



KNOWLEDGE DEVELOPMENT AROUND SELF-DETERMINATION THEORY IN HIGHER EDUCATION: A BIBLIOMETRIC PERSPECTIVE

DESARROLLO DEL CONOCIMIENTO EN TORNO A LA TEORÍA DE LA AUTODETERMINACIÓN EN LA EDUCACIÓN SUPERIOR: UNA PERSPECTIVA BIBLIOMÉTRICA

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ABSTRACT

Self-Determination Theory (SDT) has become a prominent framework in higher education research to explain student motivation, engagement, and well-being, particularly amid the expansion of online and hybrid learning and inclusivity agendas. Yet SDT-related knowledge in higher education is distributed across increasingly diverse application contexts, making it difficult to determine how thematic continuity, diversification, and structural integration have developed over time. This study examines the longitudinal development of knowledge surrounding SDT in higher education through a bibliometric approach. Using a reproducible search and screening workflow in Scopus (retrieved on 29 August 2024; final dataset: 862 records), we conduct (i) performance analysis of publication growth, citations, and leading contributors and (ii) science mapping using co-word thematic mapping and thematic evolution (Bibliometrix/Biblioshiny, complemented by data cleaning via OpenRefine and biblioMagika). Results show sharp post-2010 growth and a stable SDT-related conceptual reference point alongside the expansion and differentiated positioning of applied themes centered on motivation-related outcomes, inclusive education, and digitally mediated learning. The strategic maps further indicate that some application themes became internally developed and structurally connected, whereas others remained specialized or peripheral. This study offers a longitudinal account of knowledge development around SDT, clarifying the relationship between contextual expansion and selective structural integration while preserving the

distinction between changes in the scholarship and changes in the theory itself.

Keywords:

Self-Determination Theory, Higher Education, Bibliometric Analysis, Thematic Evolution, Academic Motivation.

RESUMEN

La Teoría de la Autodeterminación (TAD) se ha consolidado como un marco destacado en la investigación sobre educación superior para explicar la motivación, el compromiso (engagement) y el bienestar de los estudiantes, especialmente en el contexto de la expansión del aprendizaje en línea e híbrido y de las agendas de inclusión. No obstante, el conocimiento vinculado a la TAD en la educación superior se distribuye entre contextos de aplicación cada vez más diversos, lo que dificulta determinar cómo han evolucionado la continuidad temática, la diversificación y la integración estructural a lo largo del tiempo. Este estudio examina el desarrollo longitudinal del conocimiento en torno a la TAD en la educación superior mediante un enfoque bibliométrico. A partir de un flujo de trabajo reproducible de búsqueda y cribado en Scopus (consulta realizada el 29 de agosto de 2024; conjunto de datos final: 862 registros), se llevó a cabo (i) un análisis de desempeño del crecimiento de las publicaciones, las citas y los principales contribuyentes, y (ii) un mapeo científico basado en el análisis de co-palabras mediante mapas temáticos y evolución temática (Bibliometrix/Biblioshiny, complementado con la depuración de datos a través de OpenRefine y biblioMagika). Los resultados muestran un



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marcado crecimiento a partir de 2010 y un punto de referencia conceptual estable asociado a la TAD, junto con la expansión y el posicionamiento diferenciado de temas aplicados centrados en los resultados relacionados con la motivación, la educación inclusiva y el aprendizaje mediado digitalmente. Los mapas estratégicos indican, además, que algunos temas de aplicación alcanzaron un desarrollo interno y una conexión estructural, mientras que otros permanecieron especializados o periféricos. Este estudio ofrece una descripción longitudinal del desarrollo del conocimiento en torno a la TAD, esclareciendo la relación entre la expansión contextual y la integración estructural selectiva, al tiempo que preserva la distinción entre los cambios en la producción académica y los cambios en la teoría misma.

Palabras clave:

Teoría de la autodeterminación, Educación Superior, Análisis Bibliométrico, Evolución Temática, Motivación Académica.

INTRODUCTION

The development of knowledge surrounding Self-Determination Theory (SDT) in higher education reflects sustained scholarly efforts to understand student motivation and engagement across increasingly diverse learning environments. These concerns remain central as institutions seek to support academic performance, persistence, and well-being (Ferrer et al., 2022; Morris, 2019). SDT provides an established framework for this research by emphasizing the roles of autonomy, competence, and relatedness in shaping the quality of human motivation (Ryan & Deci, 2024). Although applied across multiple disciplines, SDT has assumed particular importance in education, where it informs research on how learning environments and instructional practices support or constrain students' psychological needs.

As the use of SDT in higher education has grown, so too has the body of knowledge associated with the theory. Research now extends beyond traditional classroom instruction to online and hybrid learning, student transitions, professional education, inclusive education, and the experiences of diverse learner groups (De Freitas et al., 2022; Larson et al., 2019; Lozano-Jiménez et al., 2021). Yet publication growth alone cannot explain how this knowledge has developed. A research domain may expand and diversify contextually while retaining a stable conceptual foundation. New applications may become integrated with established motivational concepts, develop into specialized research niches, or remain weakly connected to the wider knowledge structure. Distinguishing

the expansion of SDT-related scholarship from the development of SDT as a theory is therefore essential.

Despite this growth, existing research has largely generated evidence on particular SDT constructs and applications, including autonomy support, intrinsic motivation, psychological need satisfaction, and digitally mediated learning (Ferrer et al., 2022; Holzer et al., 2021). Studies focused on individual constructs or settings, however, do not reveal how the knowledge surrounding SDT has been organized and reorganized over time. Conventional bibliometric descriptions of publication trends, influential contributors, and static thematic structures characterize the scale and composition of a field but offer limited insight into whether themes persist, become structurally integrated, develop into specialized domains, or lose connection with the wider literature. The unresolved issue is therefore not simply whether SDT-related higher education research has increased or which themes are prominent, but how its knowledge structure has developed through continuity, expansion, diversification, and changing thematic relationships.

To address this gap, the present study conducts a longitudinal bibliometric analysis of 862 Scopus-indexed documents published between 1979 and 2024. Performance indicators and contributor patterns establish the descriptive context for the field's expansion, while author-keyword thematic evolution and strategic maps provide evidence of thematic continuity, structural position, and internal development across three periods. The analysis examines how the publication base of SDT-related higher education research has expanded, which knowledge themes have remained structurally persistent or changed position, and how newer application domains have become integrated, specialized, or weakly connected within the broader field.

In doing so, the study offers an empirically bounded account of knowledge development around a stable theoretical framework. It does not seek to demonstrate that SDT's propositions or mechanisms have changed. Rather, it explains how the scholarly knowledge organized around SDT has broadened across higher education contexts while exhibiting different degrees of structural integration. This perspective clarifies the relationship between contextual expansion and cumulative knowledge formation, providing a coherent basis for identifying future research priorities.

SDT, developed by Ryan & Deci (2024), is a broad framework for the study of human motivation that emphasizes the innate psychological needs of autonomy, competence, and relatedness (Larson et al., 2019). These needs are fundamental to optimal functioning and well-being, particularly in educational settings. Autonomy refers to

the sense of volition and self-direction in learning; competence involves feeling capable and effective in academic tasks; and relatedness pertains to the connection and sense of belonging with peers and educators (Ryan & Deci, 2024). SDT distinguishes between intrinsic motivation (engaging in activities for inherent satisfaction) and extrinsic motivation (engaging in activities for external rewards or pressures), arguing that educational environments should foster conditions that promote intrinsic motivation for deep learning, and sustained academic engagement (Ryan & Deci, 2024).

SDT has been extensively applied in higher education to understand how learning environments can support student motivation and engagement (Ferrer et al., 2022). Research suggests that when instructors employ supportive teaching practices such as autonomy-supportive instruction, constructive feedback, and collaborative learning, students experience higher intrinsic motivation, increased persistence, and improved academic performance (Reeve, 2012). Moreover, SDT has provided valuable insights into online learning, where fostering autonomy and competence through well-structured digital platforms can enhance students' sense of agency and reduce their disengagement (Hsu et al., 2019).

Several empirical studies have tested SDT's application of SDT in higher-education settings. Similarly, Holzer et al. (2021) used structural equation modeling in higher education to examine how psychological need satisfaction influences well-being during COVID-19, finding competence to be the strongest predictor of positive emotion and motivation. Ferrer et al. (2022) used structural equation modeling in higher education to examine how students' attitudes toward online learning mediate the relationship between motivation and engagement. The results showed that attitude influenced engagement for both intrinsic and extrinsic motivation, with stronger effects on online students. The results showed that course quality and intrinsic motivation significantly enhanced perceived usefulness and satisfaction, and increased retention rates.

While SDT research in higher education has expanded significantly, the literature remains fragmented, with studies often focusing on specific components, such as autonomy support or motivation types, without synthesizing broader trends. To address this gap, bibliometric analysis provides a valuable method for mapping research evolution, identifying key contributors, and uncovering emerging themes. Few studies have applied bibliometric techniques to SDT research in higher education, making it challenging for scholars to gain a comprehensive understanding of this field's development. Given this limitation, this study employs bibliometric tools, such as VOSviewer and Biblioshiny, to systematically analyze SDT-related

publications, offering insights into research trends, author collaborations, and thematic evolution.

MATERIALS AND METHODS

Data for this bibliometric study were retrieved from Scopus, which offers broad multidisciplinary coverage and provides structured bibliographic metadata (e.g., citations, author affiliations, and country information) suitable for bibliometric analyses. The search was conducted in the TITLE-ABS-KEY field (titles, abstracts, and author keywords) to capture literature related to SDT in the context of HE

No time restriction was applied; the search was limited to English-language records; document type was initially set to "All" to capture a broad spectrum of research output. The search and screening workflow is reported in Figure 1 using a PRISMA-informed flow diagram for transparency (Moher et al., 2009). A comprehensive keyword search was conducted using Boolean operators and specific search phrases to identify relevant materials. The search string employed in this analysis is as follows:

(TITLE-ABS-KEY("self-determination theory" OR "self-determination theory" OR "theory of self-determination" OR "SDT")) AND (TITLE-ABS-KEY ("higher education" OR "higher education institution*" OR "tertiary education" OR "post-secondary education" OR post-secondary OR college OR universit* OR "higher learning"))

This search string was designed to capture studies focusing on the theoretical and practical applications of SDT in HE settings. The terms encompassed multiple institution types to ensure broad coverage of the field.

The bibliometric dataset was retrieved from Scopus on 29 August 2024 using a TITLE-ABS-KEY query. No time restriction was applied. To ensure linguistic consistency for keyword-based science mapping, the search was limited to English-language records. Records were screened for relevance to Self-Determination Theory (SDT) in higher education based on titles and abstracts. Errata and notes were excluded because they do not represent substantive research contributions and may bias bibliometric indicators. After screening, the final dataset comprised 862 documents.

To ensure consistency and accuracy in the dataset, the records were processed using BiblioMagika 2.9 (Ahmi, 2023) and OpenRefine 3.7.6 version. Both tools were employed to clean and harmonize key bibliographic elements, such as author names and IDs, institutional affiliations, and author keywords. OpenRefine was particularly useful for detecting and resolving discrepancies, such as variations in the spelling of author keywords, while BiblioMagika facilitated the efficient standardization of author

names, countries, and institutions across the dataset (Ahmi, 2023). This harmonization process was crucial to ensure that the data were uniform and reliable for subsequent bibliometric analysis.

The 862 selected records were imported into Biblioshiny (Bibliometrix 4.3.0 for R) (Aria & Cuccurullo, 2017) to map themes and visualize thematic evolution. Records were independently screened by two reviewers for relevance to Self-Determination Theory (SDT) in higher education based on titles and abstracts. Disagreements were resolved through discussion until consensus was reached. Citation metrics, publication trends over time, affiliations, countries, and influential authors were analyzed to provide insights into the development of SDT research in the context of HE

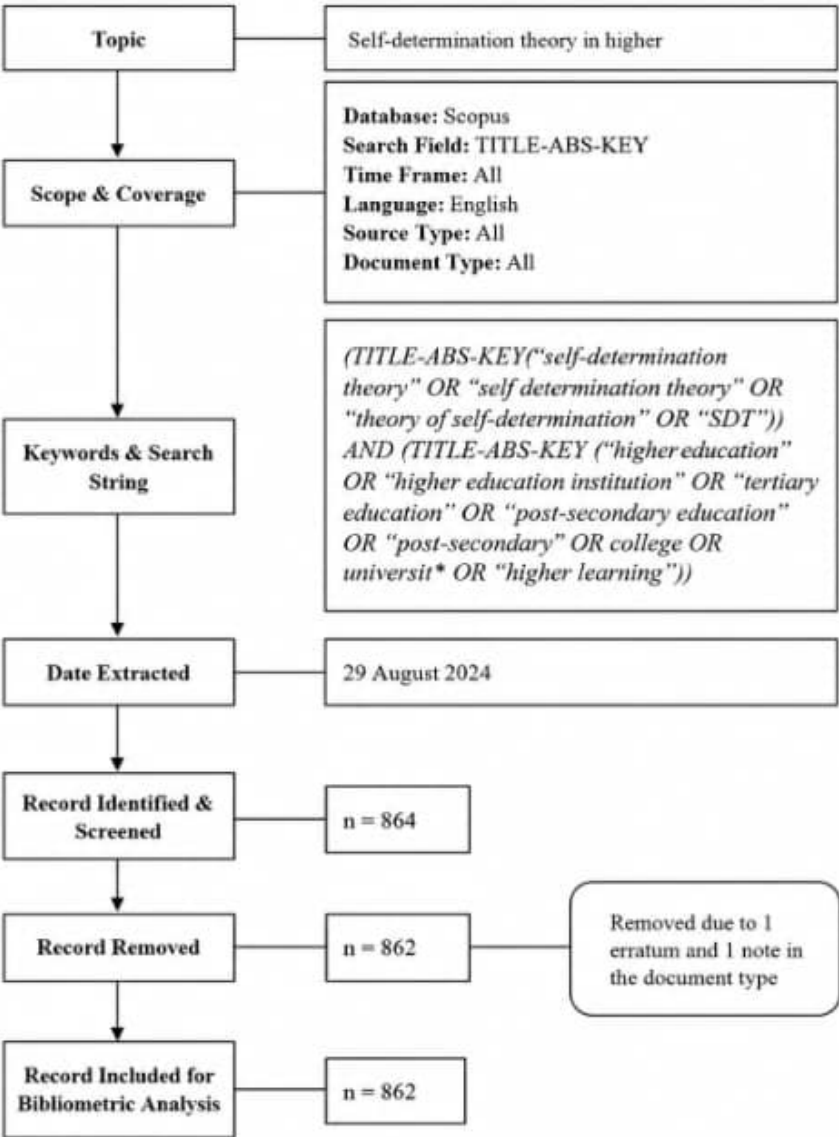


Figure 1. PRISMA flow diagram of the search strategy

RESULTS AND DISCUSSION

The bibliometric analysis highlighted key citation metrics for research on SDT in HE from 1979 to 2024, as presented in Table 1. Over the 46-year publication period, 862 publications were produced by 2,753 authors, documenting the scale of the field's authorship base. These studies received 11,993 citations. The mean number of citations per paper was 13.90. However, the 635 cited publications received an average of 18.87 citations each, indicating the citation impact of the referenced studies within the literature.

The citation profile of the field, as shown in Table 1, includes an h-index of 51 and a g-index of 84, indicating a substantial body of highly cited work. The m-index of 1.109 contextualizes the h-index in relation to the length of the publication period. Furthermore, the 9,947 citations within the h-core show that a substantial proportion of the field's citation influence is concentrated among its most prominent articles. Together, these measures indicate the citation visibility accumulated by SDT-related higher education research.

Table 1: Citation metrics

Main Information	Data
Publication Years	1979 - 2024
Total Publications	862
Citable Year	46
Number of Contributing Authors	2753
Number of Cited Papers	635
Total Citations	11,993
Citation per Paper	13.90
Citation per Cited Paper	18.87
Citation per Year	266.29
Citation per Author	4.35
Author per Paper	3.19
Citation sum within h-Core	9,947
h-index	51
g-index	84
m-index	1.109

The analysis of document types related to SDT in HE, as presented in Table 2, identified 862 publications, the majority of which were articles, accounting for 80.90% (699). This frequency highlights peer-reviewed articles as the principal vehicle for disseminating original research and theoretical insights within the academic community. Conference papers represented 7.64% (66) of the total, reflecting their role in communicating preliminary findings and facilitating scholarly exchange. Book chapters accounted for 6.02% (52), showing that edited-volume publications also contributed to the corpus. Review articles represented 3.59% (31), while books and conference reviews accounted for 1.04% (9) and 0.58% (5), respectively. This distribution describes the range of publication formats through which SDT-related knowledge has been disseminated.

Table 2: Document Type

Document Type	Total Publications	Percentage (%)
Article	699	80.90%
Conference Paper	66	7.64%
Book Chapter	52	6.02%
Review	31	3.59%
Book	9	1.04%
Conference Review	5	0.58%
Total	862	100.00

The analysis of source types related to SDT in HE, as outlined in Table 3, revealed that publications predominantly originated from journals, accounting for 84.61% (731) of the total output. This proportion demonstrates the central role of academic journals in disseminating peer-reviewed SDT-related research. Conference proceedings comprised 6.25% (54), while books accounted for 5.67% (49) and book series represented 3.47% (30).



Table 3: Source Type

Source Type	Total Publications	Percentage (%)
Journal	731	84.61%
Conference Proceeding	54	6.25%
Book	49	5.67%
Book Series	30	3.47%
Total	862	100.00

The analysis of subject areas related to SDT in HE, as presented in Table 4, reveals a diverse academic landscape. Social sciences emerged as the predominant category, accounting for 72.45% (626) of the total output. This representation reflects the centrality of social-science perspectives in examining human behaviour and motivation within educational contexts. Psychology constituted 20.49% (177) of the publications, reflecting its foundational role in developing and applying SDT principles. Computer science accounted for 11.69% (101), showing that technology-related research forms part of the multidisciplinary knowledge base surrounding SDT, particularly in online and hybrid educational environments. Contributions from medicine, business and management, the arts and humanities, health professions, engineering, and other areas further demonstrate the multidisciplinary application of SDT.

Table 4: Subject Area.

Subject Area	Total Publications	Percentage (%)
Social Sciences	626	72.45%
Psychology	177	20.49%
Computer Science	101	11.69%
Medicine	88	10.19%
Business, Management and Accounting	86	9.95%
Arts and Humanities	69	7.99%
Health Professions	60	6.94%
Engineering	44	5.09%
Environmental Science	39	4.51%
Energy	24	2.78%
Economics, Econometrics and Finance	17	1.97%
Neuroscience	15	1.74%
Decision Sciences	14	1.62%
Mathematics	13	1.50%
Multidisciplinary	13	1.50%
Nursing	8	0.93%
Chemistry	7	0.81%
Earth and Planetary Sciences	7	0.81%
Agricultural and Biological Sciences	6	0.69%
Biochemistry, Genetics and Molecular Biology	6	0.69%
Materials Science	4	0.46%
Physics and Astronomy	4	0.46%
Dentistry	2	0.23%
Pharmacology, Toxicology and Pharmaceutics	2	0.23%
Chemical Engineering	1	0.12%
Immunology and Microbiology	1	0.12%
Veterinary	1	0.12%

The Figure 2 presents the temporal distribution of publications and citations related to SDT in HE. The blue bars indicate the total number of publications per year, whereas the orange line represents the corresponding annual citations. Publication and citation activity remained limited from 1979 to the early 2000s, with relatively few publications each year and minimal citation activity. The increase in publications became more pronounced around 2010 and coincided with growth in citations. The most substantial increase in both measures occurred between 2015 and 2023, indicating increasing academic attention to the topic.

The number of publications peaked in 2023 at 151, while publications from that year had accumulated 336 citations at the time of data retrieval. This difference between recent publication output and citation counts reflects the natural citation lag, as recently published work has had less time to accumulate citations. The figures for 2024—96 publications and 70 citations—should also be interpreted in light of the incomplete publication year and the limited time available for citation accumulation.

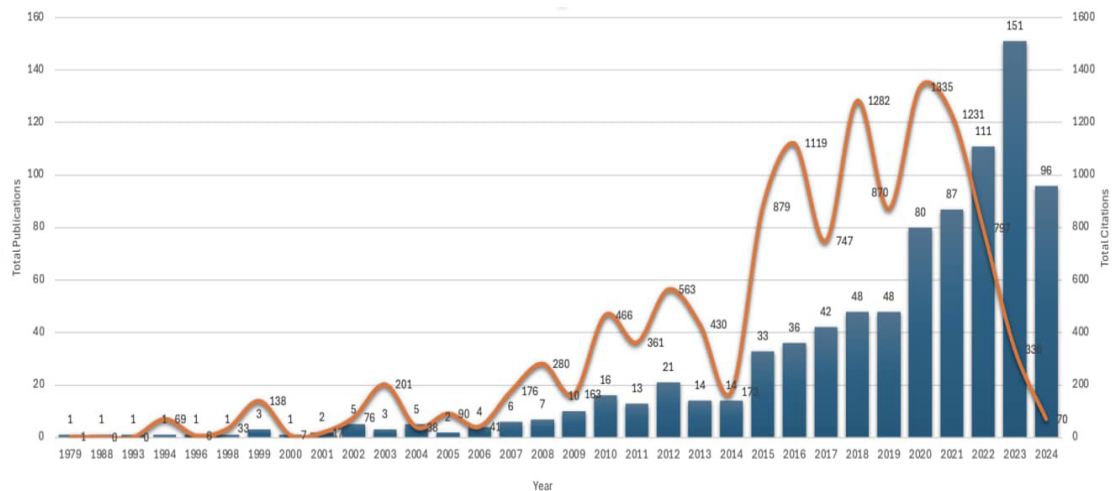


Figure 2: Total Publications and Citations by Year

Table 5 presents the most influential authors in SDT research, identified by an h-index greater than three. Karrie A. Shogren of the University of Kansas recorded the highest h-index of 9, with ten publications and 225 citations, corresponding to an average of 22.50 citations per publication. Lucas M. Jenö of the University of Bergen had an h-index of 6 and received 254 citations across nine publications, with an average of 28.22 citations per publication. Chantal Levesque-Bristol of Purdue University received the highest total number of citations among the listed authors, with 377 citations and an average of 47.13 citations per cited publication. The research profiles of these leading contributors are closely associated with self-determination theory and motivation, including the application of SDT across different educational contexts.

Table 5: Most Influential Authors by H-Index>3.

Author's Name	Current Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	g	m
Shogren, Karrie A.	University of Kansas	United States	10	10	225	22.50	22.50	9	10	0.692
Jenö, Lucas M.	University of Bergen	Norway	9	8	254	28.22	31.75	6	9	0.750
Levesque-Bristol, Chantal	Purdue University	United States	9	8	377	41.89	47.13	7	9	1.167
Kaur, Amrita	Wenzhou-Kean University	China	7	6	75	10.71	12.50	5	7	0.833



Moreno-Murcia, Juan Antonio	Miguel Hernández University	Spain	6	5	86	14.33	17.20	4	6	0.500
Wehmeyer, Michael L.	University of Kansas	United States	5	4	81	16.20	20.25	3	5	0.158
Hernández, Elisa Huéscar	Miguel Hernández University	Spain	5	4	78	15.60	19.50	4	5	0.500
Bonem, Emily M.	Purdue University	United States	4	4	161	40.25	40.25	4	4	0.667
Wang, Cong	Yale University	United States	4	4	140	35.00	35.00	4	4	0.667
Awang-Hashim, Rosna	Universiti Utara Malaysia	Malaysia	4	4	50	12.50	12.50	4	4	0.800
Stupnisky, Robert	University of North Dakota	United States	4	4	264	66.00	66.00	4	4	0.500

Notes: TP=total number of publications; NCA=Number of contributing authors; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; and m=m-index.

Table 6 presents the most productive institutions contributing to SDT research in HE, based on an h-index exceeding four. Purdue University received the highest total number of citations (593) and recorded an h-index of 10 based on 15 publications, with an average of 39.53 citations per publication. The University of Kansas also recorded an h-index of 10, based on 19 publications and 314 citations. Its average number of citations per publication was 16.53.

Other prominent institutions included KU Leuven in Belgium and Curtin University in Australia, both of which recorded an h-index of 6. KU Leuven produced seven publications with an average of 33.14 citations per publication, whereas Curtin University produced eight publications with an average of 13.50 citations per publication. Universiti Utara Malaysia also recorded an h-index of 6, with eight publications and 91 citations. Table 6 reflects the geographical distribution of contributing institutions across North America, Europe, Asia, and Australia, with varying levels of publication output and citation impact.

Table 6: Most productive institutions by H-Index>4.

Affiliation	Country	TP	NCA	NCP	TC	C/P	C/CP	h	g	m
Purdue University	United States	15	42	12	593	39.53	49.42	10	15	1.667
University of Kansas	United States	19	47	17	314	16.53	18.47	10	17	0.526
KU Leuven	Belgium	7	10	7	232	33.14	33.14	6	7	0.500
Curtin University	Australia	8	24	7	108	13.50	15.43	6	8	0.500
University of Bergen	Norway	9	30	8	254	28.22	31.75	6	9	0.750
Universiti Utara Malaysia	Malaysia	8	20	8	91	11.38	11.38	6	8	1.000
Portland State University	United States	6	18	6	169	28.17	28.17	5	6	0.217
University of Hong Kong	China	5	8	5	301	60.20	60.20	5	5	0.500
University of Toronto	Canada	9	18	9	86	9.56	9.56	5	9	0.313
The Education University of Hong Kong	China	6	14	6	85	14.17	14.17	5	6	0.625

Notes: TP=total number of publications; NCA=number of contributing authors; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; and m=m-index.

Figure 3 maps the global contributions to SDT research in HE, while Table 7 ranks the most influential countries by h-index. The United States, China, and the United Kingdom are represented by darker shading in Figure 3, indicating their higher publication output. The United States leads with 231 publications, 4,383 citations, and an h-index of 36. China follows with 80 publications, 1,019 citations, and an h-index of 16, while the United Kingdom produced 55 publications

and also recorded an h-index of 16. Australia, Canada, Germany, Malaysia, Belgium, and Spain also contributed substantially to the field. Collectively, Table 7 and Figure 3 document the international distribution of SDT-related higher education research and the differing levels of productivity and citation visibility across countries.

Table 7: Most influential Countries by H-Index>9.

Country	TP	NCA	NCP	TC	C/P	C/CP	h	g	m
United States	231	687	190	4383	18.97	23.07	36	66	0.783
China	80	207	60	1019	12.74	16.98	16	31	0.941
United Kingdom	55	100	42	939	17.07	22.36	16	30	0.615
Australia	57	171	43	975	17.11	22.67	15	31	0.652
Canada	41	110	33	506	12.34	15.33	13	22	0.500
Germany	39	91	30	866	22.21	28.87	13	29	0.722
Malaysia	37	99	32	303	8.19	9.47	12	17	0.800
Belgium	13	52	13	528	40.62	40.62	10	13	0.833
Spain	35	102	27	414	11.83	15.33	10	20	0.714

Notes: TP=total number of publications; NCA=number of contributing authors; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index

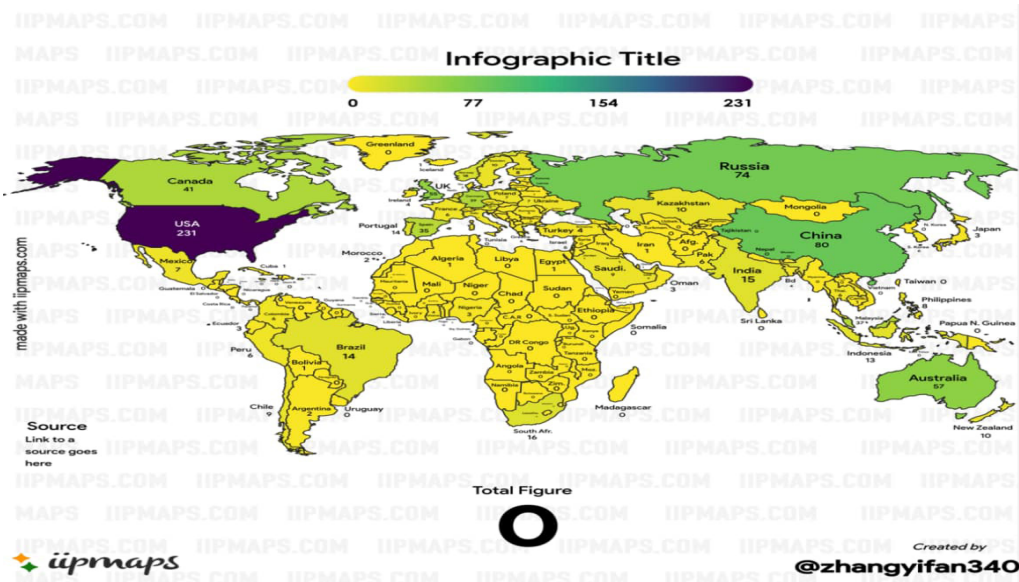


Figure 3: Scopus-indexed global social science results on self-determination theory in higher education.

According to Boyack & Klavans (2014), conceptual structure is a branch of knowledge structure that represents how different concepts are related through some of the parameters that can link them. Conceptual structures are often used to understand scholars’ topics and identify the most important and recent issues (Aria & Cuccurullo, 2017). In this study, the author-keyword structure was examined using thematic evolution and thematic maps generated through Biblioshiny.

The thematic evolution map illustrates the continuity and reorganization of research themes across three periods: 1979–2018, 2019–2022, and 2023–2024. Created using author keywords in Biblioshiny, Figure 4 represents how central concepts continued, divided, or merged over time. Each period contains a set of keywords represented by coloured squares, while grey lines indicate connections between themes across successive periods.

The thematic maps presented in Figures 5, 6, and 7 display the structural positions and internal development of author-keyword clusters. Each map is divided into four quadrants—motor themes, niche themes, emerging or declining themes, and basic themes—according to cluster centrality and density. These maps provide evidence of changes in thematic prominence, internal cohesion, and connection with the wider author-keyword network across the three periods.

The thematic evolution map was generated using the conceptual structure menu in Biblioshiny. The analysis field was set to author keywords to capture the principal concepts represented across the studies. The number of words was maintained at the default value of 250. The minimum cluster frequency was set to 10 per thousand documents to filter less frequently occurring terms. The weighted index was specified as the inclusion index and weighted by word. For the thematic maps, the number of labels for each cluster was maintained at the default value of three. The label size was set to zero to reduce visual clutter, and labels were subsequently added manually to the final images.

The first period (1979–2018) focused on foundational themes such as neoliberalism, self-determination theory, policy, and academic achievement, emphasizing theoretical and structural educational influences. Policies and reforms are explored for their impact on student outcomes, while self-determination theory marks an early interest in motivation and autonomy. Academic achievement represented an outcome-oriented strand within this early configuration, providing a baseline against which subsequent thematic arrangements could be compared.

The second period (2019–2022) reflects a shift toward applied and motivational themes in educational research. Key concepts include self-determination theory, intrinsic motivation, autonomy, and professional self-determination, indicating a growing focus on student motivation, especially in higher education. Themes such as engineering education, transition, digital skills, university, professional education, student satisfaction, adolescence, and international students demonstrate the application of SDT within more specific educational fields and populations.

The final period (2023–2024) emphasizes the application of SDT across a broader range of educational settings. Keywords such as E-learning, online teaching, and flipped classroom demonstrate the representation of digitally mediated learning contexts. Together with professional education, learning disabilities, active learning, and inclusive education, these themes indicate an expansion of the application settings represented within the author-keyword structure.

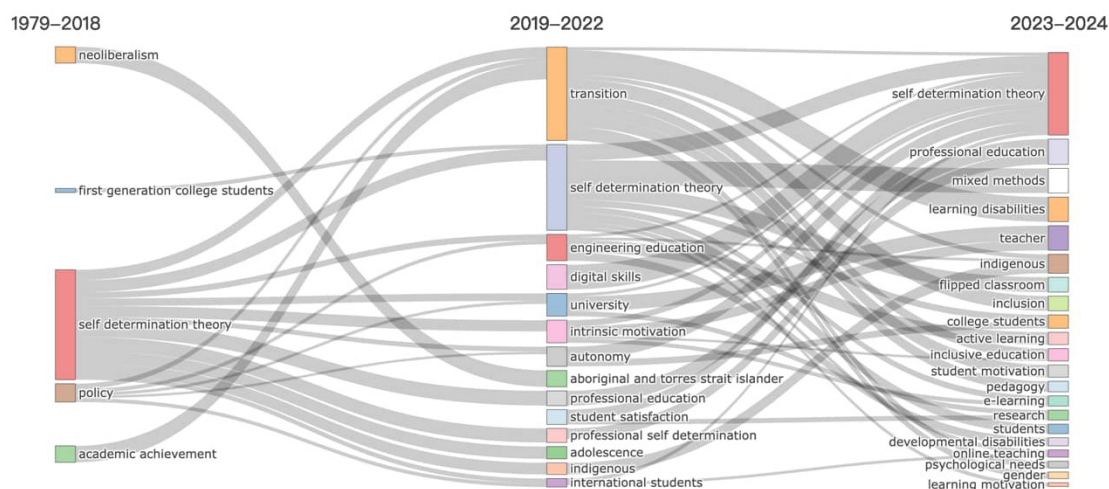


Figure 4: The thematic evolution map of the author's keywords.

Thematic maps categorize research topics into four quadrants based on centrality and density following the frameworks of (Callon et al., 1991; Cobo et al. (2011)). Centrality assesses a theme's interaction with other themes, whereas density reflects internal cohesion. The size of the colored circles in the quadrant diagram corresponds to the frequency of the occurrence of the keyword in that cluster, thus indicating the relevance and importance of the cluster. Quadrants are classified as follows:

Motor Themes (upper right): Well-developed central themes crucial to the field.

Niche Themes (upper left): Specialized, internally cohesive themes with limited external ties.

Emerging or Declining Themes (lower-left): Low centrality and density signifying emerging importance or a decline in relevance.

Basic Themes (lower right): Important but underdeveloped themes found in the field.

Figure 5 illustrates the thematic landscape for 1979–2018, during which seven distinct keyword clusters emerged. “Policy” was the only motor theme, representing the most internally developed and structurally central strand of early SDT-related higher education research. By contrast, “self-determination theory” and “academic achievement” occupied the basic-theme quadrant. This placement characterizes them as foundational and widely connected topics that had comparatively lower internal density during this period.

Peripheral clusters included “pre-university education,” which appeared as a niche theme with limited connection to the broader network. “First-generation college students” was located near the upper boundary, close to the centrality axis, placing it between peripheral and more connected themes. “Neoliberalism” occupied the boundary between the niche and emerging-or-declining quadrants, indicating limited centrality and moderate internal cohesion. Finally, the “system of vocational and educational training” appeared within the emerging-or-declining quadrant, identifying it as a marginal line of inquiry within this period. Overall, the 1979–2018 configuration was strongly anchored in policy discourse, while empirical SDT applications in higher education remained comparatively less consolidated.

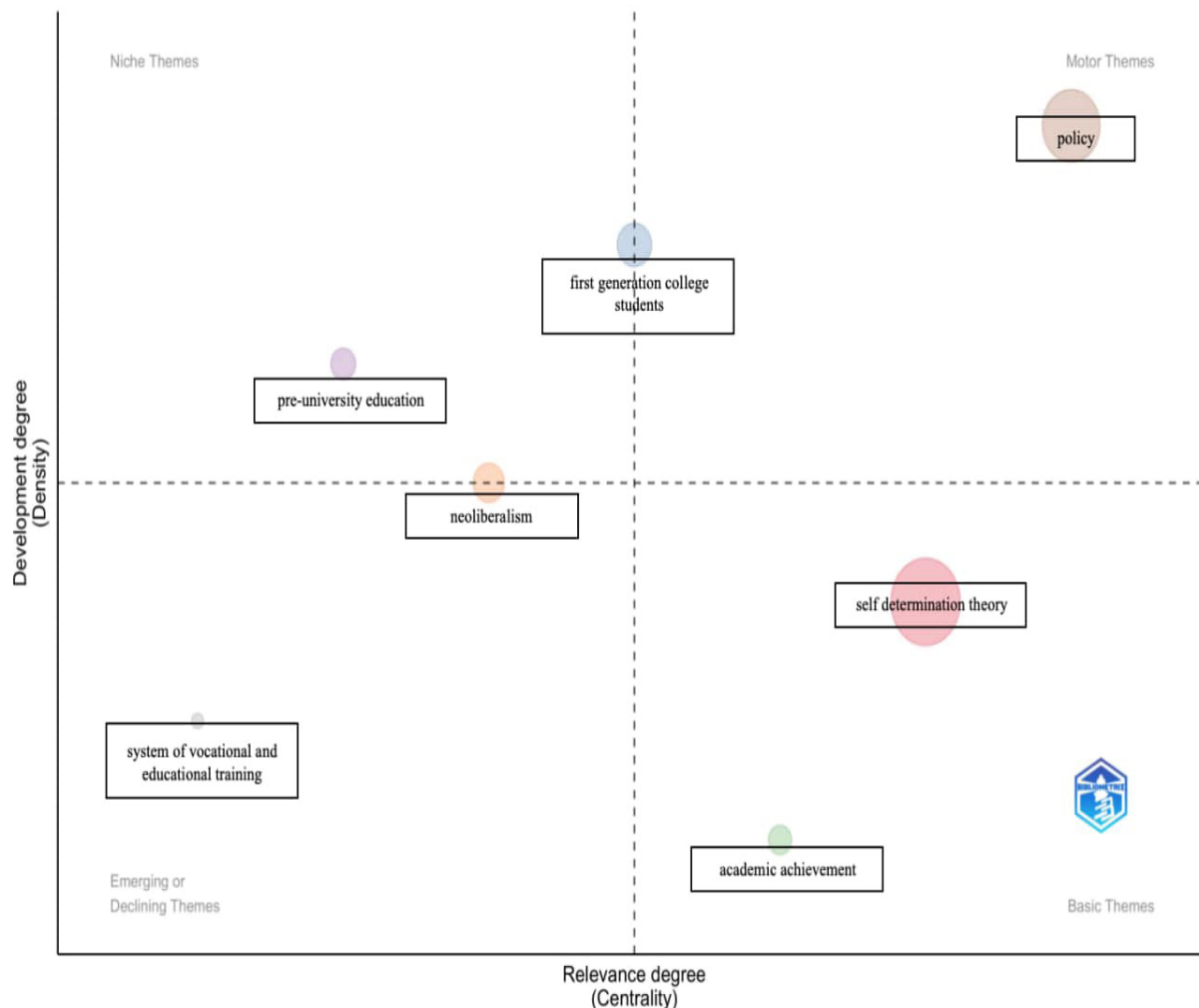


Figure 5: Thematic map (1979–2018).

The 2019–2022 analysis presented in Figure 6 reveals a more complex configuration comprising 15 keyword clusters. Intrinsic motivation, engineering education, and university occupied the motor-theme quadrant, displaying both high centrality and high density. Their positions identify them as structurally prominent and internally developed themes during this period. Professional education, student satisfaction, and digital skills appeared as niche themes. Although these themes displayed comparatively strong internal keyword cohesion, they remained peripheral to the wider SDT-related higher education network.

Professional self-determination, Indigenous/Aboriginal and Torres Strait Islander, and adolescence appeared within the emerging-or-declining quadrant, displaying low centrality and density. Meanwhile, self-determination theory, autonomy, international students, and transition remained basic themes characterized by high centrality and comparatively low density. Their positions indicate sustained connection with the wider discourse but less cohesive internal substructures than those observed among motor themes. Cognition was situated near the boundary between the niche- and motor-theme quadrants, indicating partial structural connection with more central areas of the network.

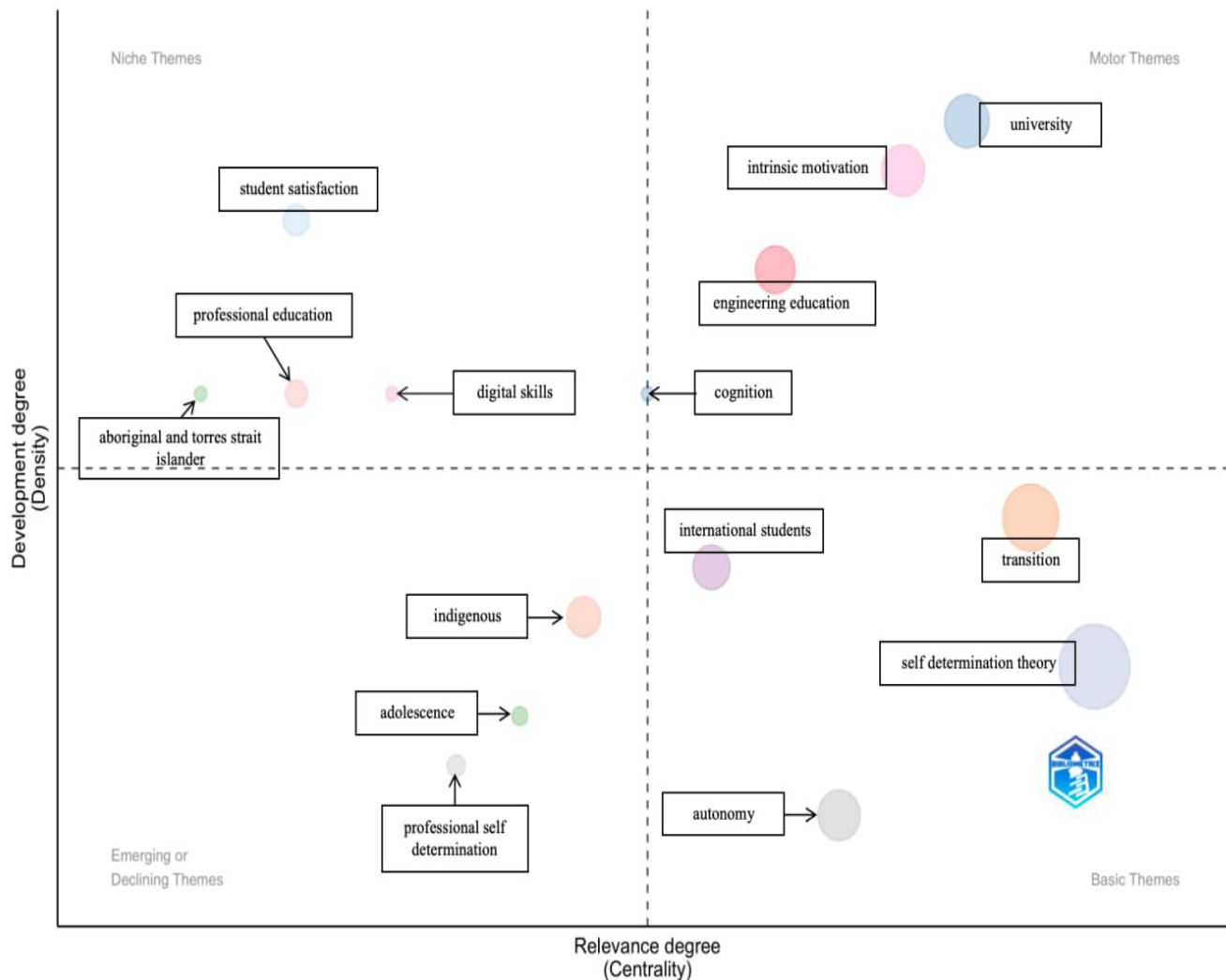


Figure 6: Thematic map (2019–2022).

As illustrated in Figure 7, the 2023–2024 period comprised 32 distinct clusters. The thematic configuration was anchored by motor themes such as inclusive education and expectancy-confirmation theory, which occupied central and internally developed positions. Specific pedagogical and methodological themes, including active learning and mixed method, appeared in the niche or emerging-or-declining quadrants, indicating that these areas were developing but remained comparatively weakly connected with the broader network.

Self-determination theory continued to occupy the basic-theme quadrant alongside gender features and inclusion. This recurring position indicates that the SDT cluster retained high centrality in the author-keyword network while displaying lower internal density than the motor themes. E-learning occupied a position towards the motor-theme quadrant, whereas online teaching remained a basic theme. These positions indicate that digitally mediated learning had acquired a visible but structurally differentiated place within the recent thematic configuration.

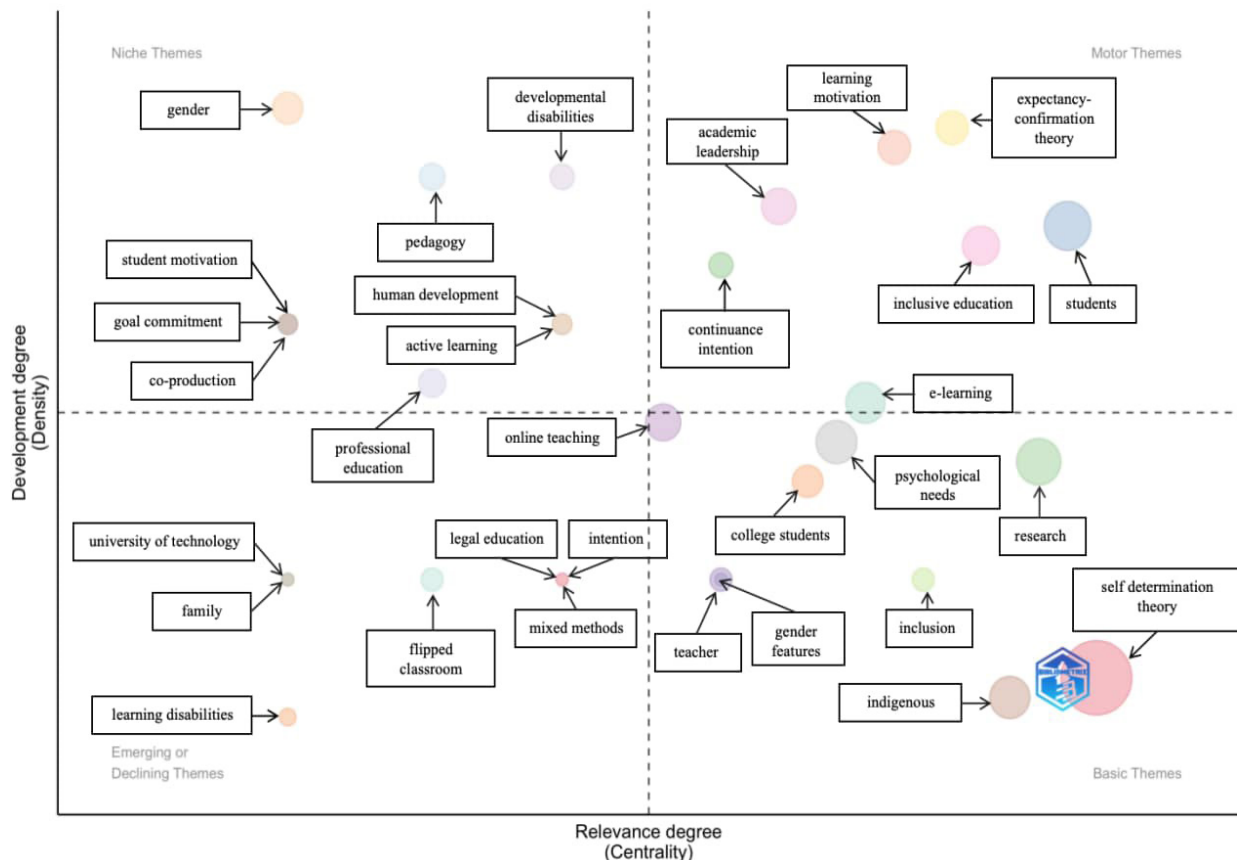


Figure 7: Thematic map (2023–2024).

Collectively, the thematic maps trace a trajectory from an early emphasis on policy and structural educational concerns towards a more diversified configuration incorporating inclusivity, digital learning, and specialized pedagogical approaches. The persistence of self-determination theory across all three periods identifies it as a stable conceptual reference point within the author-keyword structure. The longitudinal mapping therefore documents a pattern of conceptual continuity alongside expanding and differently positioned application themes.

The longitudinal maps indicate that scholarship organized around SDT was reconfigured without implying that SDT itself changed. “Self-determination theory” remained a basic theme across all three periods; its sustained centrality and comparatively low density suggest a broad conceptual anchor linking multiple lines of inquiry rather than an increasingly self-contained specialization. The continued visibility of intrinsic motivation, autonomy, and related motivational concepts supports this interpretation and is consistent with SDT’s established role in research on motivation and psychological needs. Changes in the positions of inclusive education, learning motivation, and academic leadership show newer concerns gaining prominence around this enduring base. The evidence therefore documents continuity amid thematic reorganization, not changes in SDT’s constructs, propositions, mechanisms, or validity.

Around this stable core, the literature expanded into digital, inclusive, and learner-specific contexts (León-González & Pire-Rojas, 2025; Qureshi et al., 2024). The increased visibility of psychological needs and inclusive education reflects the representation of more diverse educational experiences (Lage et al., 2000; Pelikan et al., 2021), while E-learning and online teaching mark the incorporation of digitally mediated education, particularly during the COVID-19 period (Holzer et al., 2021). Themes concerning Indigenous learners and developmental disabilities further broadened the populations represented (Gow et al., 2020). These developments constitute contextual expansion rather than theoretical development.

The strategic maps nevertheless show that diversification did not produce uniform integration. Motor themes combined greater internal coherence with stronger connections to the wider network, whereas niche and lower-centrality themes remained specialized or weakly connected. Associations between established SDT concepts and supportive, digital, or

hybrid learning environments (Akram & Li, 2024) indicate that autonomy, competence, and relatedness have been mobilized in newer settings; they do not establish intervention effectiveness or theoretical modification. Nor does bibliometric visibility demonstrate cumulative conceptual contribution, which depends on whether context-specific findings are explicitly connected and comparable across settings.

Overall, the evidence reveals an uneven but coherent trajectory: a persistent motivational core provided continuity while new settings and learner populations widened the field's contextual reach. Some themes became more cohesive and interconnected, whereas others remained specialized or peripheral. The literature therefore exhibits neither uniform cumulative development nor wholesale fragmentation. Instead, knowledge surrounding SDT has expanded around a stable foundation, with consolidation proceeding unevenly across application areas. This bounded interpretation distinguishes changes in the organization of scholarship from changes in the theory itself.

The reliance of this study on author-provided keywords may not capture all relevant emerging terminologies in SDT research, posing a limitation in comprehensively mapping the field's trajectory. Future research could focus on empirical studies by combining bibliometric analyses and systematic literature review methods. It helps researchers better identify the self-determination theory model and potential variables for future research, thereby enriching the model of this theory and providing more practical guidance for empirical research. In turn, this offers reliable theoretical and data support for educators and policymakers.

Building upon this bibliometric analysis, future studies could investigate SDT's role of SDT in varied cultural and educational settings, expanding its utility in developing practical, inclusive, and motivation-centered higher education environments. In addition, the results of the bibliometric analyses in this study were retrieved from specific databases; therefore, the results generated using alternative keyword searches may differ. Specifically, expanding research on digital adaptability and inclusivity, particularly with themes such as online teaching and psychological needs, would help to address the challenges of digital education and mental well-being. Additionally, studies incorporating diverse methodologies, including mixed methods, could provide a deeper understanding of SDT applications in various educational contexts. This analysis also suggests potential areas for integration, such as linking SDT with cognitive and affective theories, to enhance learning motivation and academic outcomes.

This study is limited by its reliance on author-provided keywords, which record how researchers describe their work but cannot reveal unreported theoretical reasoning, causal mechanisms, boundary conditions, or the quality of empirical tests. The use of Scopus and English-language records further constrains coverage, and alternative search terms, keyword-normalization decisions, thresholds, or period boundaries may yield different thematic configurations. In particular, low-centrality, low-density positions do not by themselves distinguish emerging from declining themes. Accordingly, the maps support claims about structural association and change, not about theoretical modification, intervention effectiveness, or the substantive integration achieved within individual studies.

Future research can address these limits by combining longitudinal bibliometric mapping with systematic review and content analysis. Such designs would make it possible to test whether keyword-network connections correspond to substantive conceptual relationships, whether peripheral themes reflect limited volume or distinctive vocabularies, and whether context-specific findings remain isolated or accumulate around common SDT constructs. Comparative and longitudinal studies across digital, inclusive, cultural, and learner-specific settings could further establish the conditions under which findings are transferable or context-bound. These directions extend the present structural diagnosis without treating bibliometric change as evidence that SDT itself has changed.

CONCLUSIONS

This study examined how knowledge surrounding SDT in higher education developed across 862 Scopus-indexed documents published between 1979 and 2024. The evidence indicates a mixed trajectory: an enduring SDT-related motivational core provided continuity, while the surrounding literature diversified into new educational settings and learner populations. Integration was selective rather than uniform, with some themes becoming more cohesive and central and others remaining specialized or weakly connected.

The study's contribution is therefore a longitudinal diagnosis of knowledge development around a stable theoretical framework. It distinguishes growth in research activity and contextual reach from stronger evidence of cumulative conceptual development. The findings do not show that SDT's constructs or mechanisms changed; rather, they show that scholarship around SDT expanded, diversified, and consolidated unevenly. This distinction provides a more precise account of the field's development and establishes longitudinal structural change as the study's distinctive contribution.

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