

EXPLORATION OF EXPERIENTIAL LEARNING RESEARCH TRENDS IN EDUCATION: A BIBLIOMETRIC ANALYSIS WITH THE OPENALEX DATABASE

Rahmat Saifuddin Anwar*, Suryajaya Suryajaya, Suyidno Suyidno

Master of Science in Natural Sciences Education, Posgraduate,
Universitas Lambung Mangkurat

Jl. Brigjen Hasan Basri, Banjarmasin 70123, Kalimantan Selatan, Indonesia

*corresponding author: saifuddinanwar@outlook.com

Abstract. Experiential learning has been widely applied in education, yet a comprehensive bibliometric overview of its global research trends remains limited. This study analyzes the development of experiential learning research from 2013 to 2023, focusing on its application in education. Using bibliometric analysis, data were collected from OpenAlex and processed with Biblioshiny in RStudio. After filtering, 614 articles were analyzed. The results show that experiential learning remains relevant, especially in student-centered approaches like project-based learning, simulations, and laboratory activities. A significant annual growth rate of 20.8% was found in research on experiential learning, indicating its increasing relevance. These findings highlight the need for education policies that promote hands-on, inquiry-based learning, particularly in science education. Additionally, the analysis underscores the importance of teacher training programs to effectively implement experiential learning strategies. This study offers insights into the evolution of experiential learning research and its potential for educational innovation. Future studies should focus on evaluation methods and long-term impacts to optimize its application.

Keywords: bibliometric analysis, experiential learning, science education, learning trends

INTRODUCTION

Natural Science Education in the era of Industrial Revolution 4.0, which demands innovation in various fields, is a basic subject. The rapid development of science and technology in this era is characterized by the emergence of cyber-physical systems such as the Internet of Things (IoT), Artificial Intelligence (AI), Additive Manufacturing, Big Data, and Cloud Computing (CC) (Cao et al., 2023; Cavas, 2019). Learners are required to have 4C skills (critical thinking, creativity, collaboration, and communication) to compete in the global needs of the 21st century (Hursen et al., 2023; Semilarski et al., 2021). For example, the 4C skills have been demonstrated to enhance analytical abilities, team collaboration, innovation, and interpersonal skills. Furthermore, the skills may foster social intelligence, empathy, and multicultural awareness, enabling students to navigate the complexities of the modern world and compete globally (Nurhamidah & Hafsyah, 2024).

In recent years, the development of the educational curriculum, especially in Indonesia, has emphasized the concept of 21st century learning that focuses on students. In addition, with the latest curriculum, namely the Kurikulum Merdeka, students at various levels of education in Indonesia are expected to be able to build their own knowledge through investigation activities (Aisah & Agustini, 2024; Fitriati et al., 2024). The basics of investigative activities are summarized in a set of skills

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known as science process skills (Cansız, 2024; Elliyani et al., 2024). The educational paradigm has shifted from conventional teacher-centered learning strategies to a more dynamic and student-centered approach (Ghaleb, 2024; Msonde, 2023; Pandey et al., 2023).

The transition is driven by the understanding that passive learning through traditional lectures and rote memorization is no longer adequate to prepare learners for the complexities of the contemporary world. Learners need richer and deeper learning experiences, theoretical knowledge, practical skills and critical thinking abilities (Thornhill-Miller et al., 2023; Weng et al., 2023). In addition, rapid technological developments and social changes require the education system to adopt approaches that are more adaptive and responsive to 21st century learning needs. Among the various learning strategies developed, experiential learning has received special attention from teachers and researchers.

The experiential learning method is a teaching strategy that emphasizes the learning process through direct interaction with the environment. This approach is based on the principle of constructivism, which states that knowledge is formed through personal experience and active involvement in learning (Azeez & Aboobaker, 2024; Salinas-Navarro et al., 2024). This method not only makes learning more relevant and fun but also helps learners connect theoretical concepts with real-world applications. This leads to a deeper understanding of scientific principles. Experiential learning involves practical activities, contextual problem-solving, and opportunities to develop thinking skills and self-reflection. Experiential learning encourages learners to be active participants in the learning process, resulting in a deeper and more meaningful understanding (Nurnaifah et al., 2023; Shore & Dinning, 2023).

The concept of experiential learning can be linked to the thoughts of educational experts such as John Dewey, Kurt Lewin, and David Kolb, who emphasized the central role of experience in the learning process. Kolb's experiential learning cycle, which consists of four stages, namely real experience, deep reflection, conceptual abstraction, and active experimentation. Experiential learning is a useful framework for understanding how individuals construct knowledge through experience (Kolb, 2015; Pherson-Geyser et al., 2020). By following this cycle, learners can be trained to develop practical skills, improve problem-solving abilities, and feel actively involved in the learning process (Abdullah et al., 2020; Dessie et al., 2023; Dianita, 2023).

Various empirical studies have shown that the implementation of experiential learning methods has a significantly positive impact on learning outcomes. The effectiveness of this method encourages continuous development and adaptation according to the specific learning context and characteristics of the field of study. Researchers have emphasized the importance of designing structured learning experiences by considering learners' cognitive, affective, and psychomotor aspects. Through systematic and evidence-based implementation, experiential learning has the potential to become a transformative approach that supports the development of learners' comprehensive competencies in dealing with the complexities of the contemporary world.

Studies have involved experiential learning in education. However, limited literature provides a bibliometric overview of global research trends regarding the application of experiential learning in education. Therefore, this study was conducted with the expectation to provide insight into the support of experiential learning for learning in various fields of study. Specifically, the aim of this study is to answer some of the following research questions

1. What are the trends in global scientific research on experiential learning in learning?
2. How has experiential learning research been conducted during 2013 – 2023?
3. What are the bibliometric patterns of experiential learning research in education?

METHOD

This was a descriptive study using bibliometric analysis. The research process began by formulating the research objectives and designing research data search procedures using the OpenAlex database (Priem et al., 2022). Data collection was conducted on September 15, 2024. The search format used (in its API) is as follows.

https://api.openalex.org/works?page=1&filter=default.search:experiential+learning+AND+science+education,type:types/article,open_access.is_oa:true,publication_year:2013-2023,is_retracted:false,has_abstract:true

Furthermore, the data obtained were downloaded in csv format for further selection using several criteria, as shown in Table 1. Initial searches obtain 36,590 articles and after the inclusion/exclusion criteria applied, it's reduced to only 614 remaining articles (Figure 1). These articles were processed at the analysis stage using the Biblioshiny program in RStudio (Aria & Cuccurullo, 2017). Nonetheless, the limits of the metadata search are confined to those obtained directly via the export feature in OpenAlex (i.e. the metadata described in the results of this article). Consequently, certain metadata, such as author affiliation and corresponding author, are not available, but these can be obtained through additional steps (Velez-Estevez et al., 2023).

Table 1. Article inclusion/exclusion criteria

Criteria	Inclusion	Exclusion
Publication year	2013 to 2023	Before 2013, and after 2023.
Type of publication	Published scientific articles, open access articles	Proceedings, books, book sections, book reviews, and magazines. Articles with restricted access
Language	Indonesian or English	Other than those written in Indonesian or English.
Metadata	All metadata complete	Incomplete metadata (for example: title, author, DOI).

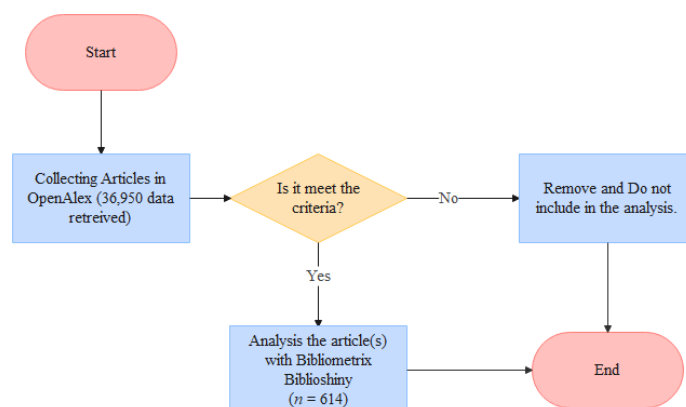


Figure 1. Flowchart for identifying and analyzing articles from the OpenAlex database

RESULTS AND DISCUSSION

Result

Research trends on experiential learning in education

Research trends related to experiential learning are shown in Table 2 and Figure 2. This graph shows a significant increase from 2013 to 2023. This graph shows an increasing trend in the number of publications each year, with annual growth reaching 20.89%. This indicates that academic interest in this topic is increasing. Recent technological advancements, including the use of digital tools, virtual reality (VR), augmented reality (AR), and artificial intelligence (AI), have made experiential learning more accessible and flexible (Balushi et al., 2024; Wang & Huang, 2025). This has encouraged researchers to investigate how these technologies affect student engagement and learning outcomes (Puspitasari et al., 2024). Changes in curriculum over the past few years, which emphasize active learning, problem-solving, and real-world applications, have also increased interest in this area. Educators are striving to improve student outcomes by adopting more practical and student-centered teaching methods.

In 2023, there was a surge in publications, reaching over 20 articles, the highest number in the curation period. Although there was a slight decline in 2018 and 2020, the research trend in experiential learning showed linear growth. Figure 2 and Figure 3 also show that the number of publications per year is projected to continue to increase at a higher rate than in previous decades. Furthermore, the demand for graduates with practical skills and problem-solving abilities in a competitive job market has prompted educational institutions to focus on providing real-world learning experiences. Together, these factors—technological progress, changing curricula, and societal needs—have contributed to a rise in research on experiential learning from 2013 to 2023, indicating that this trend is likely to persist.

Table 2. Data summary

<i>General information about data</i>		<i>Authors</i>	
Timespan	2013:2023	Number of author(s)	1.926
Number of document(s)	614	Single-author document(s)	120
Annual growth (%)	20,89	Co-author per document(s)	3,4
Avg. documents age	4,38		
Avg. citations per document	9,22		
Number of reference(s)	12.002		

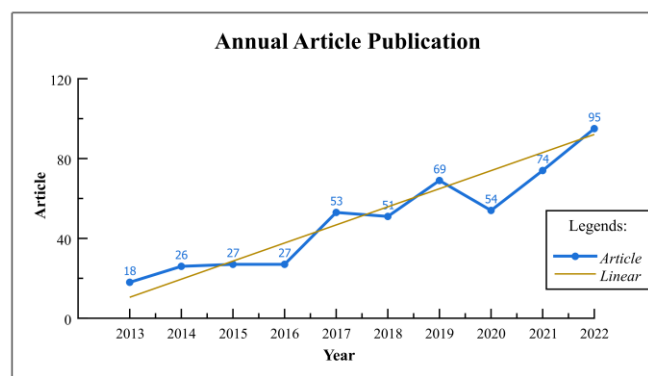


Figure 2. Graph of article publication data per year

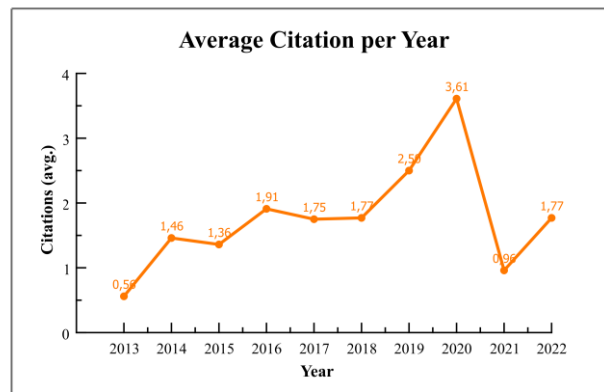


Figure 3. Graph of avg. citation a year

Thematic development

The thematic development section in this study illustrates how *experiential learning-related* research has evolved over time. Figure 4 shows a three-plane plot that maps thematic changes from 2013 to 2023. Each five-year period contained key themes that dominated the research during this time. In the 2013-2017 period, key themes included *experiential education*, *problem-based learning*, *entrepreneurial education*, and *extension education*, where experiential approaches were applied across a range of formal and informal *education* contexts. Entering the 2018-2022 period, themes such as *experiential learning* continue to dominate, indicating research interest in learning approaches that are more centered on practical experiences and direct interactions between learners.

Furthermore, in the 2023-2023 timeframe, the focus of experiential learning research remains and there is a visible evolution in the application of experiential learning in various disciplines. This evolution confirms the importance of experiential learning approaches in meeting the challenges of modern education and the skills needs of the 21st century.

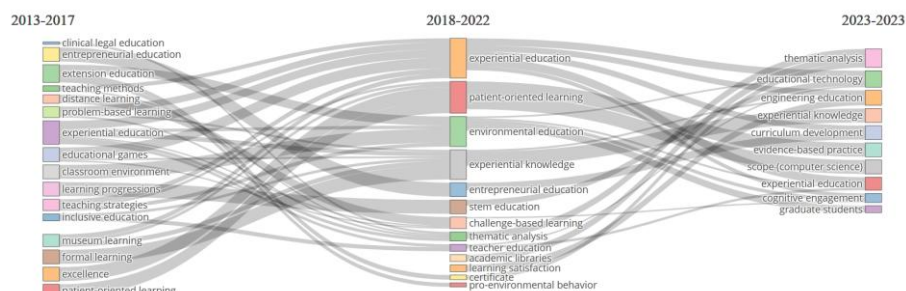


Figure 4. Thematic evolution

The most cited article

Table 3 displays the ten most cited articles related to the topic of “*Experiential Learning*.” Of the 614 documents reviewed, the article titled “Consumers and Artificial Intelligence: An Experiential Perspective” received 461 citations, making it the most cited article in this study (Puntoni et al., 2021). This article highlights the

experiential perspective of consumers in interactions with artificial intelligence, reflecting the great attention of academics on this topic.

Table 3. Top 5 ranking of cited articles

Article Title	DOI	Total of Citation (TC)	TC/year
Consumers and Artificial Intelligence: An Experiential Perspective (Puntoni et al., 2021)	10.1177/0022242920953847	461	92.20
Experiential Learning Theory as a Guide for Experiential Educators in Higher Education (A. Y. Kolb & Kolb, 2022)	10.46787/elthe.v1i1.3362	254	84.67
Experiential Education through Project Based Learning (Efstratia, 2014)	10.1016/j.sbspro.2014.09.362	169	15.36
Using simulations to teach young students science concepts: An Experiential Learning theoretical analysis (Falloon, 2019)	10.1016/j.compedu.2019.03.001	142	23.67
Mobile Mixed Reality for Experiential Learning and Simulation in Medical and Health Sciences Education (Birt et al., 2018)	10.3390/info9020031	136	19.43

Another highly cited article is “Experiential Learning Theory as a Guide for Experiential Educators in Higher Education”, which has received 254 citations (Kolb & Kolb, 2022). This article offers theoretical guidance for educators in higher education in implementing experiential learning. The articles “Experiential Education through Project Based Learning” and “Using simulations to teach young students science concepts: An Experiential Learning theoretical analysis” also took the top spot with 169 and 142 citations respectively (Efstratia, 2014; Falloon, 2019). Both underscore the important role of project learning and simulation in experiential education.

The high number of citations to these articles demonstrates the deep academic interest in the application of experiential learning theory, especially in the context of higher education, technology, and project-based education.

Journal impact

Table 4 displays ten highly reputable journals based on various criteria, such as the number of most-cited articles and high h-index scores. From the data obtained, the American Journal of Pharmaceutical Education has the highest h-index of 7, with a total of 188 citations. This journal is superior to other journals in terms of its publication impact. In addition, the Journal of Experiential Education and Procedia – Social and Behavioral Sciences have significant citation totals of 186 and 229, respectively, despite their lower h-index of 4.

The Journal of Sustainability also stands out, with 205 citations, despite having a lower h-index of 3. The Journal of Pharmacy Education, despite having only nine citations, shows the highest m-index value of 0.600, indicating the stability of its

impact over time. This suggests that these journals play an important role in the dissemination of experiential learning research, with contributions increasing year on year.

Table 4. Top 5 highly reputed journals

Source	h-Index	Total of Citation	No. Publication(s)
American Journal of Pharmaceutical Education	7	188	10
Journal of Experiential Education	4	186	4
Procedia – Social and Behavioral Sciences	4	229	6
Education Sciences (DOAJ, Directory of Open Access Journal)	3	66	3
International Education Studies	3	44	3

Figure 5 lists the authors with a high impact in *experiential learning* research based on their h-index. Although the h-index values are mostly in the 2–3 range, these authors have made significant contributions to the development of the field. Their inclusion in this list demonstrates the importance of their work in advancing research related to experiential learning and the growing interest of academics on this topic.

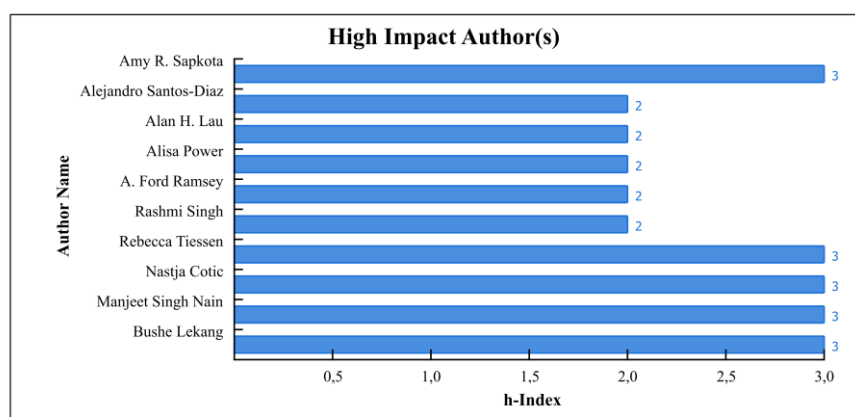


Figure 5. High-impact authors based on h-index

Keywords

This section describes the words most frequently used in experiential learning research. These keywords provide an overview of the focus of the analyzed studies. In Table 5, keywords are organized based on their frequency of occurrence, indicating the importance of certain themes in the literature. For a more interesting visualization, a word cloud is also used to determine the distribution of keywords, as shown in Figure 6. The larger the size of a word in the word cloud, the more frequently it appears in the research, providing a quick insight into the most relevant and widely discussed topics in experiential learning research. The most frequently occurring words were *experiential education*, *experiential learning*, and *educational technology*.

Table 5. Frequency of occurrence of top keywords

Keywords	Freq.	Keywords	Freq.
<i>experiential education</i>	130	<i>student perceptions</i>	41
<i>experiential learning</i>	112	<i>patient-oriented learning</i>	39

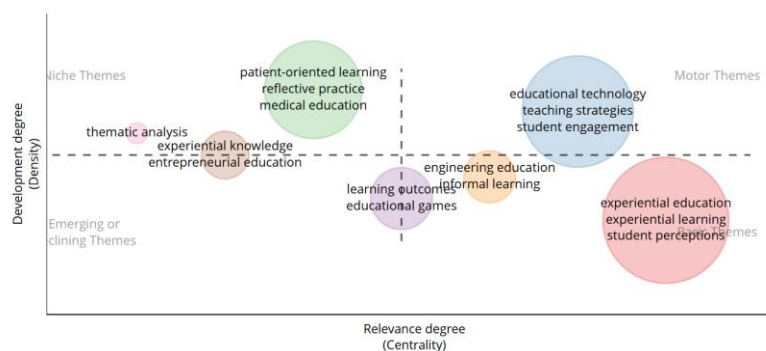


Figure 8. Thematic map

Discussion

The analysis shows that experiential learning is still very popular and relevant for supporting student-centered learning in various contexts, including science education. For example, the study from Efstratia (2014) is the use of experiential learning through project-based learning (PjBL). PjBL bridges students' experiences with the school world, triggering deep thinking as they acquire new knowledge. In PjBL, students have autonomy in determining resources, collaboration and communication to achieve challenging project goals. In another study, experiential learning can help learners to learn science concepts with the help of simulation. The study also showed that learners were able to develop a strong procedural knowledge base after the use of experiential learning (Falloon, 2019).

In Kurikulum Merdeka, activities such as fieldwork, simulations, and laboratories can be used to provide concrete experiences to students, enabling them to understand scientific concepts through hands-on engagement (Indarta et al., 2022; Yoto et al., 2024). These activities also provide an important foundation for students to connect theory with real applications, especially in the context of Industrial Revolution 4.0, which demands collaborative, practical, technology-based skills (Liu et al., 2024; Madileng & Ndlangamandla, 2024).

With experiential learning methods, at the reflective observation stage, activities such as brainstorming, logs and personal journals are effective strategies to encourage students to reflect on their learning experiences. This can be achieved through class discussions or reflective tasks that lead students to critically evaluate their learning processes either online or offline (Cridland et al., 2021; Hawk & Shah, 2007). These activities not only support the development of critical thinking skills but also strengthen the understanding of concepts through introspection. The abstract conceptualization stage involves the use of papers, projects and model building to help students construct scientific theories or principles based on their experiences. This activity is particularly important in science education, where students are required to build abstract concepts from concrete phenomena. It was noted that some learners stated that 'to truly understand and generalize knowledge through abstract conceptualization, they needed periodic breaks. During these breaks, they can 'connect the dots' of the different topics and phenomena being taught (Kee et al., 2024).

In the last stage, active experimentation, activities such as case studies, fieldwork and projects allow students to apply the concepts they have learned to new contexts. The experiential learning approach supports the development of problem-solving, collaboration, and innovation skills, which are at the core of 21st century skills. In science education, this can take the form of small research projects,

laboratory experiments, or technology-based simulations such as virtual simulation (for example, PhET), artificial intelligence (AI) or virtual reality (VR) (Almasri, 2024; Lui et al., 2023). By designing learning activities according to the experiential learning cycle, educators can ensure that students not only understand science theoretically but also have deep practical experience. This approach is in line with the principles of deep learning, which emphasize meaningful understanding and active engagement of students in the learning process (Chen & Techawitthayachinda, 2021).

The findings of this bibliometric analysis have significant implications for future experiential learning research and practice. First, the increasing intersection between experiential learning and educational technology indicates an urgent need for further research on how technology can enhance and extend the learning experience. This opens opportunities for innovations in learning design that integrate digital technologies with experiential learning principles. Furthermore, the diversity of experiential learning applications revealed in this analysis indicates great potential for interdisciplinary research.

The high frequency of keywords such as “learning outcomes” and “student engagement” in the literature underscores the importance of research that systematically measures the effectiveness of experiential learning in improving learning outcomes. These results suggest a method for researchers to develop modern and comprehensive evaluation methods. Thus, education can capture not only academic outcomes but also the development of soft skills and work readiness. As a broader implementation of experiential learning, project-, case-, inquiry-, etc.-based learning can also help students improve their learning processes (Lebert & Vilarroya, 2024; Nabilatunnisa & Hernani, 2024). With the rapid growth of publications related to experiential learning, the exploration of this topic is still relevant. This may be possible with longitudinal studies, meta-analyses, or mixed-method approaches that can provide a deeper understanding of experiential learning in various contexts and timescales, as other researchers have done (Cridland et al., 2021; Lebert & Vilarroya, 2024; Ranken et al., 2024; Tembrevilla et al., 2024).

Finally, emerging trends in bibliometric data indicate the potential of experiential learning to contribute to a more inclusive and 21st century skills-oriented education. Future research should focus on how experiential learning can be customized to meet the needs of diverse learners, including those with specific disabilities. In addition, given the global shift towards lifelong learning, there are significant opportunities to investigate the role of experiential learning in adult education and professional development.

CONCLUSION

The conclusion of this bibliometric analysis shows that experiential learning research has grown rapidly and developed thematically over the last decade. There is growing academic interest in cross-disciplinary applications and stronger integration of educational technology. Educators should integrate these approaches into curricula and leverage digital tools like simulation, AI and VR. Policymakers should support inquiry-based learning by providing resources, training, and assessment frameworks to measure its impact. However, modern evaluations, stronger interdisciplinary approaches, and more comprehensive theoretical frameworks are needed. Future research should explore interdisciplinary applications and innovative evaluation models to optimize experiential learning in education.

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