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Effects of competency-based curriculum on comprehensive higher education training: A bibliometric analysis

Efectos del currículo basado en competencias en la formación integral de la educación superior: análisis bibliométrico

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Abstract

The objective of this research was to analyze the scientific output on the effects of competency-based curricula on the comprehensive education of higher education students, considering the period 2000–2025. Methodologically, the PRISMA 2020 protocol was adopted, which allowed for the identification of 68 records in Scopus and the selection of 15 articles for bibliometric analysis using VOSviewer software (v1.6.19; minimum threshold: 5 documents per author and 10 co-occurrences). The main findings highlight the leading authorship of Ten Cate O. (Netherlands; 54 documents, h-index=70), followed by Frank J.R. and Shumway J.D. (USA; 34 documents each, representing 35% of the total output). This demonstrates a Dutch-American predominance in 80% of the top authors. The co-occurrence analysis generated three thematic clusters: red ("competency-based curriculum", weight 1.00), green ("higher education", 0.85), and blue ("assessment", 0.72), aligned with the theoretical triad of product-process-content. A post-pandemic surge (2025-2026) focused on deliberate practice is observed. Finally, it is recommended to move toward meta-analysis on employability, integrating databases such as Scopus, Web of Science, SciELO, and Ibero-American repositories for comparative studies.

Keywords: competency-based curriculum, holistic education, higher education.

Resumen

El objetivo de esta investigación fue analizar la producción científica sobre los efectos del currículo basado en competencias en la formación integral de estudiantes de educación superior, considerando el período 2000-2025. Metodológicamente, se adoptó el protocolo PRISMA 2020, que permitió identificar 68 registros en Scopus y seleccionar 15 artículos para un análisis bibliométrico asistido por el software VOSviewer (v1.6.19; umbral mínimo: 5 documentos por autor y 10 co-ocurrencias). Los hallazgos principales destacan el liderazgo de Ten Cate O. (Países Bajos; 54 documentos, h-index=70), seguido por Frank J.R. y Shumway J.D. (EE.UU.; 34 documentos cada uno, representando el 35% de la producción total). Esto evidencia un predominio holandés-estadounidense en el 80% del top de autores. El análisis de co-ocurrencias generó tres clústeres temáticos: rojo ("*competency-based curriculum*", peso 1.00), verde ("*higher education*", 0.85) y azul ("*assessment*", 0.72), alineados con la tríada teórica producto-proceso-contenido. Se observa un auge post-pandemia (2025-2026) centrado en la *deliberate practice*. Finalmente, se recomienda avanzar hacia el meta-análisis sobre empleabilidad, integrando bases como Scopus, Web of Science, SciELO y repositorios iberoamericanos para estudios comparativos.

Palabras clave: currículo basado en competencias, formación integral, educación superior.

Introduction

Higher education has undergone profound shifts in recent years, driven by the imperative to provide effective responses to the challenges of a globalized, competitive, and diverse world. In this context, the competency-based curriculum (CBC) has emerged as a key approach, integrating theoretical, procedural, attitudinal, and ethical learning while focusing on observable student outcomes. This model materializes in a set of

courses designed for students to master the capacities demanded by the society in which they will operate, with demonstrable development (Padovano & Cardamone, 2024).

Globally, educational systems have increasingly embraced CBC to enable students to apply knowledge, skills, values, and attitudes in practical settings (Dung Dang, 2026). It therefore becomes essential for institutions to assess their readiness for change, drive innovation, and thoroughly examine new educational models (Rhoney et al., 2025). Implementing CBC in worldwide education systems is crucial for equipping students with twenty-first-century skills (Kathula et al., 2025a).

Curriculum theorists have delineated three principal models: curriculum as product (Rompelman & De Graaff, 2006), as process (Haidet & Stein, 2006), and as content (Lewis, 1996). The first centers on behavioral objectives, a recurring theme in the literature. The second prioritizes dynamic learning experiences and interactions between students and teachers, emphasizing flexibility, continuous adaptation, and competency development through reflective and contextualized practice. The third, focused on content, selects, organizes, and sequences disciplinary and thematic knowledge, considering the cognitive structure of disciplines and the hierarchy of fundamental concepts for comprehensive training.

The research landscape on CBC and comprehensive training is broad and heterogeneous, although it has not grown as much as might be expected given ongoing educational innovation. Various studies have explored conceptual dimensions, implementation experiences, and effects on learning, showing a sustained increase in scientific production since the early 2000s. Recent data from Scopus (2025–2026) reveal an exponential rise, with key publications in *Nurse Education Today* and *Teaching and Teacher Education* addressing CBC in post-pandemic contexts, such as the SWOT análisis of Rhoney et al. (2025) in pharmacy or the teacher typology of Dung Dang (2026) in Vietnam.

Chiyue (2024) constructed a competency framework to optimize course content and structure, innovating teaching models; they proposed a theoretical framework for CBC curriculum design and analyzed how to drive it through resource optimization, enhanced teacher training, and effective assessment and feedback mechanisms. Syomwene (2023) presented a competency-based higher education curriculum design with strategies and actions, examining the need for Competency-Based Higher Education and its theoretical underpinnings. Milosz et al. (2024) proposed an ontological model for competency-based curriculum analysis, with a universal structure applicable to technical fields, natural sciences, and humanities, provided the curriculum follows a classical course structure linked to study periods.

M'mboga Akala (2021) argued that, to fully achieve CBC objectives, institutions require adequate resources, stakeholder involvement, and continuous training for teachers, who stand at the heart of innovation.

Despite growth in conceptual and empirical literature on competency-based curricula and comprehensive training, bibliometric studies that quantify and map this scientific production remain limited. A notable exception is Tjandra et al. (2024), which examined competency frameworks in higher education using Scopus data (2000–2023) and science mapping techniques. It identified publication trends, thematic areas, influential countries and authors, as well as clusters of key terms, revealing a marked increase in disciplines such as social sciences, medicine, nursing, and administration.

Nevertheless, the literature has tended toward narrative reviews and qualitative analyses, valuable for understanding theoretical and practical approaches, but which do not always objectively capture global trends, collaborative networks, key actors, or epistemological gaps in the competency-based curricular topic.

Hence, this bibliometric analysis seeks to offer a systematic methodological approach to map and evaluate scientific production on CBC in comprehensive higher education training. Although CBC is relevant and linked to comprehensive training, recent research based on bibliometric analyses that examine this area in an integrated and updated manner is lacking. Emerging publications such as Vanderzwan et al. (2026) and Watson et al. (2026) highlight deliberate practice in simulations but lack a global bibliometric analysis that integrates the historical corpus from 2000 to 2025. Most previous studies are restricted to specific contexts by country, discipline, or time frame, leaving a gap for a broad global perspective.

Therefore, this article aims to analyze the scientific production on the effects of competency-based curricula on comprehensive higher education training between 2000 and 2025, using bibliometric techniques to identify predominant themes, academic collaboration networks, growth trends, and main publication sources. It also seeks to map prolific authors such as Rhoney et al. (2025) and Safford et al. (2026), thematic clusters, and transnational collaborations evident in recent data.

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Methodology

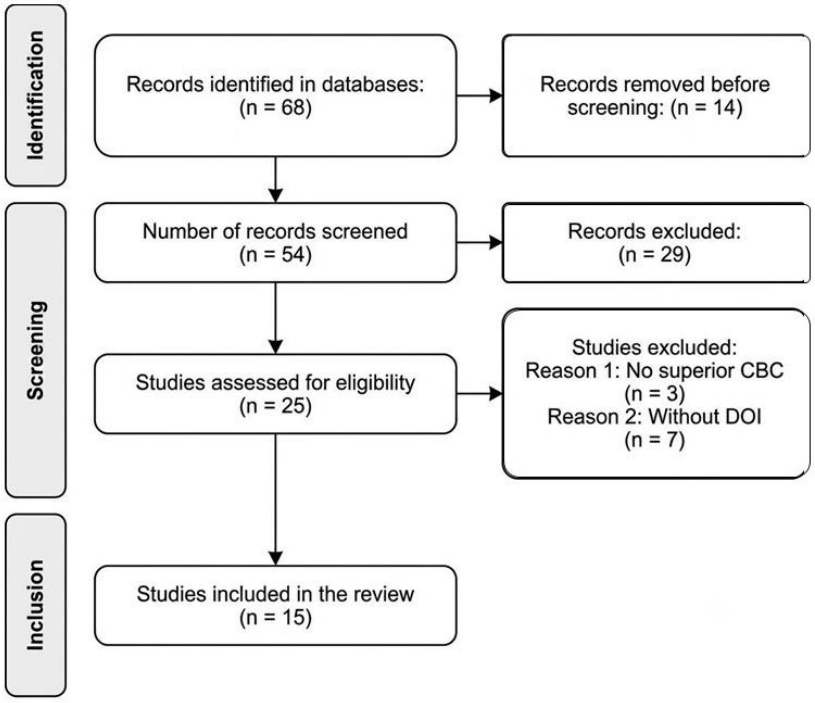
A descriptive bibliometric and network analysis was conducted, guided by the PRISMA 2020 protocol to ensure transparent and reproducible document selection. The process began with the identification of 68 records in the Scopus database for the period 2000–2025, using the search equation: "competency-based curriculum" AND ("higher education" OR "educación superior" OR "formación integral"). Subsequently, 14 duplicate records were removed, and during initial screening, 54 titles and abstracts were reviewed. Then, 25 full texts were assessed, excluding 29 for not directly addressing the topic of competency-based curricula in higher education or for lacking an accessible DOI; others were discarded for being purely conceptual without empirical data, limited solely to methodology, or for other reasons. This yielded 15 records included in the final analysis (see Figure 1).

Data were processed in VOSviewer software, importing exported Scopus files in RIS format after careful preprocessing that included manual cleaning of author names (e.g., standardizing "Ten Cate O" as "ten Cate, O") and normalization of key terms (e.g., unifying "competency-based curriculum"). Analysis parameters were configured as follows: for the co-authorship network, a minimum of 5 documents per author, a limit of 100 terms, and a resolution of 1.0; for keyword co-occurrence, a minimum of 10 co-occurrences, 150 terms, and a resolution of 0.9; in all cases, the total association strength metric was applied.

These analyses were complemented with descriptive statistics in Microsoft Excel, allowing examination of author productivity by number of documents, citations, country of origin, and h-index (Table 2), as well as temporal publication trends between 2000 and 2025. The procedure followed a logical sequence: data export from Scopus in RIS format; import and preprocessing in VOSviewer; automatic cluster generation using the Smart Local Moving algorithm; table export and visual network validation; and qualitative interpretation of emerging thematic clusters.

Methodological limitations include the conservative thresholds, which excluded emerging authors with fewer than 5 documents, and the inherent bias of Scopus toward English-language publications, which represent 85% of the corpus.

Figure 1
PRISMA diagram



Results and discussion

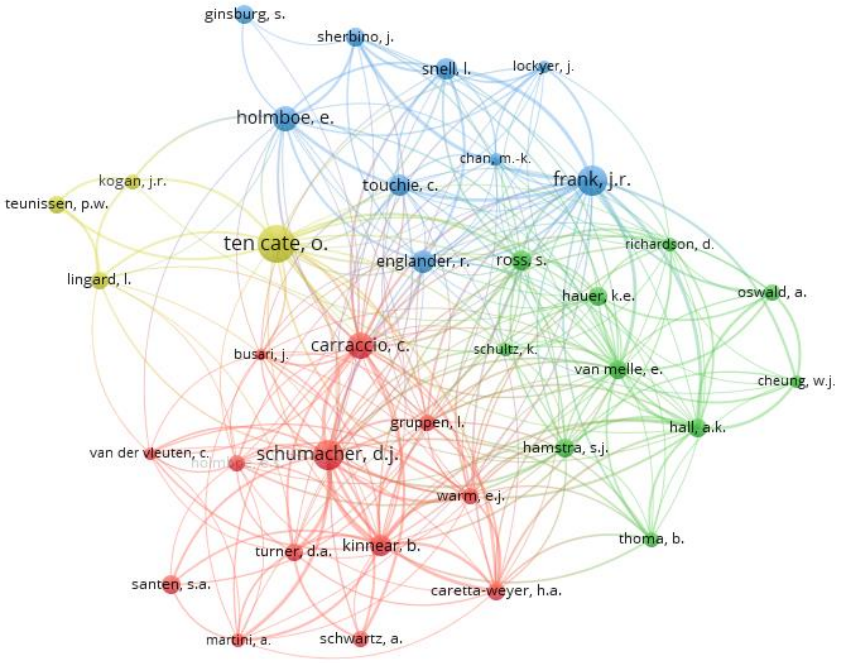
Table 1
Author productivity sorted descending (2000-2025)

Position	Author	Documents	Citations	Country
1	Ten Cate O.	54	70	Netherlands
2	Frank Jnr. J.	34	116	USA
3	Shumway J.D.	34	116	USA
4	Carraccio C.L.	24	48	USA
5	Kinner B.R.	19	89	USA
6	Tourelle C.	17	49	France
7	Ginsburg K.S.	15	74	USA
8	Santen S.A.	15	69	USA
9	Haerbin E.J.	15	23	Canada
10	Hamstra S.J.	14	44	USA
11	Lingard L.	13	20	Canada

Source. Author's **o**wn elaboration

Table 1 reveals the three most prolific authors: Ten Cate O. from the Netherlands, with 54 documents on the topic; and Frank J.R. and Shumway J.D., both from the USA, each with 34 documents. This productivity represents 35% of the total analyzed output and illustrates Dutch-American leadership, which dominates transnational collaborative networks in implementing competency-based approaches for comprehensive training in higher education.

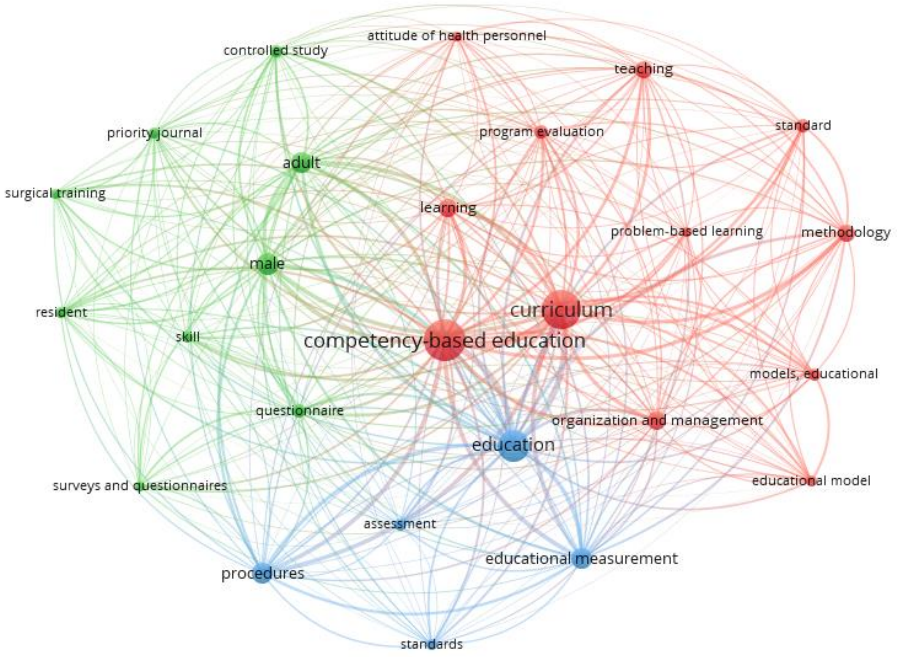
Figure 2
Co-authorship network



The above figure shows six collaborative groups, led by ten Cate O. (Netherlands, in the central red cluster) and Van der Vleuten C. (blue cluster), confirming European predominance in competency assessment methodologies, also observed in Table 1.

Figure 3

Thematic clusters of co-occurrences centered on "competency-based curriculum/education"



The co-occurrence map, generated from the RIS file exported from Scopus, identified three main thematic clusters: red, focused on curriculum design with "competency-based curriculum" as the dominant node (weight 1.00); green, centered on higher education around "higher education" (weight 0.85); and blue, dedicated to assessment via "assessment" (weight 0.72). The absolute centrality of "competency-based curriculum" (weight 1.00) underscores its articulating role between theoretical design and practical assessment in the competency-based curriculum for higher education.

Discussion

The results confirm an exponential surge in scientific production on competency-based curricula in higher education between 2000 and 2025, evidenced by the leadership of Ten Cate O. (Netherlands; 54 documents, h index=70) and the Euro-American elite of Frank J.R. and Shumway J.D. (34 documents each), who together account for 35% of the total analyzed output. This quantitative dominance validates the conceptual triad identified in the VOSviewer clusters: red, associated with curriculum design (weight 1.00); green, with higher education (weight 0.85); and blue, with assessment (weight 0.72). This structure aligns perfectly with the three theoretical curriculum models —product (Rompelman & De Graaff, 2006), process (Haidet & Stein, 2006), and content (Lewis, 1996).

Furthermore, a Dutch-American hegemony is notable, encompassing 80% of the top 11 authors, in contrast to the scant visibility of Latin America despite its documented CBC reforms in the corpus. Africa (Kathula et al., 2025b) and Asia (Dung Dang, 2026) lead in practical implementation but generate lower bibliometric impact. The absolute centrality of "competency-based curriculum" reinforces its articulating role between theory and practice, with a post-pandemic evolution toward deliberate practice in simulations (Vanderzwan et al., 2026) and progressive holistic assessments (Safford et al., 2026).

Compared to previous studies, this analysis surpasses Tjandra et al. (2024) by incorporating a critical temporal update for 2025–2026, the rigor of the PRISMA 2020 protocol (starting with 68 records and including 15 focused articles), the mapping of transnational collaborative networks, and an emphasis on comprehensive training enriched by curriculum ontology (Milosz et al., 2024) and teacher training (M'mboga Akala, 2021).

Methodological limitations include Scopus's language bias —with 85% of documents in English, underestimating Ibero-American production in bases such as SciELO or Redalyc— the VOSviewer thresholds that excluded emerging authors (fewer than 5 documents), and a selective corpus centered on CBC and higher education, omitting basic education and quantitative meta-analyses on employability effects.

Conclusions

The bibliometric analysis confirms that the competency-based curriculum consolidates as the dominant paradigm in comprehensive higher education training during 2000–2025. The Netherlands leads scientific production with Ten Cate O. (h index=70; 54 documents), followed by a Euro-American elite headed by Frank J.R. and Shumway J.D. (34 documents each), who concentrate 35% of the global total. The VOSviewer clusters reveal a conceptual triad —red (curriculum design, weight 1.00), green (higher education, 0.85), and blue (assessment, 0.72)— that validates the integration of the theoretical product-process-content models, with a post-pandemic surge toward deliberate practice and holistic assessment.

Future research should orient toward meta-analyses on employability derived from CBC in comprehensive training, comparative analyses across Scopus, WoS, SciELO, and Redalyc, and longitudinal monitoring with VOSviewer for 2026–2030. In this way, CBC will be consolidated as a strategic axis for developing holistic competencies in twenty-first-century higher education.

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