

English for specific purposes (ESP) in the digital era: Bibliometric mapping with critical reflection on the lack of performance-based learning studies



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Abstract This study aims to map the development of ESP studies in the digital era through a bibliometric approach and to provide critical reflection on the lack of studies that promote performance-based learning. Data were collected from the Scopus database from 2010–2025, with a total of 665 documents identified. After a gradual screening process, 71 articles were obtained and analyzed qualitatively. The analysis of publication trends reveals significant fluctuations, with a peak in 2022 (9 documents) and then a sharp decline until 2025. Visualization with VOSviewer software identifies dominant clusters such as virtual reality, digital literacy, interdisciplinary approaches, and learner engagement. The findings show that ESP research is experiencing dynamic growth, especially in the use of technology and the development of digital materials. However, performance-based learning approaches are still underrepresented in the literature. Evaluations of assessment strategies and curriculum development that emphasize real learning outcomes are still rare. Therefore, this study highlights the need for a new direction in ESP research that integrates authentic assessment, simulation of professional tasks, and reinforcement of communicative competencies according to real-world needs. Critical reflection in this study is expected to be the foundation for further research and practical innovation in the development of an ESP curriculum that is more contextual and relevant to the digital age.

Keywords: communication, professionalism, assessment, innovation, technology

1. Introduction

The rapid development of digital technology in the last decade has had a significant impact on English education and learning (Hsiao et al., 2023). One branch of English learning that continues to develop is English for Specific Purposes (ESP), which is language learning that is contextually designed according to the needs of certain fields of expertise or professions, such as business, medicine, engineering, and tourism (Fastré et al., 2010; Ghafar, 2022). Unlike general-purpose English teaching, ESP teaching is always practiced applicatively, especially given its relevance to specific contexts and existing professional needs (Berendonk et al., 2013). With the ever-changing dynamics of the workplace, there is a growing demand for practical skills that are immediately applied as well as a shift toward a greater multidisciplinary focus in training and education.

In this digital age, ESPs must not only address the specific content that needs to be taught but also pay attention to technological advances and changes in the characteristics of digitally interconnected learners (Pack & Barrett, 2021). With increasing reliance on technology, research on ESPs is taking a more dynamic direction (Bobkina & Romero, 2022; Salmani-Nodoushan, 2020). Many innovations are emerging, including the integration of technology into teaching, for example, the use of virtual reality, the improvement of digital literacy, and an interdisciplinary approach that focuses on the active participation of learners (Marquardt & Kearsley, 2024). However, during the wave of innovation, there is still one important focus that has received little attention, namely, performance-based learning (PBL). PBL focuses on skill mastery through real performance-based tasks (Chen et al., 2019). This approach is considered effective in increasing student engagement, deepening understanding, and preparing students to face real-world challenges.

PBL is an approach that focuses on the achievement of skills through authentic activities that reflect the professional world, such as project presentations, case simulations, or context-based problem-solving (Bora, 2020; Chen et al., 2018). In an ESP context where the focus is on the application of language in a given situation, the application of PBL should have great potential. Unfortunately, studies that explicitly address the integration of PBL into ESP teaching are still very limited. The available literature tends to be fragmented, unfocused or unable to adequately explore the dimensions of authentic evaluation and assessment, which are the main strengths of PBL (Elibol et al., 2018; Kang et al., 2010; McKinney & Hagedorn, 2017; Shahin et al., 2014; Vernadakis et al., 2012; Zafari et al., 2021). This situation highlights a gap in the development of ESP studies, especially in the effort to connect the concept of real-world needs with a teaching approach that reflects real professional



challenges. Therefore, a mapping of the bibliometric literature is needed to identify how the direction of ESP research is evolving and the extent to which performance-based pedagogical models are integrated into the study.

In light of technological advancements and global professionalism, ESP education is designed to be not only content-adaptive but also innovative in its approach to teaching (Bhatia et al., 2011). One approach that can help with this is PBL, which encourages students to learn through practical exercises. However, preliminary results suggest that although PBL is highly relevant in the context of ESP, scholarly research that integrates the two topics remains relatively underdeveloped and has not been conducted in a systematic manner (Liton, 2015). The majority of ESP research focuses on the use of technology or innovative digital learning materials without explicitly addressing how performance-based assessments can improve students' communication skills in the relevant professional field (Lam et al., 2014; Mariotti, 2024). This indicates that there is a need to conduct a comprehensive literary analysis to determine how PBL has been implemented in ESPs and to provide a framework for developing knowledge and teaching methods that are more relevant, applicable, and in line with the demands of the digital age.

This study aims to document the evolution of ESP research in the digital age through bibliometric analysis based on data from Scopus (2010–2025) and critically examines the minimal PBL research findings in the ESP literature. Through audience analysis, thematic cluster visualization, actor identification, and key collaboration, this study provides a comprehensive overview of the rise of ESPs and highlights new developments that integrate performance-based learning into ESP curriculum design, making it more contextual, authentic, and relevant to the digital era.

On the basis of this background, this research is formulated into the following two questions:

RQ1: What are the trends and developments of ESP research in the digital age based on the number of documents, countries, authors, highest citations, and article themes published in the Scopus database from 2010–2025?

RQ2: What are the trends of author collaboration and keyword linkage that dominate ESP research, as well as the position and representation of the performance-based learning approach in the literature?

2. Materials and Methods

This research was systematically prepared with a practical approach without involving theoretical discussions. The entire procedure is described in detail and sequentially so that it can be replicated. The researcher focused on concrete implementation stages, from data collection to analysis, to ensure the achievement of the research objectives. The methods used are focused on the concrete actions taken during the research process, emphasizing the direct link between the procedure and the results obtained (Ariyatun et al., 2024). Thus, this section forms a solid basis for the validity and reliability of the results achieved.

2.1. Search terms

In the data collection process, a literature search was carried out through the Scopus database via a combination of keywords that represent the focus of the research, namely, ESP studies in the digital era. The keywords used include "English for Specific Purposes" OR "ESP" and are combined with additional keywords that reflect the integration of technology and contemporary learning approaches, such as "digital learning", "virtual reality", "technology-enhanced learning", "digital literacy", "online learning", and "digital pedagogy". To explore potential linkages to performance-based learning approaches, additional keywords such as "performance-based learning", "authentic assessment", and "task-based performance" were also included in the initial search. However, the screening results show that the number of articles explicitly linking ESP to performance-based learning approaches is still very limited. Therefore, the literature mapping is focused on ESP publications that are relevant to the development of digital technology, with critical reflection on the lack of integration of the PBL approach in this domain. The search focused on titles, abstracts, and keywords in the time range of 2010-2025.

After the initial search stage is carried out, the article screening process uses several inclusion criteria to ensure the relevance and quality of the document being analyzed. These criteria include (1) articles published from 2010-2025; (2) documents that are of the type of scientific articles, not proceedings, editorials, or book chapter reviews; (3) articles written in English to fit the context of the ESP study; (4) topics that explicitly discuss ESPs both in titles, abstracts, and keywords; and (5) articles that address the use of digital technology in English-language learning or relevant pedagogical approaches, such as virtual learning, online instruction, and digital content development.

Articles that mention only ESPs in general with no connection to digital developments or that are overly descriptive without a clear theoretical contribution are also excluded from the analysis. In the context of critical reflection on performance-based learning, although articles that specifically address PBL in ESPs are very limited, articles that have potential relevance, such as the use of authentic tasks, professional simulations, and performance evaluations, are still noted for qualitative analysis in the deep reflection stage.

2.2. Study selection

The study selection process is carried out systematically to ensure that the analyzed documents are the focus and objectives of the research. The first stage starts with an initial search using predetermined keywords, such as "English for Specific Purposes", "ESP", "digital learning", "technology integration", and other combinations, such as "ESP AND digital era", "ESP AND virtual learning", and "ESP" AND "performance-based learning". The search was conducted on the Scopus database, with a publication year limit from 2010--252525. The second stage is the automatic filtering process, which is carried out through the advanced search feature in Scopus to separate document types. Only documents in the form of journal articles are included, whereas document types such as conference proceedings, reviews, editorials, and book chapters are excluded.

The third stage is a manual screening of article titles and abstracts. Articles that do not explicitly address ESP or are not relevant to the theme of digitalization of learning and pedagogical approaches are excluded from the analysis. In addition, articles that are too general, contain no conceptual contributions, or are descriptive without a pedagogical focus are also eliminated. The final stage was a full-text screening of 71 selected articles to identify linkages to the central theme of the research, in particular, to find gaps in the integration of the PBL approach in the ESP domain. Although the number of documents specifically mentioning "PBL" is very limited, studies that contain elements of authentic assignment, simulation, performance assessment, and professional competency reinforcement are still considered critical reflections that are part of the qualitative analysis of the research.

The PRISMA flowchart facilitates a transparent, systematic, and replicable selection process and helps ensure that only relevant and quality articles are analyzed in the research. The PRISMA flowchart is presented in Figure 1.

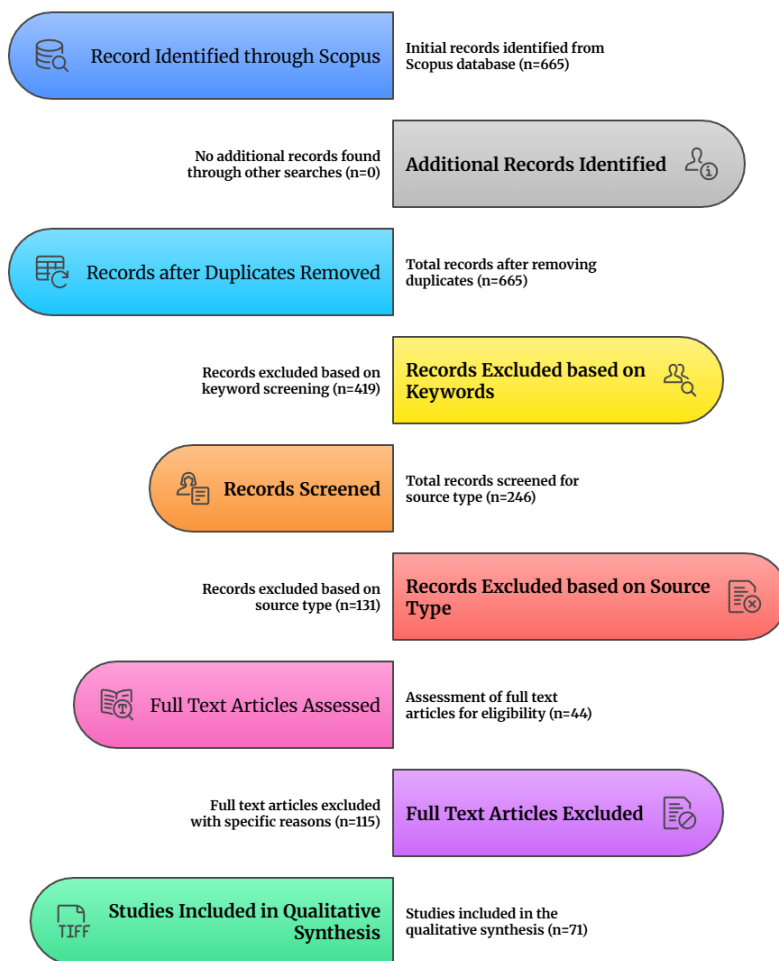


Figure 1 PRISMA flowchart.

2.3. Analysis and visualization

The selected data were analyzed via a bibliometric approach with the help of VOSviewer software. The analysis includes identifying publication trends by year, the author's country of origin, institutional affiliation, and the article with the highest number of citations. Visualization was carried out to map the collaboration networks between authors, keyword co-occupancy, and thematic clusters that emerged in ESP studies during the digital era. This visual representation provides a comprehensive overview of the scientific map and direction of research development and helps identify gaps that are still not widely studied, especially those related to the integration of performance-based learning in the ESP domain.



3. Results

3.1. ESP publication trends in the digital era (2010–2025)

In the last two decades, attention to ESPs has increased significantly, along with the growing global demand for English, which is more focused on specific professional or academic areas. The results of the bibliometric mapping of ESP publications from 2010 early 2025 reveal three main phases of development. A visualization of publication trends is presented in Figure 2.

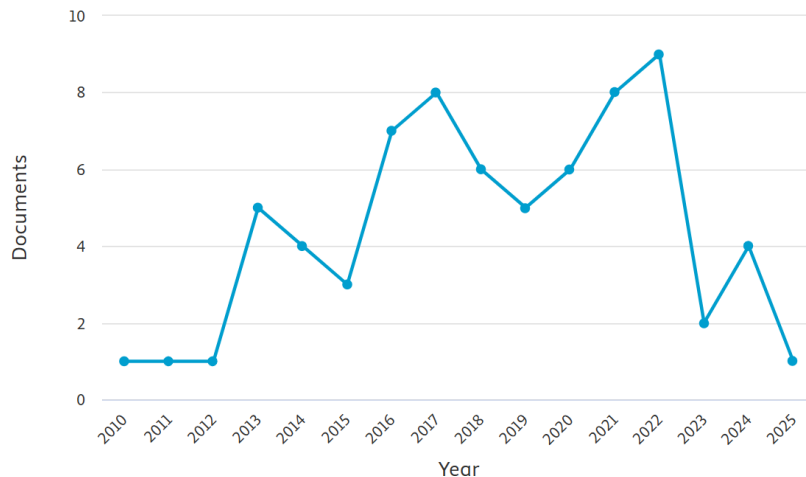


Figure 2 Distribution of documents and articles by year. Source: Scopus database (2025).

Figure 2 shows fluctuating dynamics that tend to increase in the long term. The period 2010–2012 recorded a very low and stable number of publications, which is only one document per year. A significant surge of 5 documents began in 2013, after which it decreased to 3 documents in 2015. A drastic increase occurred in 2016 and reached the first peak in 2017, with 8 documents. After experiencing a slight decline in the following years, the trend increased again and reached a high point in 2022, with 9 documents. However, the number of publications declined sharply in 2023 and 2025. This pattern shows that although interest in ESP continues to grow, especially since the era of digitalization and the pandemic, the amount of research published is not always consistent every year, indicating the need for more attention to the sustainability of ESP studies in the future.

3.2. Geographical and institutional distribution

To understand more comprehensively how ESP research is evolving globally in the digital age, analysis of geographic and institutional distributions is crucial. This section presents the contributions of the countries and institutions that are most active in publishing scientific papers related to digital-based ESPs, as well as the patterns of collaboration that have formed between researchers across countries. A visualization is shown in Figure 3. Featuring collaborative networks and science production centers in the field of ESP during the period 2010–2025.

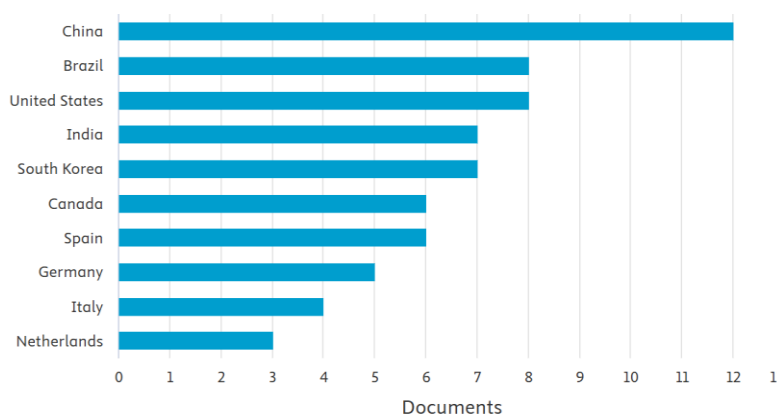


Figure 3 Distribution of documents by country or territory. Source: Scopus database (2025).

Figure 3 shows that China is the country with the highest publication contribution to digital-based ESP studies, with a total of 12 documents. The next position was filled by Brazil and the United States, each with 8 documents, showing that interest in ESPs is not only limited to English-speaking countries but also growing rapidly in developing countries. India and



South Korea each contributed 7 documents, followed by Canada and Spain with 6 documents. The diversity of the countries of origin of this publication confirms that the ESP in the digital age has become a global issue involving various linguistic and cultural contexts. Nevertheless, most of the publications come from institutions in Asian and American countries, showing the potential for cross-regional collaboration that can still be improved, especially in the context of knowledge exchange and best practices in the development of technology-based ESPs. The institutions that are most active in publishing scientific papers related to digital-based ESPs are presented in Figure 4.

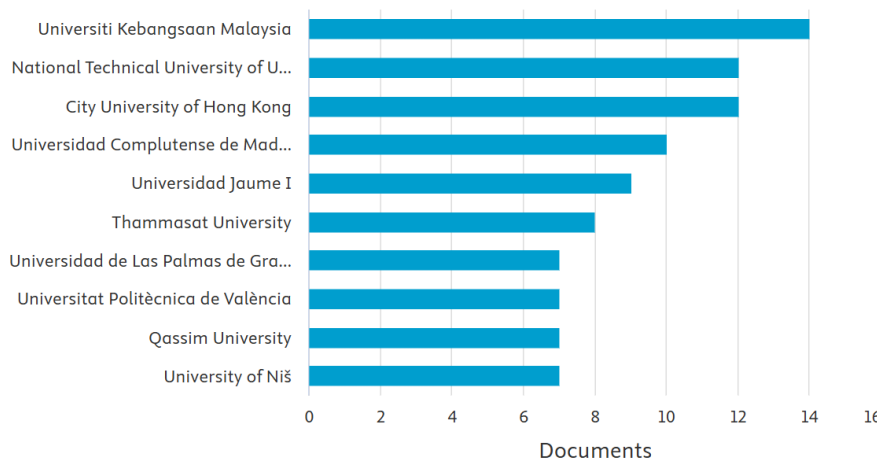


Figure 4 Distribution of documents by affiliation. Source: Scopus database (2025).

Figure 4 shows that Universiti Kebangsaan Malaysia ranks as the most productive institution in digital-based ESP publications, contributing a total of 14 documents. This is followed by the National Technical University of Ukraine and the City University of Hong Kong, each with 12 publications. The prominence of institutions from Asia and Europe illustrates the broad geographical landscape of ESP research in the digital context. Notable contributions also come from Spanish institutions such as Universidad Complutense de Madrid, Universidad Jaume I, and Universitat Politècnica de València. The variety of contributing institutions underscores the presence of globally distributed research hubs in ESP and highlights the strong potential for international collaboration to meet the evolving language learning demands across professional fields in the digital era.

3.3. Most influential authors and articles

The presence of authors from different countries also shows that ESP research is cross-border and multicultural, reflecting the diversity of approaches and educational contexts studied. The dominance of some authors shows that although the field of digital ESP is quite broad, there are key actors that consistently contribute to the development of the literature. Table 1. Author influence should be strengthened through citation metrics.

Table 1 presents the 15 articles with the highest number of citations in digital-based English for ESP research. Tao and Gao's (2018) work entitled "Identifying the Construction of ESP Teachers at a Chinese University" occupies the most influential position, with 71 citations. This was followed by Liu and Hu (2021), who mapped the development of the ESP field over almost four decades and obtained 70 citations. These two articles show that the study of ESP teacher identity and field mapping through cocitation analysis are topics that are of great interest to academics worldwide. In addition, the contributions of Salmani-Nodoushan (2020), Pack and Barrett (2021), and Dafouz (2021) confirm that ESP research trends are moving toward technology integration (such as virtual reality), cross-disciplinary learning, and innovative learning approaches such as flipped classrooms. Other articles, including those of Indonesian authors such as Mulyadi et al. (2020) and Mauludin (2021), have also gained significant academic recognition, demonstrating the active involvement of researchers from developing countries in the global discourse. With respect to the contributions of the top 15 authors, Figure 5 presents an overview of the role of the top journals that publish ESPs in the digital age.

The graph in Figure 5 illustrates that the Journal of Teaching English for Specific and Academic Purposes dominates the number of publications, especially in 2021, with the highest peak reaching 9 documents. Moreover, English for specific purposes and the Asian ESP Journal showed fairly stable fluctuations, with significant contributions in certain years, especially in 2023. The Journal of Language Teaching and Research and ESP currently also contribute, albeit with a lower volume of publications, and tend to be constant. In general, this trend reflects an increase in interest in ESP studies in various scientific journals, with peaks in publications indicating specific topics or issues of major concern in those years.

3.4. Keyword analysis and thematic clustering



The results of the visualization of co-occurrence keywords from VOSviewer, which show the dominant clusters, such as virtual learning, digital literacy, authentic tasks, interdisciplinary approaches, and others, are presented in Figure 6.

Table 1 List of the 15 highest citation articles.

Title	Author-Year	Citation
Identify of construction of ESP teachers in a Chinese university	Tao and Gao (2018)	71
Mapping the field of English for Specific Purposes (1980-2018): A cocitation Analysis	Liu & Hu (2021)	70
English for specific purposes: Traditions, trends, directions	Salmani-Nodoushan (2020)	45
A Review of Virtual Reality and English for Academic Purposes: Understanding Where to Start	Pack and Barrett (2021)	35
Crossing disciplinary boundaries: English-medium education (EME) meets English for specific purposes (ESP)	Dafouz (2021)	28
The flipped classroom approach in an English for specific purposes (ESP) course: A quasi-experimental study on learners' self-efficacy, study process, and learning performances	Hsiao et al. (2023)	23
Needs analysis for English for specific purpose course development for engineering students in Korea	Kim (2013)	21
Blended learning in English for specific purposes (ESP) instruction: Lecturers' perspectives	Mulyadi et al. (2020)	20
Students' Perceptions of the Most and the Least Motivating Teaching Strategies in ESP Classes	Mauludin (2021)	17
Voicing the challenges of ESP teaching: Lessons from ESP in non-English departments	Iswati and Triastuti (2021)	17
Engineering Students' Motivation to Learn Technical English in ESP Courses: Investigating Iranian Teachers' and Students' Perceptions	Pazoki and Alemi (2020)	15
Challenging ESP teacher beliefs about active learning in a Vietnamese university	Nguyen et al. (2019)	14
Science dissemination videos as multimodal supporting resources for ESP teaching in higher education	Garcia et al. (2023)	12
Is ability grouping beneficial or detrimental to Japanese ESP students' English language proficiency development?	Sheppard et al. (2018)	12
Preservice teachers' belief changes in an English for specific purposes teacher education context	Dang et al. (2024)	10

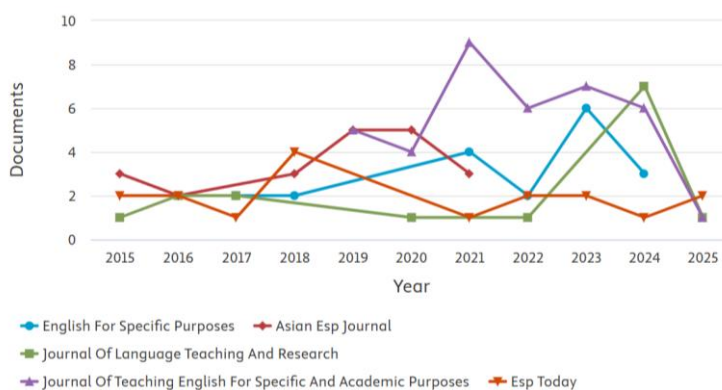


Figure 5 Distribution of documents per year by source. *Source:* Scopus database (2025).

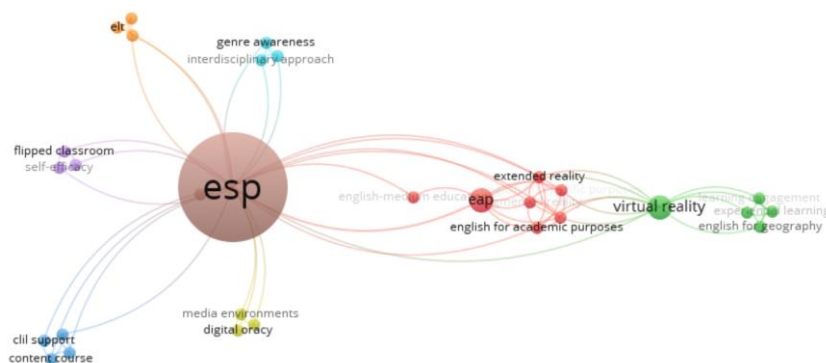


Figure 6 Visualization of co-occurrence keywords from VOSviewer (2025).



Figure 6 shows the results of the visualization of co-occurrence keywords via VOSviewer, which shows thematic maps in the ESP study. The keyword "ESP" is the center of connectivity of several main interrelated clusters. The red cluster highlights the linkage of the ESP with English for Academic Purposes (EAP), extended reality, and English-medium education, showing a focus on technology-based academic approaches. The green cluster reflects the connection between VR, experiential learning, and contextual learning, such as English for geography. The other cluster included the themes of digital literacy, media environments, flipped classrooms, and self-efficacy, which highlighted the integration of technology and active learning strategies in ESP teaching. In addition, clusters such as genre awareness, interdisciplinary approaches, and CLIL support emphasized the importance of a cross-disciplinary approach and content integration in the development of ESP learning. Overall, this visualization confirms that ESP research is currently moving dynamically. Integrating technology, pedagogical innovation, and cross-disciplinary collaboration to address the demands of 21st-century learning.

3.5. Critical reflections on the lack of performance-based learning studies in ESPs

An in-depth analysis based on data reveals the explicit limitations of studies that integrate the PBL approach in ESP teaching even though the concept is aligned with ESP goals (Takeda et al., 2017). Although the performance-based learning approach has great potential in supporting real needs-based learning outcomes, as emphasized in ESP (Dong & Frangopol, 2016; Prastikawati, 2020), bibliometric data show that its application in the context of ESPs is still very limited. Studies that explicitly incorporate PBL in ESP teaching are relatively rare, even though this approach is in line with the core principles of ESP, which emphasize contextual learning and applicative skills. For example, a study by Chen et al. (2019) on digital comic performance-based learning showed that this approach can increase students' learning autonomy and ownership in English language learning. Similarly, the embodied cognition approach used in the study *Teaching the Tragedy of the Commons through an iterative, performance-based, embodied cognition pedagogy* (2023) successfully integrated active learning experiences that impacted students' deep understanding and engagement.

In addition, research by Chen et al. (2018) using an attention-based diagnosis mechanism with a digital pen to support paper-based learning has been shown to improve students' English learning performance. However, very few of these studies explicitly focused on the ESP context, creating a significant research gap. This indicates the need for further exploration of how PBL design can be tailored to the specific needs of the ESP in terms of the content, media, and instructional strategies used. By closing this gap, ESP teaching can evolve to be more authentic, applicable, and in line with the needs of the professional world.

4. Discussion

The results of the bibliometric analysis of publications in the Scopus database from 2010–2025 indicate that research on ESPs has experienced a fairly dynamic increasing trend, especially since 2018. To answer RQ1, the data show that the number of ESP documents tends to increase, with a significant peak occurring in 2023 in the journal *English for Specific Purposes* and the *Journal of Teaching English for Specific and Academic Purposes*. The distribution of this document shows that ESP publications are not only concentrated in one major journal but are also spread across journals such as the *Asian ESP Journal*, *ESP Today*, and the *Journal of Language Teaching and Research*, indicating the breadth of coverage and interest in this topic.

In terms of authors and citations, an article by Tao and Gao (2018) entitled *Identity of Construction of ESP teachers at a Chinese university* was the most cited, with 71 citations, followed by Liu and Hu (2021), with a cocitation analysis entitled *Mapping the field of English for Specific Purposes (1980–2018)*, which obtained 70 citations. These findings show that the issue of ESP teacher identity and the mapping of the ESP field is a major concern in the academic community. Geographically, ESP research is dominated by Asian countries such as China, South Korea, Indonesia, and Iran, reflecting the context of the region's growing need for professional and academic English language skills.

In response to RQ2, the results of the visualization of coauthorship and co-occurrence keywords via VOSviewer show that author collaboration is dominated by small clusters based on similar regions or topics without a strong global collaborative network. Moreover, the dominant keywords include virtual reality, digital literacy, authentic tasks, interdisciplinary approaches, and flipped classrooms, which signals a shift in focus toward integrating digital technology and innovative learning approaches in ESPs (Pack & Barrett, 2021). However, visualization shows that the performance-based learning approach has not emerged as a key keyword or a strong thematic cluster in ESP studies.

The explicit limitations of ESP studies that adopt a performance-based learning approach constitute a research gap that deserves attention. Several studies outside the ESP context have proven the effectiveness of this approach in improving English learning performance, such as research by Tien et al. (2018), who developed digital comic performance-based learning to encourage learning autonomy and ownership, and a study by Chen et al. (2019), who integrated digital pens in paper-based learning with improved student performance outcomes. Another study by Barzilai and Blau (2014) in the context of embodied cognition also supports the importance of performance-based learning to build a more immersive learning experience. However, the lack of similar research in the ESP corpus analyzed suggests that this approach has not been proportionately

represented in the ESP literature, thus opening up further research opportunities to explore the integration of PBL in the context of specific needs-based teaching.

5. Conclusion

This study shows that ESP studies have undergone significant developments in the digital era, with publication trends increasing fluctuantly during the period 2010–2025. The dominance of contributions from Asian countries, such as China, South Korea, Indonesia, and Iran, reflects the need for English-language learning geared toward specific professional and academic goals in the region. The most influential articles in terms of citations generally raise the issue of ESP teacher identity and field of study mapping, which confirms the importance of critical and contextual perspectives in ESP development. Visualization of the relationship between author collaboration and keyword linkage indicates a tendency to use technology-based approaches such as virtual reality, digital literacy, and flipped classrooms, but the dominance of performance-based learning approaches in the ecosystem has not been observed in ESP research.

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Ethical Considerations

Not applicable.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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