Journal of Education and Learning (EduLearn)
Vol. 19, No. 4, November 2025, pp. 1988~1996
ISSN: 2089-9823 DOI: 10.11591/edulearn.v19i4.22031

Mapping the landscape of innovative work behavior: a bibliometric analysis of teacher contributions

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Article Info

Article history:

Received Mar 28, 2024
Revised Oct 19, 2024
Accepted Mar 18, 2025

Keywords:

Bibliometric
Innovation
Innovative behavior
Innovative work behavior
Innovativeness
Teacher
VOSviewer

ABSTRACT

In the ever-evolving landscape of education, implementation of innovative work behavior (IWB) among teachers is crucial. However, the current situation indicates that teachers' contributions to the understanding of IWB have not been thoroughly explored and need further investigation. This bibliometric analysis aims to systematically analyze and map the scholarly contributions in this field, offering insights into the key themes, contributors, and emerging trends. Employing a systematic searching and screening from 2020-2023, a total of n=532 peer-reviewed articles were analyzed, retrieved from Scopus database. Scopus analyzer and VOSviewer software are employed to determine the evolution of research trends, authors' contributions, the research area of interest, most cited manuscripts, keyword co-occurrence, and visualize co-authorship network maps. The anticipated outcome of this bibliometric analysis is a comprehensive mapping of the landscape of IWB research, with a specific focus on teacher contribution. Identified clusters and influential contributors will serve as a foundation for future research endeavors. Recommendations based on the analysis will inform educators, policymakers, and researchers about potential areas for intervention and collaboration, fostering a more innovative and effective educational environment. Future research could delve deeper into specific subdomains identified in this analysis, further exploring the intricate factors influencing IWB among teachers.

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1. INTRODUCTION

In the dynamic landscape of education, the role of teachers transcends traditional boundaries, evolving into a multifaceted and ever-evolving profession that demands continuous adaptation and innovation [1], [2]. As educational paradigms shift, understanding the intricacies of innovative work behavior (IWB) among teachers becomes paramount [3]–[5]. The traditional perception of educators merely imparting information has given way to a more nuanced understanding of their role as facilitators of critical thinking, creativity, and problem-solving skills. In this context, IWB among teachers emerges as a critical factor that not only influences the quality of teaching, but also contributes to the broader educational ecosystem.

IWB encompasses intentional behaviors where employees generate, initiate, and implement novel ideas to contribute to team or organizational success [6]. In expanding the definition, IWB is viewed as a combination of behaviors related to the development and implementation of new, important, and beneficial ideas aimed at enhancing employee and organizational performance [7]. IWB is also highlighted as

employees' approach to generating, creating, developing, applying, promoting, realizing, and modifying new ideas to benefit their organizations [8]. It accentuate the systematic approach employees adopt to achieve organizational goals by developing, managing, and implementing unique ideas, contributing to a competitive advantage and long-term profitability [9]. In educational context, teachers' IWB refers to their ability to introduce new ideas, processes, and solutions to improve teaching and learning. It is not just about novelty or creativity but also about a deep sense of professional duty driven by passion and dedication to enhancing student learning experiences [10].

Previous research demonstrated IWB can be influenced by various factors [11], such as temporal leadership [12], transformational leadership [13], [14], distributed leadership [15]–[18] leader-member exchange [13], [16], principal support [19], professional learning communities (PLCs) [20], rewards [21], sustainable leadership [22] culturally sensitive teaching roles [23], autonomy [24], and teachers' motivation [25]. With regard to the COVID-19 pandemic's quick changes and challenges along with the growing integration of technology into education, IWB is crucial for teachers [22], [26], [27]. However, a critical examination reveals that teachers encounter obstacles in the adoption of innovative practices, resulting in a gap between the aspirational potential and the practical implementation of IWB. One of the main obstacles is difficulties associated with management teams, such as lack of support, conflicting priorities, and resistance to change [28]. The consequences extend beyond individual classrooms, influencing the overall quality of education. To address this multifaceted problem comprehensively, a bibliometric analysis is imperative. Traditional research methods may fall short in capturing the intricacies of the contemporary educational landscape, where information is rapidly disseminated across diverse platforms.

By analysing, synthesizing, and evaluating the vast tapestry of literature, this current study will outline the evolution of research on IWB among teachers, identifying foundational works, prominent authors, and emerging trends based on research questions stated as follows:

- RQ1: what are the research trends in IWB among teachers according to the year of publication?
- RQ2: who are the top ten authors published in the field of IWB among teachers?
- RQ3: who writes the most cited articles in IWB among teachers?
- RQ4: what is the most popular subject area in IWB among teachers?
- RQ5: what are the popular keywords related to the study?
- RQ6: what are co-author and countries' collaboration?

2. METHOD

Bibliometrics is a research method that employs statistical and computational techniques to analyze academic publications within a specific field [29]. The goal is to quantify patterns, relationships, and trends within the scholarly literature [30]–[32]. In this study, a comprehensive literature search was conducted using Scopus database, due to its extensive coverage of peer-reviewed literature across diverse disciplines. Scopus has been recognized for its broad indexing capabilities and citation tracking, making it a preferred source for bibliometric analysis [33], thereby enhancing the study's applicability and generalizability [34]. Besides, numerous studies published in credible journals, such as those by Salam and Senin [35] in IWB and [36] in education, use Scopus data in their analysis, demonstrating the academic community's acceptance and dependability of the data. Then, to focus on the topic of IWB among teachers, relevant keywords and related terms were employed. After that, the retrieved data included details such as authors, titles, publication years, source titles, keywords, and the number of citations. This information formed the basis for subsequent analyses. In order to get specific data, inclusion criteria were conducted. Scopus analyzer facilitates data retrieval and preliminary analysis, while VOSviewer allows for the creation of visual maps depicting keyword co-occurrence and co-authorship networks.

2.1. Data search strategy

The study used a screening sequence to identify the search string for article retrieval. At first, 2,318 articles were assembled from the Scopus online database. After going through several filtration processes and searching selection criterion, which only included articles in English and lasted from 2020 to 2023, with only journal articles and articles in the final publication stage, the Scopus database gathered an amount of 532 related articles. The final search string used in Scopus was: TITLE-ABS-KEY (("innovative work behavi*or" OR "innovative behavi*or" OR " teach* innovat*") AND (teach* OR educat* OR "faculty member" OR instructor*)) AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2023)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")). All publications from the Scopus database about teachers' IWB were included in the study as of December 2023.

2.2. Data analysis

Data sets covering the period 2020 to December 2023 were obtained from the Scopus database, containing the study publication year, publication's title, author's name, journal, citation, area of research, and keyword in PlainText format. Then, the data sets were analyzed using Scopus analyzer to answer RQ1, RQ2, RQ3 and RQ4, while RQ5 and RQ6 were analyzed using VOSviewer software version 1.6.19. Employing VOS clustering and mapping techniques, this software has been utilized for the analysis and generation of maps. VOSviewer, as an alternative to the multidimensional scaling (MDS) approach, is employed for this purpose [37]. Similar to the MDS approach, the primary objective of VOSviewer is to position items in low-dimensional spaces, ensuring that the distance between any two items accurately reflects their relatedness and similarity [37]. In contrast to MDS, which centers on the computation of similarity measures such as cosine and Jaccard indices, VOS employs a superior method for normalizing co-occurrence frequencies [38], like association strength (ASij) and it is calculated as:

$$AS_{ij} = \frac{C_{ij}}{W_i * W_j}$$

which is "proportional to the ratio between the expected number of co-occurrences of i and j under the assumption that co-occurrences of i and j are statistically independent and the observed number of co-occurrences of i and j" [37]. Thus, after lowering the weighted total of the squared distances between each pair of items, VOSviewer arranges the items in the form of a map with the aid of this index. The normalization of LinLog/modularity was implemented. Additionally, the researchers conducted investigations involving keyword co-occurrence and co-authorship analysis, utilizing visualization techniques through VOSviewer to unveil patterns based on mathematical connections within the dataset.

3. RESULTS AND DISCUSSION

The study investigated the critical gaps in the existing literature on IWB among teachers through a rigorous bibliometric analysis. By focusing on teachers' contributions to understanding IWB, this research addresses areas that have been previously underexplored. The results are systematically discussed based on six research questions formulated at the beginning of the study, providing a thorough examination of the emerging trends, patterns, and significant insights within this field.

3.1. RQ1: what are the research trends in IWB among teachers according to the year of publication?

The bibliometric analysis of publications on teachers' IWB reveals a notable trend in the scholarly output over the past four years, as shown in Figure 1. The extracted data indicates a significant increase in the number of publications, with 100 (19%) documents in 2020 rising to 117 (22%) in 2021, 162 (31%) in 2022, and 144 (28%) in 2023. This is due to increasing awareness of the importance of innovation in education, driven by the need to adapt and prepare students for future challenges [39]. IWB among teachers is seen as crucial for driving this adaptation and fostering creativity, critical thinking, and problem-solving skills in students [40]. This temporal analysis provides valuable insights for researchers, educators, and policymakers alike, signaling the evolving priorities and emphases in the field over the specified timeframe.

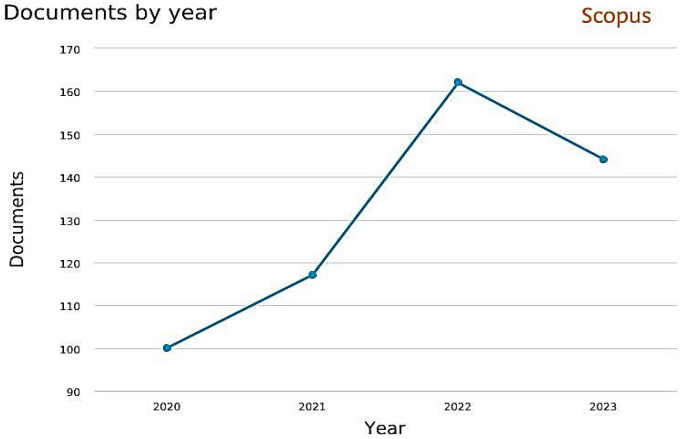

Figure 1. Documents by year of publication

3.2. RQ 2: who are top ten authors published in the field of IWB among teachers?

Figure 2 shows the top 10 authors who have significantly contributed to the field. The leading author, Whalen, D.J., has demonstrated a remarkable presence with 10 publications, representing 2% of the total dataset. It would be insightful to delve deeper into Whalen's contributions to gain a comprehensive understanding of theoretical frameworks, methodologies, and key insights presented in these publications. Following by, Drehmer, C., with 5 publications, Chand, V.S. Fiernaningsih, N., Han, J., and Herijanto, P., with 4 publications, secured the second to sixth positions, each contributing 1% to the overall body of literature. Aboobaker, N., Aboramadan, M., Arcos-Alonso, A., and Gao, C., each have 3 publications, also constituting 1% of the dataset. Observations of the author names revealed an international collaboration involving researchers from Saudi Arabia, China, Indonesia, the United States, and other nations. This highlights the international nature of research on teachers' IWB.

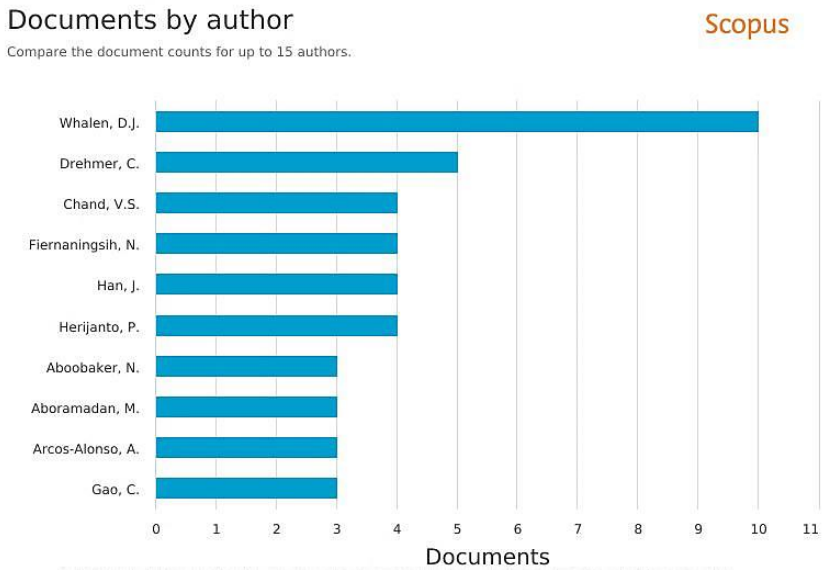

Figure 2. Documents by author

3.3. RQ3: who writes the most cited articles in IWB among teachers?

Table 1 shows the most cited manuscripts based on Scopus database from 2020 to 2023. Artacho *et al.* [41] emphasize the pivotal role of digital competence in teacher training for lifelong learning, garnering 100 citations, highlighting the contemporary importance of technological proficiency in fostering teaching innovation. Aboramadan [42] investigates the influence of green human resource management on employee green behaviors in higher education, with a focus on the mediating mechanism of green work engagement, accruing 93 citations. Additionally, Khan *et al.* [43] explored the intricate interplay of leadership styles, IWB, organizational culture, and organizational citizenship behavior, contributing 89 citations to the scholarly discourse. In summary, these articles collectively contribute to the academic discourse on IWB among teachers, covering diverse aspects such as digital competence, leadership styles, education technologies, and human resource management practices. The citation counts reflect the scholarly impact of these contributions within the fields of education and organizational studies.

3.4. RQ4: what is the most popular subject area in IWB among teachers?

Figure 3 shows the documents published by subject area, revealing a dominance of social sciences (35.1%) in IWB research. This aligns with the inherent focus of these fields on understanding human behavior, motivation, and cognitive processes, all of which play a crucial role in teacher innovation. While traditional fields continue to lead the way, the presence of fields like business, management, and accounting (11.8%) suggests a growing interest in applying organizational and leadership theories to foster IWB in educational settings. The notable presence of subject areas like computer sciences (8.1%) and engineering (5.5%) hints at the increasing integration of technology into IWB research. This interdisciplinary trend underscores the need for collaboration between educational researchers and scholars from other fields to explore the complex interplay of technology, pedagogy, and human factors in driving teacher innovation.

Table 1. Top ten manuscripts based on the number of citations

Author (s)	Title	Year	Source title	Citation
Artacho *et al*. [41]	Teacher training in lifelong learning-the importance of digital competence in the encouragement of teaching innovation	2020	Sustainability (Switzerland)	100
Aboramadan [42]	The effect of green HRM on employee green behaviors in higher education: the mediating mechanism of green work engagement	2022	International Journal of Organizational Analysis	93
Khan *et al.* [43]	The interplay of leadership styles, IWB, organizational culture, and organizational citizenship behavior	2020	SAGE Open	89
Zhu and Wang [44]	Team-based mobile learning supported by an intelligent system: case study of STEM students	2020	Interactive Learning Environments	41
Moreno-Guerrero *et al.* [45]	Flipped learning and good teaching practices in secondary education	2021	Comunicar	39
Parra-González *et al.* [46]	Gamification and flipped learning and their influence on aspects related to the teaching-learning process	2021	Heliyon	37
Wu and Chen [47]	Stimulating innovation with an innovative curriculum: a curriculum design for a course on new product development	2021	International Journal of Management Education	35
Cabezas *et al.* [48]	University teachers' training: the digital competence	2020	Pixel-Bit, Revista de Medios y Educacion	35
Sudibjo and Prameswari [49]	The effects of knowledge sharing and person–organization fit on the relationship between transformational leadership on IWB	2021	Heliyon	32
Kutieshat and Farmanesh [50]	The impact of new human resource management practices on innovation performance during the COVID 19 crisis: a new perception on enhancing the educational sector	2022	Sustainability (Switzerland)	31

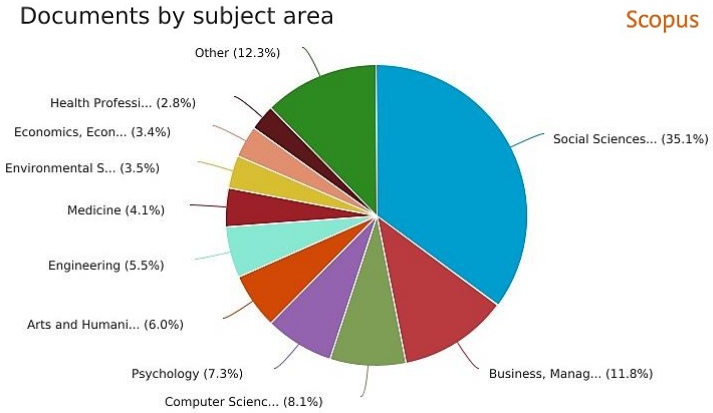

Figure 3. Documents by subject area

3.5. RQ5: what are the popular keywords related to the study?

Figure 4 shows several clusters and relationships of keywords' co-occurrence in IWB among teachers. The central clusters in the map appears to focus on teaching innovations and teacher innovation. This includes keywords like "teaching methods," "gamification," "active learning," "entrepreneurship," and "pedagogy." This suggests that a major theme in research on IWB among teachers revolves around developing and implementing new teaching approaches. Several peripheral clusters branch out from the central theme. One cluster seems to relate to the context of innovation, including keywords like "higher education," "university teaching," "medical education," and "sustainability." This suggests that research considers how the specific context of teaching influences the nature and implementation of IWB. Another cluster appears to focus on the role of technology in IWB, with keywords like "artificial intelligence," "educational technology," and "learning." Additionally, a cluster on the right side highlights the importance of knowledge sharing among teachers, with keywords like "collaboration" and "teamwork." These peripheral clusters suggest that various factors, including technology, knowledge sharing, and the specific teaching context, influence and interact with teacher innovation.

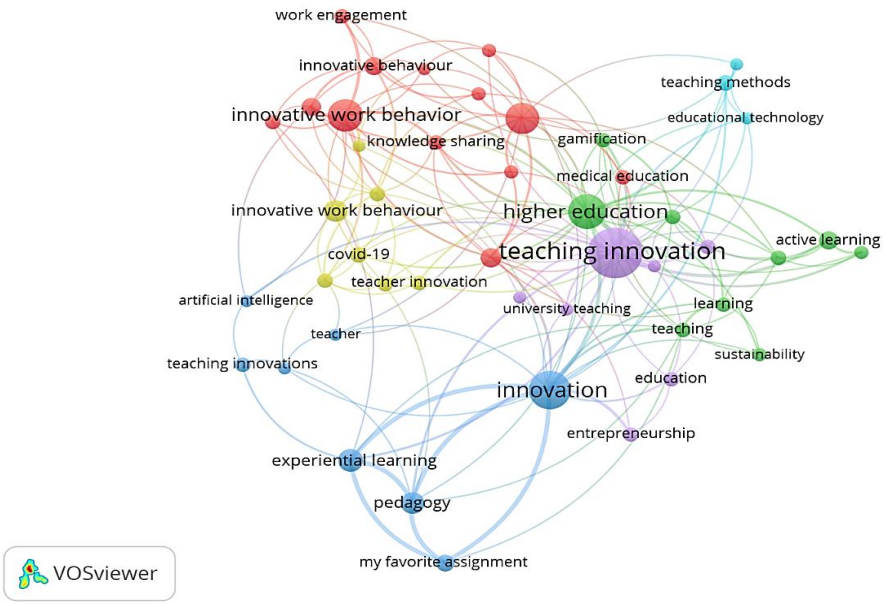

Figure 4. A network visualization map of keywords' co-occurrence

3.6. RQ6: what are co-authorship and countries' collaboration?

Figure 5 illustrates the international and collaborative character of this field of study, as scholars from many backgrounds work together to explore teacher innovation. The size of the nodes in the map represents the number of co-authored papers between countries, while the lines between the nodes represent co-authorship relationships, and the thickness of the lines represents the strength of the co-authorship relationship. The United States is the most active country in the field of teachers' IWB, followed by China, the United Kingdom, Canada, and Australia. There is a strong collaboration between the United States and other English-speaking countries, while there is also a strong collaboration between China and Asian countries. This could indicate the influence of cultural similarities and local contexts or educational systems on research priorities and collaboration patterns. Exploring these geographical connections could be an interesting avenue for further investigation. Overall, the VOSviewer map can be used to identify potential collaborators for future research, and to track the development of this field over time.

Figure 5. Co-author and countries' collaboration

4. CONCLUSION

The bibliometric analysis of publications on teachers' IWB reveals heightened attention between 2020 and 2023, which can be attributed to increased investments by governments and educational institutions in teacher professional development programs. The findings indicate a concentrated landscape of authorship, suggesting a potential knowledge gap dominated by a limited group of contributors. The global nature of IWB research is reflected in the diverse affiliations of contributing authors. Moreover, the analysis of top-cited articles contributes to a comprehensive understanding of IWB, encompassing themes such as teacher training, lifelong learning, and digital competence. Additionally, the interdisciplinary nature of IWB research, as reflected in subject area distribution, highlights the increasing integration of technology, emphasizing the need for collaboration between researchers from education and other fields. Furthermore, analysis of keywords' co-occurrence revealed a theme related to IWB, emphasizes teachers as the driving

force behind innovation, explores specific innovative approaches, considers the impact of the teaching context, and highlights factors like technology and knowledge sharing in fostering innovation among them. The core cluster in visualization of co-authorship trends appears to consist of researchers from various countries. The geographical diversity of authors across the globe underscores a widespread and interconnected research community.

It is important to highlight that the current study exclusively examined journal publications and solely relied on the Scopus database for its findings. For a more comprehensive investigation, it is necessary to incorporate additional sources such as other databases, books, conference papers, government or institutional reports, and dissertations. Furthermore, the study concentrated on keywords mentioned in publication titles, abstracts, and keywords, without delving into the entire articles. The structure of the academic literature was also ascertained through the use of quantitative methodologies in this study. In order to provide thorough data, future studies might use a qualitative approach to evaluate previous research. Additionally, the scope of this investigation was confined to the temporal span from 2020 to 2023. Consequently, eminent scholars with enduring expertise in the domain of IWB may elude recognition within the parameters of this study.

Despite its shortcomings, this study provides noteworthy contributions. A comprehensive and up-to-date bibliometric analysis provides an accurate understanding of the current subtleties and emphasis in the field of IWB. Correlations between keywords in the trend map is a new direction in research. Disclosures pertaining to prolific authors and influential countries may open up new potential to pave the way for collaborative opportunities. In conclusion, this bibliometric analysis offers a rich and nuanced perspective on the landscape of IWB among teachers, providing valuable insights for future research endeavors and the implementation of innovative practices in education.

FUNDING INFORMATION

This paper is part of the first author's doctoral-level study, which is funded by the Sponsorship Division, Ministry of Education, Malaysia under the Federal Training Grant, KPM.BT.700-30/23/67(6).

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Noorazura Awang	✓	✓	✓		✓	✓	✓		✓		✓			
Mua'azam Mohamad	✓			✓				✓		✓		✓	✓	✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

No new data were created or analyzed in this study. The bibliometric data used are publicly available from the Scopus database.

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