

***Transforming Vocational Education Through Cybergogy:  
Research Trends and Impacts Over the Last Decade***

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**Abstract**

The rapid advancement of technology underscores the need for vocational education institutions to adopt digital learning approaches. However, many vocational institutions still rely on traditional teaching methods. This reliance on outdated approaches contributes to a significant skills gap, where graduates often lack the digital competencies and adaptability required by today's industries. This study aims to identify trends and relationships among topics in the application of cybergogy a method that combines cybernetics with pedagogy in vocational education. Through a comprehensive bibliometric analysis using tools like Publish or Perish and VOSviewer, this research examines publications from 2013 to 2023. This dataset includes 162 papers, which collectively have garnered a total of 3,511 citations. Notably, the research reveals a marked increase in publication frequency starting in 2020, likely correlating with the increased push towards digital integration in vocational education triggered by the COVID-19 pandemic. This analysis outlines several key research clusters, including innovative learning methodologies, pedagogical strategies, student engagement, and the implementation of digital frameworks within educational settings. The findings emphasize the innovative nature of this research, positioning cybergogy not just as a novel educational method but as an essential foundation for developing forward-looking vocational education strategies. These insights pave the way for further investigation into effective digital integration in vocational learning environments, aiming to bridge the skills gap and enhance educational outcomes in line with the demands of the modern workforce.

Keywords: Vocational Education, Cybergogy, Bibliometric Analysis, Publish or Perish, VOSViewer

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## **Introduction**

Vocational education is crucial for equipping graduates with the skills necessary to thrive in a workforce that is continually transformed by rapid technological advancements. However, many vocational institutions are still entrenched in traditional teaching methodologies, which often fall short in preparing students with the essential digital skills and adaptability required by today's industries. This disconnect results in a significant skills gap among graduates, highlighting the urgent need for vocational colleges to embrace digital transformation to cultivate a workforce capable of meeting contemporary industry demands (Deng & Badiane, 2021).

The integration of digital teaching resources can significantly enhance the flexibility and interactivity of the educational experience, which is vital for preparing students to navigate the dynamic challenges of the modern workplace (Feng, 2024). Additionally, it is imperative to focus on improving educators' digital competencies, as this plays a critical role in bridging the existing skills gap in this digital era (Wei, 2024). Moreover, fostering collaboration with industry stakeholders is essential to ensure that educational curricula remain relevant and closely aligned with the evolving demands of the labor market (Setiyawami et al., 2020).

The effectiveness of vocational education is largely dependent on its ability to provide direct, practical training that prepares individuals for specific roles within the workforce, thereby enhancing their employability (Yoto, 2021). Strategic partnerships with relevant industries are also crucial as they can significantly mitigate the skills gap among graduates by ensuring that the training provided is directly applicable to current industry needs (Khoerunnisa et al., 2020). Consequently, this study aims to explore the trends, contributions, and impacts of cybergogy-related research through a bibliometric analysis. This approach is intended to lay a solid foundation for the development of effective digital learning strategies and serve as a comprehensive reference for researchers and practitioners aiming to design vocational education systems that are well-aligned with the demands of the digital era and industry needs.

## **Methods**

This study employs bibliometric analysis to explore the relationship between cybergogy and vocational education within modern educational paradigms. Utilizing Publish or Perish and VOSviewer tools, this research systematically examines trends, authorship, and interconnections in this field (Donthu et al., 2021; Ellegaard & Wallin, 2015). Based on data from 2013 to 2023, the analysis identified 162 publications with a total of 3,511 citations, averaging 319.18 citations per year and 21.67 citations per publication. These findings are anticipated to offer valuable insights for developing learning strategies that align with industry demands, thereby enhancing the quality and relevance of vocational education.

## **Result and Discussion**

### **Research Trends in Vocational Education and Cybergogy**

The bibliometric analysis conducted on the topics of "Vocational Education" and "Cybergogy" in journal publications from 2013 to 2023 revealed substantial engagement in this research area. Based on Publish or Perish data, 162 papers garnered a total of 3,511 citations, averaging 319.18 citations per year and 21.67 citations per paper, indicating a

consistent interest in this field. The average number of authors per paper was approximately 2.70, highlighting a collaborative research trend. Key metrics include an h-index of 24, meaning 24 papers received at least 24 citations each, and a g-index of 57, reflecting a strong presence of highly cited publications that shape the field's citation landscape.

Additionally, the age-weighted citation rate was 1,044.61, suggesting that citations are significantly weighted toward recent publications, further underscoring a growing interest in the integration of cybergogy within vocational education. The high percentage coverage of citations within the h-index (82.5%) and g-index (94.8%) indicates that most citations are attributed to influential, core studies, marking this research area as both impactful and increasingly relevant in educational paradigms. The table below (Table 1) presents the most-cited articles in the field.

Table 1: Journal Article Search Results Based on the Most Citations

Cites	Authors	Title	Year	GSRank
623	Sarstedt, M., et al.	Beyond a tandem analysis of SEM and PROCESS: Use of PLS-SEM for mediation analyses!	2020	148
447	do Valle, P. O., & Assaker, G.	Using partial least squares structural equation modeling in tourism research: A review of past research and recommendations for future applications	2016	147
437	Al Husaeni, D. F., & Nandiyanto, A. B. D.	Bibliometric Using Vosviewer With Publish or Perish (Using Google Scholar Data): From Step-By-Step Processing for Users to The Practical Examples In The Analysis of Digital Learning Articles in Pre and Post Covid-19 Pandemic	2022	31
247	Ramírez-Montoya, M. S., et al.	Complex thinking in the framework of Education 4.0 and Open Innovation—A systematic literature review	2022	34
138	Berge, Z. L.	Barriers to communication in distance education	2013	86

In contrast, the second table (see Table 2) showcases the articles with the greatest relevance and impact according to Google Scholar (GS) rankings, indicating their influence within the academic community.

Table 2: Journal Article Search Results Based on Google Scholar Rank

Cites	Authors	Title	Year	GSRank
15	FR Baharuddin, W Setialaksana	Andragogy, Peeragogy, Heutagogy and Cybergogy Contribution on Self-Regulated Learning: A Structural Equation Model Approach.	2023	1
23	RA Rahma, Y Affriyenni, M Widyaswari	Cybergogy as a Digital Media to Facilitate the Learning Style of Millennial College Students.	2021	2
0	A Amiruddin, FR Baharuddin, T Takbir...	Pedagogy-Andragogy Continuum with Cybergogy to Promote Self-Regulated Learning: A Structural Equation Model Approach	2023	3
23	JA Malek	The impact of heutagogy education through telecentre in smart village (SV)	2017	4
8	M Mureşan	Collaborative learning and cybergogy paradigms for the development of transversal competences in higher education	2015	5

The following presents the annual number of publications and a graph illustrating the research progression on this topic.

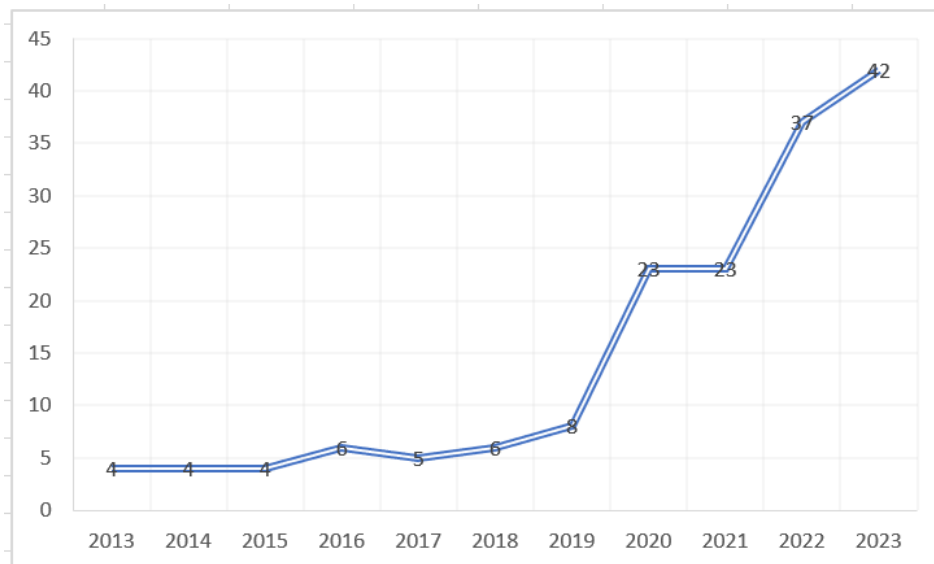


Figure 1: Trend Graph of This Topic

The analysis of article trends from 2013 to 2023 reveals a significant increase in publications discussing the topics of "Vocational Education" and "Cybergogy." In the initial years, from 2013 to 2015, the number of publications was relatively low and stable, with only 4 articles each year. A slight increase to 6 articles was observed in 2016, but the numbers remained fluctuating until 2019.

A major shift occurred in 2020, with the number of publications surging to 23 articles. This upward trend continued steadily, maintaining the same count in 2021 and then rising sharply to 37 articles in 2022. The peak was reached in 2023 with 42 articles.

This consistent growth, particularly after 2019, indicates a rising interest and focus on cybergogy within vocational education research. This trend can be interpreted as a response to the need for more digitally integrated educational approaches, highlighting the relevance and importance of this topic in modern educational paradigms.

## Research Connections and Novelty

The VOSviewer visualization (see Figure 1) shows that "cybergogy" and "learning" have become central themes in vocational education research, with high density indicating a primary focus in this area. Terms such as "education," "teaching," "student," and "development" also appear dominant, indicating a close connection with the concept of cybergogy. The network visualization (see Figure 2) reveals several thematic clusters, including a cluster around "cybergogy" and "learning" associated with education, teaching, and learning; a cluster focused on the role of educators with terms like "teacher," "pedagogy," and "heutagogy"; and a cluster related to student engagement and learning outcomes. The numerous connections between clusters suggest a collaborative and interdisciplinary approach to exploring cybergogy in vocational education. Based on the overlay visualization (see Figure 3), terms like "learner engagement" and "framework" appear in brighter colors, indicating recent research trends, particularly in digital learning methods and student engagement strategies that have emerged in response to the COVID-19 pandemic.

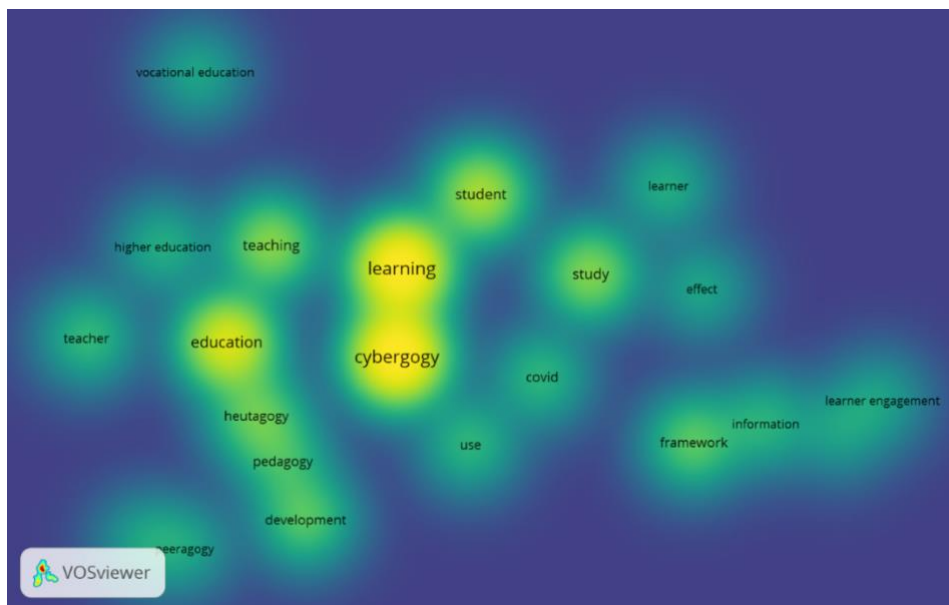


Figure 2: Density Visualization

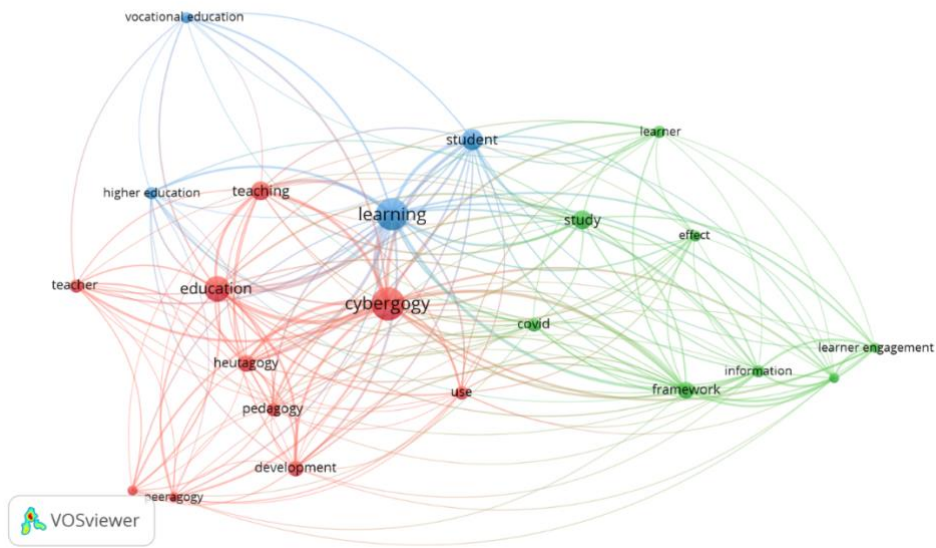


Figure 3: Network Visualization

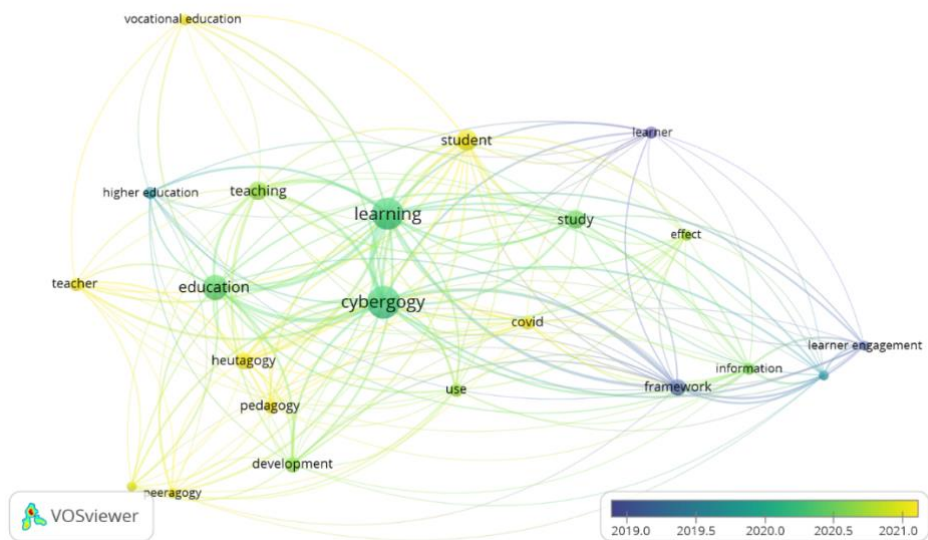


Figure 4: Overlay Visualization

This visualization depicts cybergogy as a central and continuously evolving theme in vocational education research, with strong connections to learning processes, pedagogy, and new shifts toward student engagement and digital frameworks, likely accelerated by the COVID-19 pandemic. This analysis highlights a trend toward integrating digital learning tools and adaptive frameworks, underscoring the relevance of this field within modern educational paradigms. Overall, these connections indicate the novelty of research in which cybergogy not only serves as an innovative learning approach but also as an essential foundation for developing vocational education strategies that are responsive to changing times.

## **Conclusion**

This study highlights the prominence and dynamic evolution of cybergogy as a central theme in vocational education research, particularly noting its strong linkages to modern pedagogical strategies, learning processes, and new directions in student engagement and the adoption of digital frameworks. The observed surge in related publications since 2020 underscores a burgeoning interest among educational researchers and practitioners in harnessing digital learning methodologies to address the current and future needs of the industry. The VOSviewer visualizations provide a clear depiction of thematic clusters, underscoring a collaborative and interdisciplinary effort to probe the depths of cybergogy within the context of vocational education. These clusters not only map the existing research landscape but also suggest areas ripe for further exploration and development.

Moreover, these findings underscore the innovative nature of cybergogy, establishing it not merely as a modern teaching tool but as a fundamental pillar in the formulation of effective and responsive vocational education strategies. This is particularly relevant in adapting to the rapid shifts seen in the post-pandemic era, where digital tools and approaches are increasingly seen as critical to educational success and relevance in the digital age. By aligning educational strategies with the evolving demands of the workforce, cybergogy can play a pivotal role in equipping students with the skills necessary to thrive in a continually changing professional environment. This study serves as a call to action for continued research and application of cybergogy, to ensure vocational education remains at the forefront of educational innovation and workforce development.

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