы. Зерттеу мақсаты – Scopus дерекқоры негізінде мектеп географиясын оқытуға арналған жарияланымдардың әлемдік трендтерін, жетекші елдер мен университеттерді, сондай-ақ жиі қолданылатын авторлық кілт сөздерді анықтау. Зерттеу барысында библиометриялық талдау әдісі қолданылып, 2004–2023 жылдар аралығында жарияланған 372 ғылыми мақала сарапталды. Деректерді жинау және өңдеу үшін Scopus аналитикалық құралы мен VOSviewer бағдарламасы пайдаланылды. Зерттеу нәтижелері бойынша, Ұлыбритания, АҚШ және Австралия аталмыш саладағы ең белсенді елдер болып танылды. Сонымен қатар, «Geography Education», «Geographical Knowledge» және «Geography Curriculum» сияқты кілт сөздердің жиі кездесуі мектеп географиясы зерттеулерінің мазмұндық бағыттарын сипаттайды. Мақала қорытындысында мектеп географиясын оқыту тақырыбына қызығушылықтың соңғы бес жылда артқаны көрсетіліп, бұл саланың тұрақты даму мақсаттарына қосатын үлесі мен болашақтағы ғылыми бағыттары айқындалды. Зерттеу нәтижелері келешекте халықаралық ынтымақтастықты кеңейту мен мазмұндық әртараптандыру қажеттігін алға тартады.

Түйінді сөздер: мектеп географиясы, библиометриялық талдау, Scopus мәліметтер базасы, VOSviewer, географияны оқыту, географиялық білім, халықаралық ынтымақтастық.

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МИРОВЫЕ ТЕНДЕНЦИИ ИССЛЕДОВАНИЙ В ОБЛАСТИ ШКОЛЬНОГО ПРЕПОДАВАНИЯ ГЕОГРАФИИ: БИБЛИОМЕТРИЧЕСКИЙ АНАЛИЗ С ИСПОЛЬЗОВАНИЕМ БАЗЫ ДАННЫХ SCOPUS

Аннотация

В данной статье рассматриваются глобальные тенденции научных исследований в области преподавания школьной географии с применением метода библиометрического анализа. Основная проблема исследования заключается в том, что, несмотря на рост количества публикаций по теме географического образования в школах, наблюдается недостаточный уровень международного сотрудничества, а сами исследования сосредоточены в ограниченном числе стран. Целью исследования является выявление мировых тенденций публикационной активности по преподаванию школьной географии на основе данных базы Scopus, а также определение ведущих стран, университетов и часто используемых авторских ключевых слов. Анализ проведен на основе 372 научных статей, опубликованных в период с 2004 по 2023 годы. Для сбора и обработки данных использовались инструменты аналитики Scopus и программа VOSviewer. Результаты показали, что Великобритания, США и Австралия являются наиболее активными странами в данной области. Частое использование ключевых слов «Geography Education», «Geographical Knowledge» и «Geography Curriculum» указывает на основные тематические направления исследований по школьной географии. В заключении подчеркивается, что за последние пять лет наблюдается устойчивый рост интереса к вопросам преподавания географии в школах. Отмечается значимость данной области для достижения целей устойчивого развития и обозначаются перспективные направления будущих исследований. Полученные результаты свидетельствуют о необходимости расширения международного научного сотрудничества и тематического разнообразия в дальнейших исследованиях.

Ключевые слова: школьная география, библиометрический анализ, база данных Scopus, VOSviewer, географическое образование, географические знания, международное сотрудничество.

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