Heutagogical Learning in Professional Development: A Bibliometric Analysis of Published Literature between 2010 and 2024

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ABSTRACT

This study explores the evolution and significance of heutagogical learning in professional development using a bibliometric analysis of literature published between 2010 and 2024. Heutagogy, emphasizing learner autonomy, has emerged as a transformative educational paradigm, particularly in workforce training and lifelong learning. The research employs a bibliometric approach to analyze 473 peer-reviewed publications sourced from Scopus, highlighting trends, influential authors, collaborative networks, and key thematic areas. Findings indicate a notable rise in publications since 2016, driven by the increasing demand for adaptive and autonomous learning strategies. Co-authorship and co-citation analyses using VOSviewer reveal robust global collaborations, with significant contributions from institutions in the US, UK, and Australia. Key thematic clusters, such as self-directed learning, digital education, and professional adaptability, were identified, reflecting the relevance of heutagogical practices in addressing 21st-century workforce challenges. The results offer significant perspectives for stakeholders who seek to include heutagogical approaches into professional development initiatives.

Keywords: Bibliometric analysis, Heutagogy, Professional Development, Scopus, Self Learning, VOSviewer.

INTRODUCTION

Since its emergence in the early 2000s, heutagogy—also known as self-determined learning—has seen substantial development. It fosters learner autonomy and flexibility in educational environments. Hase and Kenyon's groundbreaking work of early 2000s distinguished heutagogy from andragogy and pedagogy, emphasizing its importance for professional growth and lifelong learning (Siga & Acharya, 2023; Handayani et al., 2022). The relevance of heutagogy in professional development was established by this fundamental distinction, which this study investigates using a bibliometric analysis of research trends, influential figures, and thematic advancements in the area. Subsequent research supports these theories by showing how heutagogical approaches effectively help students grow their capacity for independent learning in a variety of learning environments (Jaya et al., 2022; Ishaq et al., 2024).

Heutagogical learning is a learner-centred, self-determined approach that emphasises autonomy and reflective practice, enabling individuals to take control of their own learning paths. In today's fast-paced work situations, the capacity to adapt and learn independently is essential, making this approach particularly relevant to professional development. Through encouraging autonomous learning, heutagogy promotes professionals to pursue lifelong learning and continual development, which are crucial for career advancement and innovation (Stoszkowski & Collins, 2018; O'Brien, 2019). Research suggests that heutagogical approaches enhance critical thinking and problem-solving abilities, empowering individuals to navigate challenging situations effectively (Churchill & Xiu, 2023; Beckh et al., 2023).

Rapid advancements in technology and shifting job needs have made heutagogical learning increasingly essential for the 21st century workforce. Its expanding importance and broad usage across professional domains are highlighted by the rising number of research in this field, as shown by bibliometric analysis. By promoting adaptation and resilience—key attributes for navigating a dynamic workforce influenced by the digital revolution and globalization—this learner-centred approach empowers individuals to take charge of their own learning experiences (Conn et al., 2021; Seevaratnam et al., 2023). Organisations recognize the importance of cultivating a workforce competent in heutagogical learning, reflecting characteristics such as critical thinking, problem-solving, and cooperation as traditional educational models becoming outdated (Sudjimat et al., 2020; Aiello & Mellor, 2019).

Few studies argue that incorporating heutagogical principles into professional development programs leads to more personalised learning experiences that match organisational demands and individual career aspirations (Narayan et al., 2018; Zhang & Yu, 2019). There is a growing corpus of research that supports this integration, according to bibliometric trends, which reflects a

rising understanding of the role heutagogy plays in developing professional learners who are adaptable and autonomous. By fostering metacognitive abilities, this approach not only facilitates knowledge acquisition but also enables learners to critically evaluate their learning experiences and outcomes (O'Brien, 2019; Churchill & Xiu, 2023). As organisations desire flexibility and agility, heutagogical learning is becoming more and more significant as a framework for professionals to thrive in dynamic situations through independent learning pathways (Nambiro & Ikoha, 2022; Narayan et al., 2018). Stoszkowski and Collins (2018) highlights that heutagogy essentially signifies a shift towards empowering learners to take responsibility of their professional growth, cultivating a culture of determination, and actively participating in their training programs.

Figure 1.
Heutagogical Learning Ecosystem
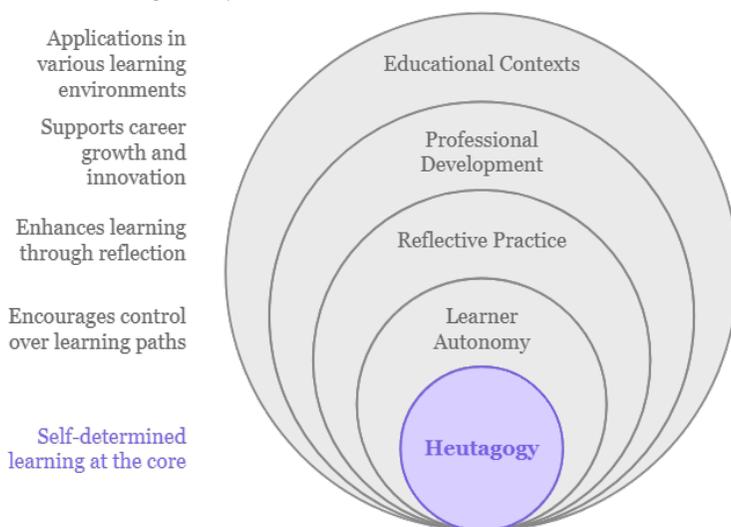
An increasingly accepted transition from traditional educational frameworks to heutagogical models is now widely recognized as crucial for developing the critical thinking and problem-solving abilities required for success in a swiftly changing workplaces (Handayani et al., 2022; Ishaq et al., 2024). The development of heutagogy is indicative of an overall trend in education towards learner-centeredness emphasising flexibility, involvement, and lifelong learning in a variety of settings, particularly in professional development environments where the focus is on empowering individuals to take charge of their learning journeys (Bagustari & Santoso, 2019; Khodabandelou et al., 2021).

Furthermore, incorporating technology into the heutagogical learning enhances digital literacy, which empowers individuals with skills essential for lifelong learning and continuous professional development (Khan et al., 2022;

Warsito et al., 2023). The transition to personalized learning experiences gives individuals the flexibility to address potential challenges in addition to preparing them to meet their immediate professional requirements (Conn et al., 2021). Moreover, autonomous learning encourages creativity and initiative among individuals as organisations focuses on multidisciplinary approaches and novel practices (Aiello & Mellor, 2019; Warsito et al., 2023). Research suggests that heutagogical strategies in education and training results in more skilled & flexible workforce capable of innovation and economic success in dynamic industries (Khan et al., 2022; Glynn et al., 2019).

Studies demonstrate that combining technology with heutagogical principles – such as Feynman Technique – may provide a more personalised and engaging learning environment which enhance autonomous learning outcomes (Kaswan et al., 2024; Reyes et al., 2021). Recent studies on digital learning environments also highlights the significance of heutagogy in equipping teachers and students for the intricacies of contemporary education, especially in light of sustainable development goals (Jaya et al., 2022).

In professional settings, self-directed learning cultivates vital abilities like problem-solving and collaboration, the pattern can be observed in a number of disciplines (Yusri et al., 2024; E. Handayani, 2024). Technology integration further enhances the heutagogical learning by offering personalized learning experiences that accommodate different requirements and preferences, especially through mobile platforms and adaptive learning systems (Zainuddin, 2023; Dwikoranto et al., 2023). The increasing adoption of Massive Open Online Courses (MOOCs) demonstrates the applicability of heutagogical learning in a variety of situations, which enable individuals to interact with the material in a flexible way and acquire skills necessary for their future careers (Jang & Kim, 2023; Ochukut et al., 2022). Overall, the current research landscape highlights the increasing relevance of heutagogical principles in shaping effective learning strategies across various professional domains.

Examining bibliometric trends that highlight significant research contributions and emerging themes is crucial to understanding the development and implications of heutagogical learning in professional development. This approach expands on the previous discussion of heutagogy's role in promoting adaptive, autonomous learning by placing it within the larger context of scholarly research and institutional engagement. Identifying publishing patterns, influential authors, and significant publications that have influenced heutagogical learning becomes accessible by bibliometric analysis. This study provides insights into global research dynamics and identifies potential for collaborative efforts across disciplines by looking at research trends and collaboration networks. Finding gaps and new themes will also help guide future research attempts, pointing scholars as well as practitioners in the direction of more successful workplace implementations of heutagogical learning.

OBJECTIVES OF THE STUDY

This study primarily seeks to achieve the following objectives:
1. To analyze the distribution patterns of publications on heutagogical learning in professional development across different years and countries.
2. To identify key authors, influential publications, and relevant journals contributing to the field of heutagogical learning in professional development.
3. To explore authorship collaboration patterns across countries, organisations, and authors in heutagogical learning in professional development.
4. To examine the distribution and trends of relevant keywords in heutagogical learning in professional development over time.
5. To conduct a co-citation analysis to uncover patterns among cited authors and references in heutagogical learning in professional development.

RESEARCH METHODOLOGY

Research Design
This study employs a *bibliometric analysis* to systematically examine research on heutagogical learning and professional development. Bibliometric analysis was chosen given its ability to provide an objective and quantitative assessment of the impact of research, networks of collaboration, and thematic trends within the field of study (Zupic & Čater, 2014). This approach makes it possible to pinpoint influential authors, organizations, and publishing patterns that influence the conversation surrounding heutagogical learning. In order to map the field's intellectual structure and guide future research directions, bibliometric methods explore co-authorship networks, keyword occurrences, and citation trends (Amiri et al., 2023; Kemeç & Altınay, 2023; Donthu et al., 2021).

Database Selection
Scopus was chosen as the main database since it provides a comprehensive dataset for bibliometric analysis by covering a wide range of peer-reviewed journal articles from many fields. Advanced search features, citation tracking, and analytical tools are all provided by Scopus to help accurately identify research trends and scholarly influence (Mongeon & Paul-Hus, 2015). While reducing the number of non-peer-reviewed sources, Scopus provides better indexing of research on professional development and education than its alternatives. Global research trends may be mapped with ease thanks to its sophisticated search features and bibliometric tools. The widespread usage of Scopus in bibliometric research, which guarantees

methodological rigour and reproducibility, further supported the choice to employ it.

Figure 2.
The Search Strategy Flow Diagram: Adapted from Zakaria et al. (2021)
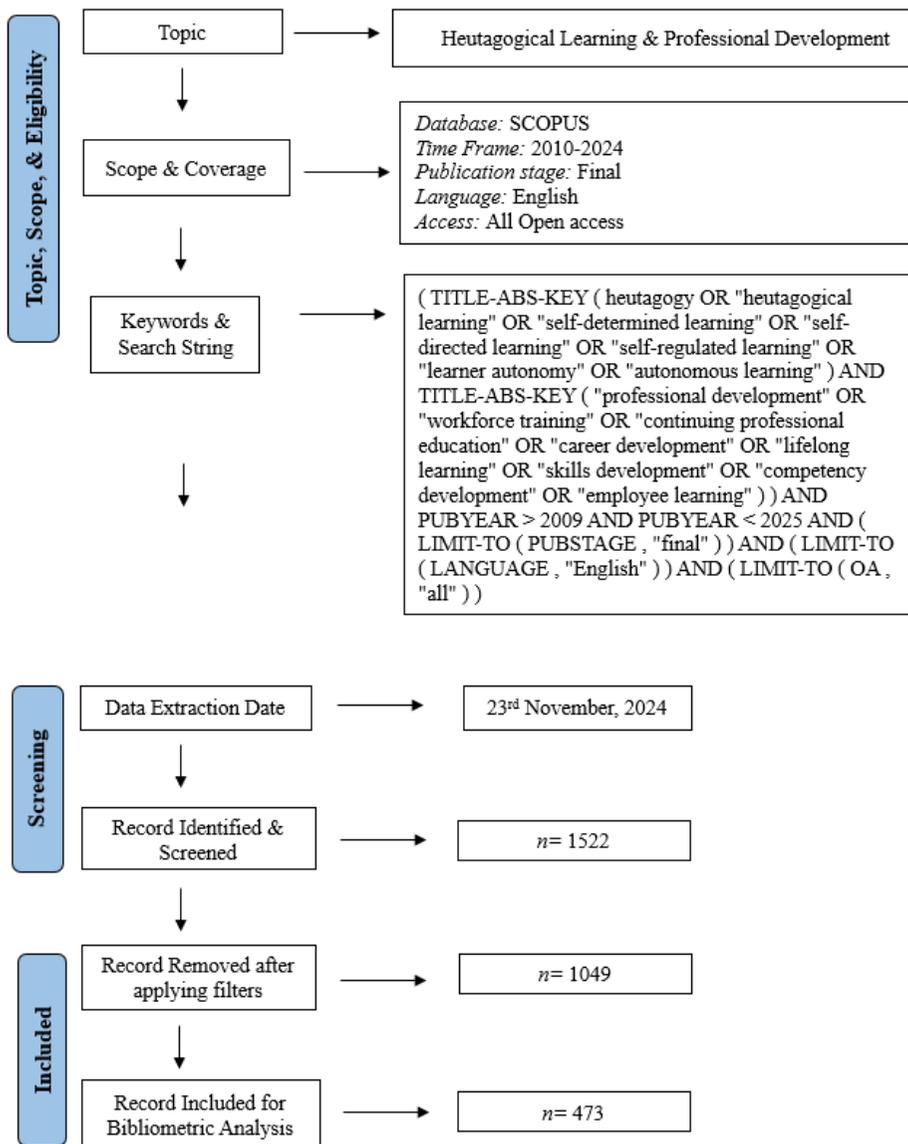
Study Selection/Eligibility Criteria

There was particular eligibility criteria set in order to ensure the inclusion of relevant and high-quality literature on heutagogical learning and professional development. Research that was peer-reviewed and published between 2010 and 2024 were included in this analysis. The selection was confined to English-language articles to preserve consistency in data analysis and prevent translation biases which could influence keyword mapping and citation analysis. Studies that were non-peer-reviewed, unrelated to heutagogy, or published outside the specified period were excluded. The purpose of these inclusion and exclusion criteria was to guarantee the dataset's reliability and improve the accuracy of bibliometric mapping.

Search Strategy and Selection

To effectively optimize the dataset, a methodical search was carried out in Scopus utilizing Boolean operators and controlled keywords. The search terms included "autonomous learning," "heutagogy," "self-determined learning," and similar terms paired with "professional development" guaranteeing the inclusion of pertinent literature on heutagogical learning in professional environments. Filters were applied to narrow down the results to research published between 2010 and 2024. After screening the 1,522 papers that were found by the first search using the predetermined inclusion and exclusion criteria, 473 articles were retained for analysis (see Figure 2).

Data Analysis

An analysis of the extracted bibliometric data was conducted using *Scopus search analytics, Microsoft Excel,* and *VOSviewer*. Initially, Scopus search result analysis was used to map the distribution pattern of relevant publications on heutagogical learning in professional development across different years, countries/territory, sources, authors, affiliations, document type, subject area, and funding sponsors. This exploration involved the entirety of the collected data from Scopus, which was exported into Excel which further facilitated detailed trend analysis, tabular presentation of findings, and organization of citation data. VOSviewer facilitated network visualizations, encompassing co-authorship analysis, keyword co-occurrence mapping, and citation network identification. Because of its capacity to provide graphical presentations of bibliometric relationships, this software was particularly selected to enhance the comprehension of research patterns. The integration of these analytical tools guarantees methodological rigour and offers a comprehensive analysis of the development of heutagogical learning in professional development contexts. The study's contribution to the field is strengthened by the refined methodological approach, which also strengthens the validity of the findings.

RESULTS AND ANALYSIS

The Results and Analysis section provides a thorough bibliometric analysis, including information on influential studies on the subject, important contributors, and publishing patterns. It draws attention to trends in funding sponsors, institutional affiliations, the subject areas, and document types. Additionally, co-authorship, keyword co-occurrence, and citation networks were visualised by a thorough network analysis. The academic landscape's collaboration patterns, research hotspots, and thematic links are better understood via this study.

Distribution of Publications over the Years

With a consistent rise starting in 2016 and reaching a top of 97 articles in 2024, the Figure 3 shows a notable rising trend in the number of publications from 2010 to 2024, showing increasing research work.

Figure 3.
Distribution of Publications over the Years (2010-2024)
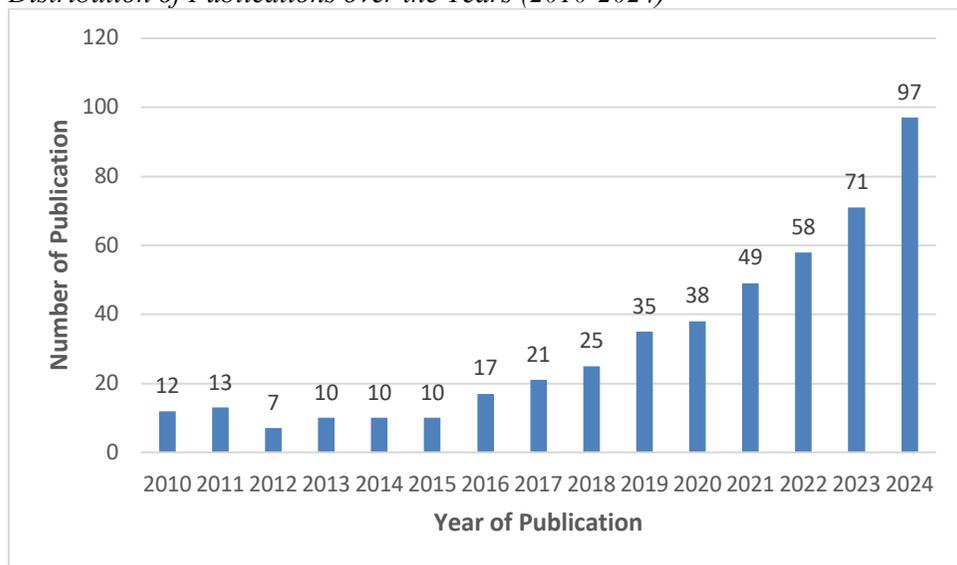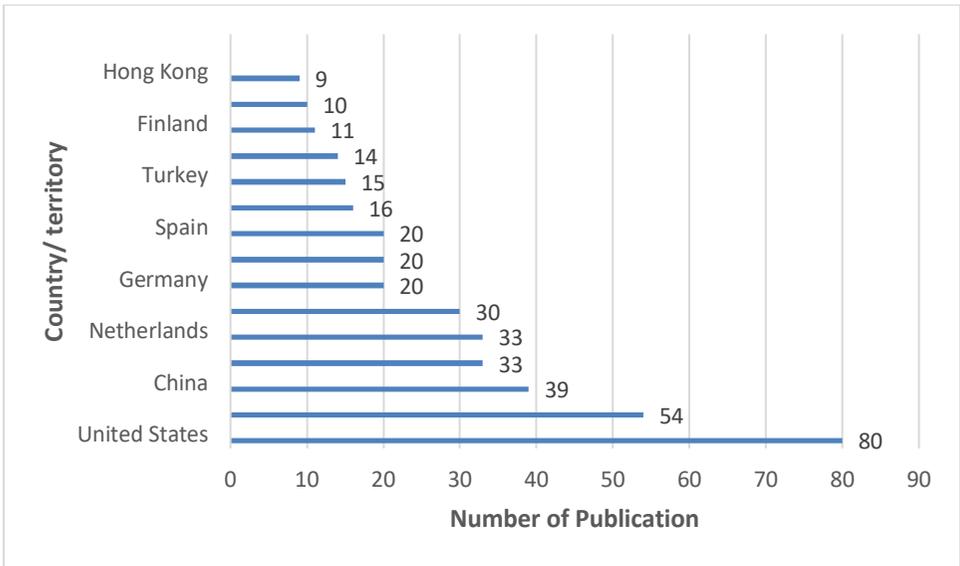

Distribution of Publications by Country/ territory

The top 15 nations and territories are shown in the Figure 4, with the United States leading with 80 publications, followed by the United Kingdom with 54 and China with 39. Significant contributions are also noted from Canada, the Netherlands, and Australia.

Figure 4.
Distribution of Publications by Country/ territory (Top 15)

The global spread of publications on map highlighting significant research hubs worldwide can be seen through Figure 5.

Figure 5.
Global spread of Publications on the topic under study

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© Australian Bureau of Statistics, GeoNames, Microsoft, Navinfo, Open Places, OpenStreetMap, Overture Maps Fundation, TomTom, Zenrin
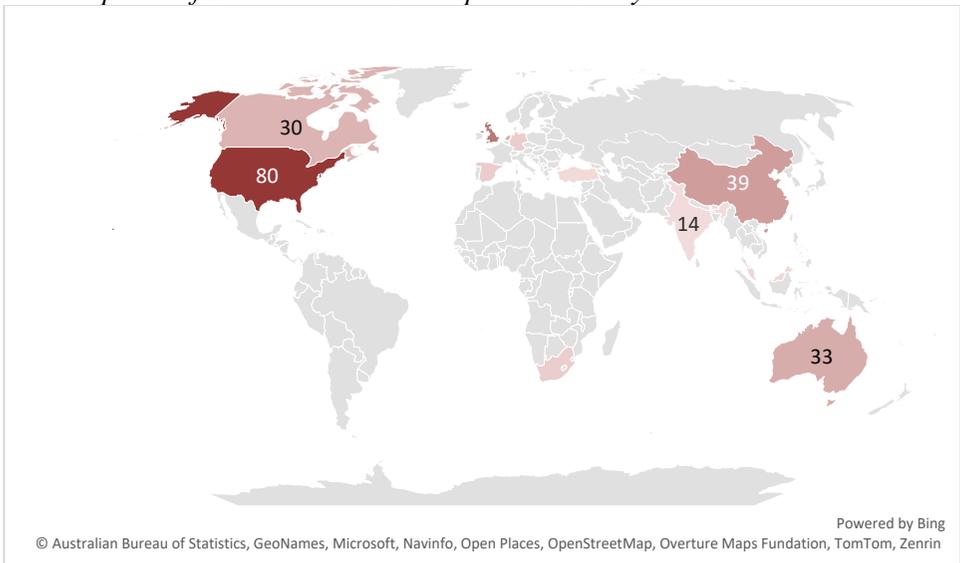
Distribution of Publications by Sources
The top 10 document sources are shown in the Table 1, with "BMC Medical Education" having the most papers (22). "Education Sciences" (17) and "Frontiers

in Psychology" (13), two more notable sources, are also included. The sources emphasise multidisciplinary research contributions in a variety of sectors, including sustainability, education, and medical. Few sources, notably, have seven or less items, demonstrating a diverse range of publications.

Table 1.
Number of documents by source (top 10)

SN	Source Name (Journals & Conference Proceedings)	Number of Documents
1	BMC Medical Education	22
2	Education Sciences	17
3	Frontiers In Psychology	13
4	Academic Medicine	10
5	Sustainability Switzerland	8
6	Frontiers In Education	7
7	International Journal of Training And Development	6
8	Nurse Education Today	6
9	Medical Science Educator	5
10	Metacognition And Learning	5

Source: SCOPUS

Distribution of Publications by Authors
Figure 6 shows the top 15 authors who have written on the topic at hand, with A. Margaryan topping with four articles. Nine writers contributed two papers apiece, while five authors—including D.W. Stoten and T.H. Morris—have three publications each. With the exception of A. Margaryan, the data shows a rather uniform distribution of contributions among the top authors.

Distribution of Publications by Affiliations
Universiteit Maastricht leads with 10 documents among the top 15 affiliations that contributed on the topic under investigation (see Table 2). The University of Toronto comes in second with eight, and the University of California (San Francisco), the University of Melbourne, and Rijksuniversiteit Groningen each produced seven documents. Universities from various parts of the world, such as Universidade do Porto (4) and the University of South Africa (6), have a balanced representation. Instituto Politécnico do Porto and Universiti Malaya are notable institutions with five documents. Each lower contributor, including Université McGill and North-West University, has four documents. This data demonstrates how different affiliations organization to boost research contributions.

Figure 6.
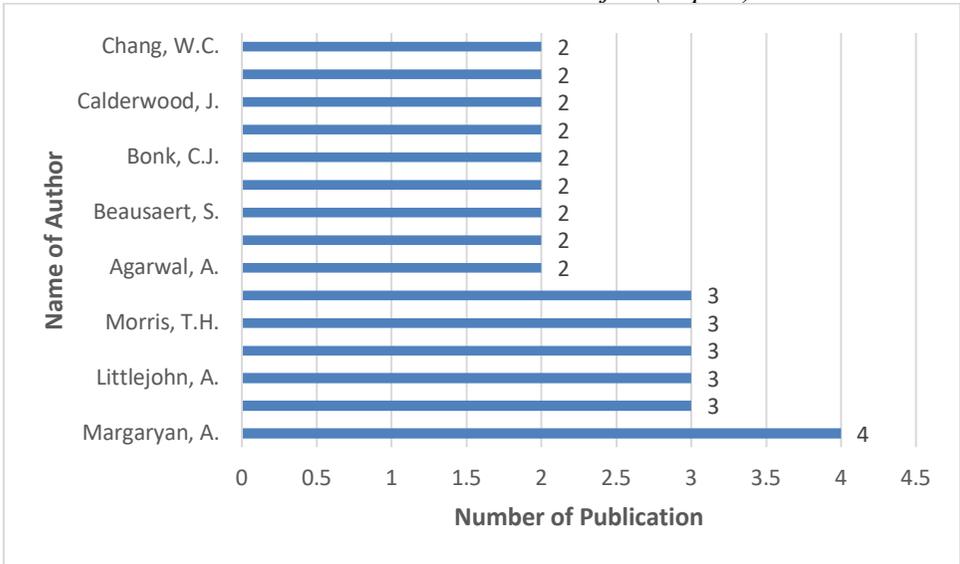*Authors which have contributed the most in the subject (Top 15)*

Table 2.
Number of documents by Affiliation (top 15)

| SN	Affiliation Name	Number of Documents
1	Universiteit Maastricht	10
2	University of Toronto	8
3	Rijksuniversiteit Groningen	7
4	University of California, San Francisco	7
5	University of Melbourne	7
6	University of South Africa	6
7	University of Tasmania	6
8	Instituto Politécnico do Porto	5
9	Universiti Malaya	5
10	North-West University	5
11	Université McGill	4
12	Radboud University Medical Center	4
13	Universitat Oberta de Catalunya	4
14	University of Northumbria	4
15	Universidade do Porto	4

Source: SCOPUS

Distribution of Publications by Document type

The Figure 7 reveals that, with 403 documents, articles are the most common publishing category, followed by reviews (30) and conference papers (27). With three or fewer documents, editorials and letters are among the other genres that contributed.

Figure 7.
Distribution of publications by document type
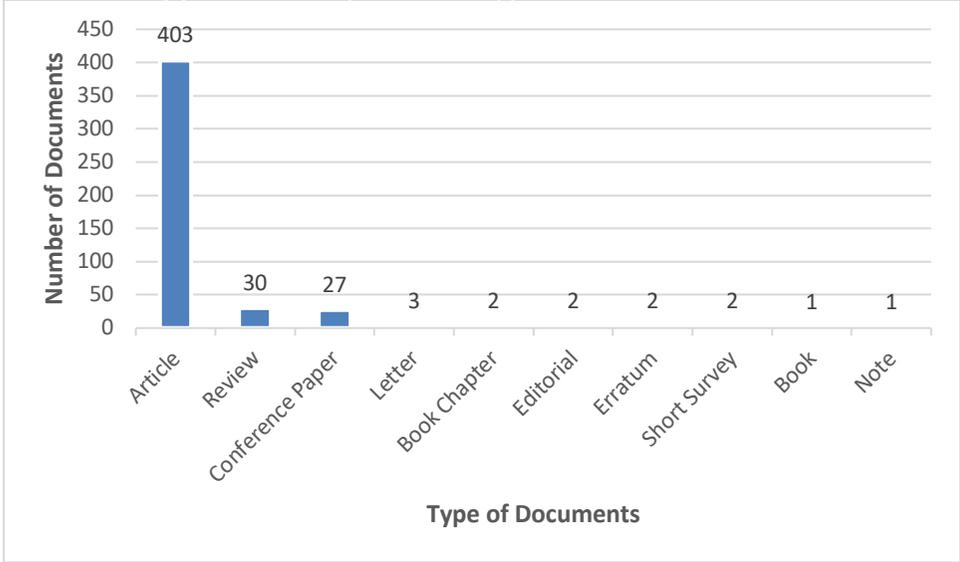
**Distribution of Publications by Subject Area**

The distribution of publications is dominated by the social sciences (46%) and computer science (11%) and medicine (9%), referring to the pie chart (see Figure 8). The percentages for health professions, arts and humanities, and nursing are 4%, 3%, and 3%, respectively, while psychology makes up 7%. Engineering, business, management, and accounting also make small contributions. The combined contribution of the other areas is lower, indicating that research is diverse but mostly focused on the social sciences.

Distribution of Publications by Funding Sponsors

The top 15 funding sponsors that supported publishing on the topic are shown in Table 3. With nine papers each, the National Science Foundation and the European Commission are in first place. With six publications, the Ministerio de Economía y Competitividad comes next, followed by the Ministry of Education, Culture, Sports, Science, and Technology with five. Numerous organisations, including the Japan Society for the Promotion of Science, the Directorate for Education and Human Resources, and the Social Sciences and Humanities Research Council of

Canada, each contributed four documents, demonstrating the diversity of research financing around the globe.

Figure 8.
Distribution of publications by subject area
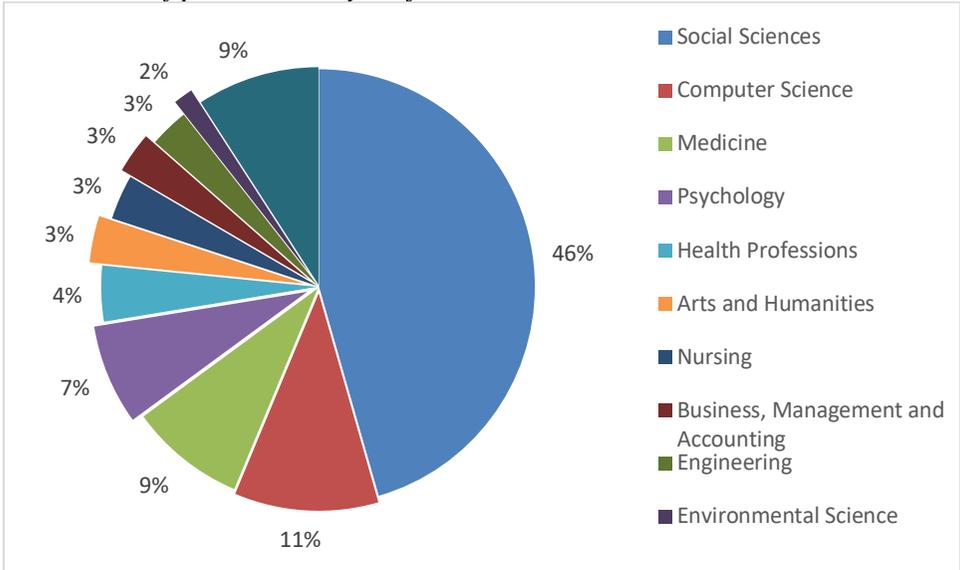
Publication Citation Analysis

The top 10 publications with the most citations are shown in Table 4, highlighting significant research in a range of disciplines. With 475 citations, Davies et al. (2012)'s paper "Creative learning environments in education: A systematic literature review" was the most cited. It was published in Thinking Skills and Creativity. Developing the master learner by Schumacher et al. (2013), which has 209 citations, and Exploring Deliberate Practice in Medicine by Van De Wiel et al. (2010), which has 154 citations, are two more noteworthy papers. These articles include active medical education, self-directed learning, and creative learning. Well-known publications like Advances in Health Sciences Education and Academic Medicine are frequently featured. Their academic importance and multidisciplinary relevance are shown by the topics covered, which vary from public health initiatives to teaching methodologies and lifelong learning. Their contributions to the advancement of psychology, medicine, and education are reflected in the citations.

Table 3.

Number of documents by Funding Sponsor (top 15)

SN	Affiliation Name	Number of Documents
1	European Commission	9
2	National Science Foundation	9
3	Ministerio de Economía y Competitividad	6
4	Ministry of Education, Culture, Sports, Science and Technology	5
5	Directorate for Education and Human Resources	4
6	Japan Society for the Promotion of Science	4
7	Social Sciences and Humanities Research Council of Canada	4
8	Agencia Estatal de Investigación	3
9	Australian Research Council	3
10	Department of Education and Training	3
11	Economic and Social Research Council	3
12	Fundação para a Ciência e a Tecnologia	3
13	Ministry of Education of the People's Republic of China	3
14	Ministério da Educação e Ciência	3
15	National Institutes of Health	3

Source: SCOPUS

Table 4.
Articles with highest citations (top ten)

SN	Title	Authors	Year	Source	Citations
1	Creative learning environments in education-A systematic literature review	Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P., & Howe, A.	2012	Thinking Skills and Creativity, 8(1), pp. 80–91	475
2	Developing the master learner: Applying learning theory to the learner, the teacher, and the learning environment	Schumacher, D. J., Englander, R., & Carraccio, C.	2013	Academic Medicine, 88(11), pp. 1635–1645	209
3	Exploring deliberate practice in medicine: How do physicians learn in the workplace?	Van De Wiel, M. W. J., Van Den Bossche, P., Janssen, S., & Jossberger, H.	2010	Advances in Health Sciences Education, 16(1), pp. 81–95	154
4	The Role of Direct Strategy Instruction and Indirect Activation of Self-Regulated Learning—Evidence from Classroom Observation Studies	Dignath, C., & Veenman, M. V. J.	2020	Educational Psychology Review, 33(2), pp. 489–533	150

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5	Exploring the divergence between self-assessment and self-monitoring	Eva, K.W., Regehr, G.	2010	Advances in Health Sciences Education, 16(3), pp. 311–329	143
6	An investigation of self-directed learning skills of undergraduate students	Tekkol, I.A., Demirel, M.	2018	Frontiers in Psychology, 9(NOV), 2324	137
7	Teachers' self-directed learning and teaching experience: What, how, and why teachers want to learn	Louws, M. L., Meirink, J. A., Van Veen, K., & Van Driel, J. H.	2017	Teaching and Teacher Education, 66, pp. 171–183	115
8	Context matters when striving to promote active and lifelong learning in medical education	Berkhout, J. J., Helmich, E., Teunissen, P. W., Van Der Vleuten, C. P. M., & Jaarsma, A. D. C.	2017	Medical Education, 52(1), pp. 34–44	99
9	Effectiveness of capacity building interventions relevant to public health practice: A systematic review	DeCorby-Watson, K., Mensah, G., Bergeron, K., Abdi, S., Rempel, B., & Manson, H.	2018	BMC Public Health, 18(1), 684	98
10	Successful self-directed lifelong learning in medicine: A conceptual model derived from qualitative analysis of a national survey of pediatric residents	Li, S. T., Paterniti, D. A., Co, J. P. T., & West, D. C.	2010	Academic Medicine, 85(7), pp. 1229–1236	96

Source: SCOPUS

Co-Authorship Network Analysis

An understanding of research dynamics may be gained by analysing collaborative links between countries, organisations, and authors using co-authorship network analysis. Research shows collaboration improves cross-disciplinary creativity and knowledge exchange (Payumo et al., 2021; Akçomak, 2011). Furthermore, methods such as social network analysis and bibliometric analysis are used to visualise these intricate networks (De Stefano et al., 2011; Petrovich, 2022). These studies make it easier to comprehend international research trends and collaborations across institutions (De Stefano et al., 2019).

Co-Authorship Network Analysis – Countries

Figure 9 displays the international collaboration network that was obtained by using VOSviewer to analyse co-authorship. With the US (9 links & 80 documents), UK (14 links & 54 documents), Netherlands (11 links & 33 documents), China (9 links & 39 documents), and Australia (13 links & 33 documents) emerging as significant contributors, the map illustrates robust research collaborations. While thicker lines signify stronger collaborative links, larger nodes reflect nations with higher publication counts. To improve the visualisation, certain parameters were established throughout the study, such as the minimum number of papers per country (5) and the minimum number of citations per document (10). Differentiated by colour, the clusters reflect groups of nations that frequently have co-authorship relationships. Central hubs in this network promote worldwide information sharing and collaboration in scientific developments, reflecting the global characteristics of research collaborations.

Figure 9.

Collaborative Network among Countries
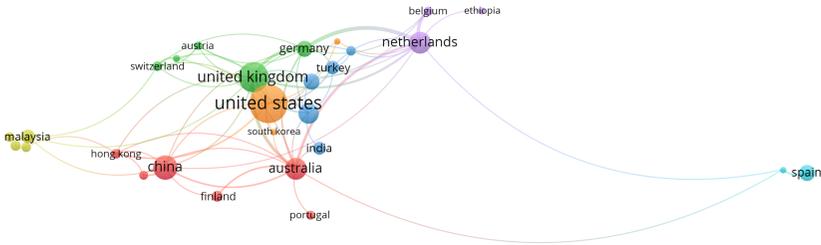
Co-Authorship Network Analysis – Organizations

Figure 10 shows a network of co-authorship amongst certain institutions. Institutions actively contributing to the field are represented where The Centre for Post-Digital Culture, the Disruptive Media Learning Lab, and Falmouth University constitute significant organisations that showcase their connections in academic research on concerned topic. The specific threshold level required a minimum of

2 documents and at least 1 citation. The three interconnected organisation were qualified in the criteria for threshold and network analysis.

Figure 10.
Collaborative Network among Organizations
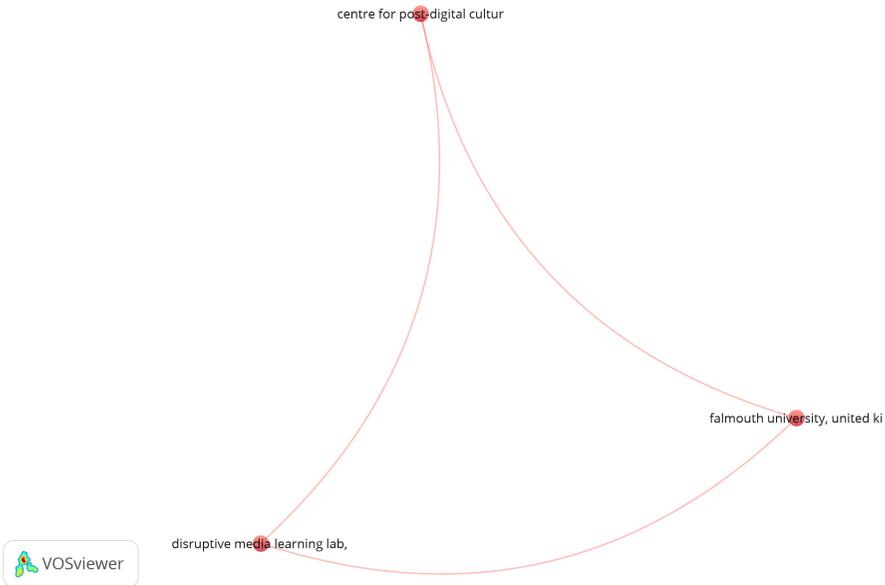

Co-Authorship Network Analysis – Authors
According to co-authorship data, the collaborative network among authors is shown in Figure 11. The lines that link the nodes show the relationships between co-authors, and each node represents one author. Distinguished authors like Richard Shaw, Nicole Derish, and Cheryl Al-Mateen exhibit a significant degree of interconnectedness, underscoring their vital roles for fostering research collaboration. The specific threshold criteria for this network analysis were a minimum of 1 document with at least 5 citations, in which 25 authors networked together, qualified.

Co-Occurrence Keyword Network Analysis
Co-occurrence By using network mapping to uncover connections between terminology in research publications, keyword network analysis provides insights into patterns and knowledge structures in a variety of fields (Weerasekara et al., 2022). The network of Keywords that appear together in the examined literature can be seen in Figure 12. Keywords that emphasise their importance in the subject included a total of seven clusters having 54, 44, 31, 26, 17, 10, and 1 item respectively with learning, professional development, and self-directed learning as

the most significant terms. Thematic groupings including online learning, psychology, and medical education are represented by colour-coded clusters of Keywords. Medical student, clinical competency, and nursing student clusters, for instance, highlight discipline-specific applications, whereas blended learning and lifelong learning indicate educational approaches. This visualisation sheds light on the study corpus's connected subjects and thematic emphasis areas. a specific threshold was not set for this however, the default threshold of minimum 5 number of occurrences of a keyword was applied proceeded with co-occurrence analysis on all 183 keywords.

Figure 11.
Collaborative Network among Authors
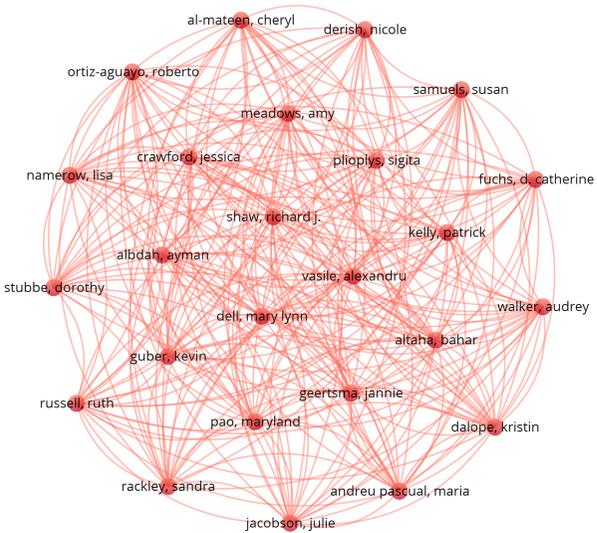
The average publication year of articles containing the related term is represented by the colour of each node in the temporal insights map or overlay visualization (see Figure 13). With more current study subjects shown in yellow-green and older ones in blue, the colour gradient draws attention to the changing emphasis areas over time. Emerging trends and the development of research themes in the subject can be identified as a result to this overlay analysis.

Figure 12.
Network of Co-occurrence Among Keywords

Figure 13.
Network of Co-occurrence – Overlay Visualization

Co-Citation Network Analysis

In order to comprehend research dynamics, co-citation network analysis can examine the connections between cited references and cited authors. This approach

reveals knowledge clusters within domains by quantifying interdisciplinarity without the need for predetermined classifications (Hernández & Dorta-González, 2020; Wang et al., 2023).

Co-Citation Analysis – Cited Authors

The network of cited authors' co-citations is shown in Figure 14. The size of each node, which represents an author, is correlated with the number of citations obtained. Node-to-node connections show that the authors were cited together in the same papers; the strength of the link reflects how frequently the authors were cited together. Key contributors include notable authors like Bandura A. (88 citations), Pintrich P.R. (131 citations), and Zimmerman B.J. (224 citations), who demonstrate their significant influence on the subject of study. With a threshold of 20 citations per author, the co-citation map was created, and 101 satisfied the requirements. Understanding the intellectual structure and theme partnerships within the area is facilitated by cluster analysis, which unites authors with comparable research interests.

Figure 14.
Network of Co-citation Among Cited Authors

Co-Citation Analysis – Cited References

The network of referenced texts' co-citations is shown in Figure 15. The size of each node, which represents a document, is correlated with the number of citations it contains. Co-citation is indicated by links between nodes, which means that the papers were referenced together in other publications. Notable papers by

Zimmerman B.J., Pintrich P.R., and Knowles M. predominate the network, indicating their fundamental position in the field of study. 41 documents satisfied the minimal citation requirement of five per document, which was established for this study. Clusters of closely related works, each represented by a distinct colour, draw attention to subject groups and indicate important research streams and links among the field's foundational works.

Figure 15.
Network of Co-citation Among Cited References
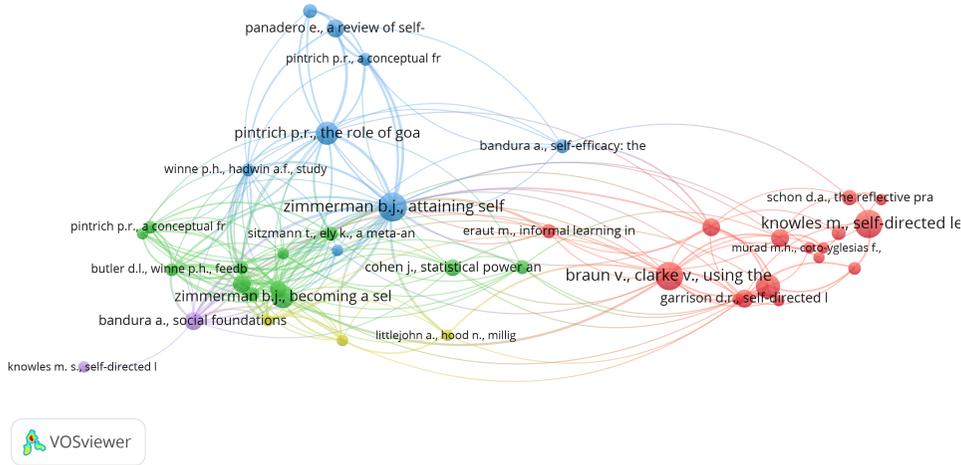
DISCUSSION

The bibliometric analysis's findings highlight the increasing importance of heutagogical learning in professional development, which is consistent with its applicability in modern education and workforce training. Publications have significantly increased from 2010 to 2024, especially after 2016, indicating a growing interest in self-determined learning strategies. Rapid technological advancements and the need for lifelong learning are two characteristics of the 21st-century workforce that align with this trend. Key thematic areas found through keyword occurrence and co-citation network analysis include "learner autonomy," "self-directed learning," and "digital education," highlighting the importance of heutagogical principles in creating individualized and adaptive learning experiences.

Key Insights and Contributions

The distribution of articles across the subject areas, such as computer science, medicine, and the social sciences, confirms the analysis's multidisciplinary involvement with heutagogical learning. The versatility of heutagogy to different professional fields is demonstrated by this diversity. The popularity of renowned writers and organisations, such Universiteit Maastricht and A. Margaryan, respectively, indicates that strong institutional support and academic leadership contribute for this field of study. A targeted distribution of information in education and allied fields is also indicated by the noteworthy contributions from journals such as BMC Medical Education and Education Sciences.

Analyses of the co-authorship and co-citation networks offer important insights into patterns of collaboration and theoretical frameworks in the discipline. The worldwide scope of heutagogical research is shown by the inclusion of important nodes in the international collaboration map, such as the US and the UK. Similar to this, the pivotal role played by influential authors such as Zimmerman B.J. and Pintrich P.R. in co-citation networks emphasizes their vital contributions to the theoretical and applied foundations of self-determined learning.

Relevance to Professional Development

According to the results, heutagogical concepts can be applied in professional development settings. The emphasis on autonomous learning fits very nicely with the growing need for robust and adaptive workers who can handle challenging and changing work settings. Individuals are prepared for professional advancement and lifelong growth by utilizing heutagogical learning, which cultivates abilities like critical thinking, problem-solving, and metacognitive awareness. By making individualized and scalable learning experiences possible, technological integration, as seen in research trends, significantly expands the potential of heutagogical practices.

Research Gaps and Emerging Trends

Even with the abundance of material, there are still certain gaps and areas that may use more study. For example, regardless of the co-occurrence analysis identifies new themes like "online learning" and "MOOCs," further research is necessary to fully comprehend these topics' effects on heutagogical learning. Furthermore, the comparatively low number of studies from South America and Africa points to a geographic imbalance that needs to be looked into further in order to advance diversity and inclusion in the area.

The use of heutagogical strategies in organisational contexts is another crucial area of deficiency. Despite the well-established theoretical advantages, there are still few empirical studies assessing the long-term effects of these strategies in various professional contexts. Closing this gap might give policymakers and practitioners useful information.

Challenges and Opportunities

The use of heutagogical learning in professional growth is fraught with difficulties. These include the requirement for a strong technology infrastructure, the reluctance to depart from conventional instructional paradigms, and the uneven digital literacy of students. Nevertheless, these difficulties also provide chances for creativity. For instance, obstacles may be removed and more inclusive learning opportunities can be facilitated by integrating mobile platforms with adaptive learning systems. Targeted training programs and policy efforts can help create organisational commitment and support, which is necessary to cultivate a culture that supports self-determined learning.

LIMITATIONS

A number of limitations apply to this bibliometric analysis. One such is database limitations, this analysis only used Scopus, to gauge literature from 2010 to 2024 (extraction date: 23rd November 2024), which could have limited the analysis's broadness by excluding pertinent research that were indexed in other repositories. As a result, research published in regional repositories or other respectable sources like Web of Science would have gone unnoticed. To improve coverage, future studies have to take into account a larger dataset.

Language bias is yet another key limitation. This analysis may have overlooked important studies published in other languages as it solely examined English-language publications. Because of this, results may not accurately reflect heutagogical learning advancements in non-English speaking nations, especially those where studies are released in indigenous languages. The contributions from various language settings may be undervalued as a result of this bias, which can also distort the theme representation.

Concerns about geographic bias also exist. When looking at the distribution of publications, there is a concentration of research from North America, Europe, and Australia, while there are relatively less studies from South America and Africa. This disparity might be a result of differences in access to indexed journals, academic publishing infrastructure, and research funding. Consequently, care should be used when interpreting the findings' global applicability. To effectively capture the variety of viewpoints on heutagogical learning, future research should strive for a more inclusive approach by combining many databases and investigating non-English sources. The necessity for more comprehensive and varied bibliometric methodologies in subsequent research is highlighted by these gaps.

CONCLUSION

The results of this bibliometric research demonstrate how heutagogical learning is becoming more and more important in professional development. The study highlights the importance of self-determined learning approaches in developing flexible and autonomous professionals by mapping research trends, identifying important contributions, and revealing thematic links. The growing use of heutagogical principles in a variety of fields, including computer science, health, and education, highlights how widely applicable they are in work environments.

The study's conclusions highlight the necessity for practitioners to integrate heutagogical principles into professional development training. Employers can support autonomous learning by offering flexible learning paths for workforce, integrating digital learning resources, and encouraging reflective activities. The following are examples of practical steps:

- Implementing competency-based training programs and micro-learning to enable professionals to take responsibility for their own learning.
- Promoting peer learning communities and mentorship programs that support both autonomous and collaborative learning.
- Utilizing adaptive learning platforms and artificial intelligence to tailor learning experiences to the needs of each individual.

The study emphasizes for policymakers the significance of creating educational policies that encourage heutagogical learning approaches in professional education and workforce training. Among the primary recommendations for policy are:

- Creating frameworks that include the concepts of self-directed learning into programs for continuing professional development.
- Investing funds into open-access learning resources and digital infrastructure to improve lifelong learning's equity and accessibility.
- Promoting interdisciplinary collaborations between business, academia, and government in order to match heutagogical approaches to learning with the requirements of the workforce.

Regardless its many benefits, heutagogical learning has shortcomings, including institutional support variations, digital literacy gaps, and resistance to change in conventional learning environments. Employer-driven learning programs, governmental incentives, and the incorporation of emerging technology into professional training programs are all necessary to address these shortcomings and promote a culture of lifelong learning. Heutagogical learning ultimately provides a novel approach of professional development, offering individuals what they need to thrive in a workforce which is becoming more intricate and dynamic. Professionals can be better prepared to prosper in the knowledge economy of the twenty-first century by practitioners and policymakers encouraging autonomy, flexibility, and continuous learning.

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