

Role of Innovation and Entrepreneurship Education in Enhancing Graduate Employability in Vocational Higher Education: A Systematic Literature Review

Xiong Yijun, Sururi Sururi, Taufani Chusnul Kurniatun

Universitas Pendidikan Indonesia

Jl. Dr. Setiabudhi No. 229 Bandung Correspondence: xiongyijun@upi.edu

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Abstract: This study aims to examine the role of innovation and entrepreneurship education in enhancing graduate employability in vocational higher education through a Systematic Literature Review (SLR) and bibliometric analysis. In the context of rapid technological change and increasing labor market demands, vocational higher education institutions are expected to produce graduates who are not only technically competent but also innovative, entrepreneurial, and adaptable. This study analyzed 41 Scopus-indexed publications published between 2021 and 2026, with data processed using VOSviewer to identify research trends, keyword relationships, thematic clusters, and the knowledge structure of the field. The findings reveal that employability is the dominant and central theme, strongly associated with innovation, entrepreneurship education, digital skills, soft skills, and work-based learning. The keyword co-occurrence analysis indicates a shift from a traditional skills-based orientation toward a more integrated and multidimensional understanding of employability, emphasizing not only technical competencies but also creativity, communication, collaboration, adaptability, and lifelong learning capacity. In addition, the distribution of authors, institutions, and countries demonstrates that this topic has attracted global scholarly attention, particularly in developing and transitional economies, although the field remains fragmented and continuously evolving. The study concludes that enhancing graduate employability requires a holistic ecosystem that integrates curriculum innovation, entrepreneurial learning, digital capability development, and strong collaboration between educational institutions and industry. It is recommended that future research develop integrative frameworks and explore context-specific strategies to strengthen the alignment between vocational education and labor market needs.

Keywords: employability, entrepreneurship education, innovation education, vocational higher education.

In the contemporary global economy, characterized by rapid technological advancement and the emergence of Industry 4.0, the demand for a highly skilled, adaptive, and innovative workforce has intensified significantly. Vocational higher education institutions are expected to play a pivotal role in preparing graduates who are not only technically competent but also capable of navigating complex, dynamic, and uncertain labor markets. Employability, therefore, has become a central outcome of vocational education, reflecting the ability of graduates to secure, maintain, and progress in employment (Kholifah *et al.*, 2025). However, employability is no longer limited to technical proficiency; instead, it encompasses a broader set of competencies, including digital literacy, problem-solving skills, communication, collaboration, and adaptability (Magadza, 2026). Despite the strategic role of vocational education in workforce development, a persistent gap between education and employment outcomes continues to be observed globally, particularly in

developing countries. Empirical evidence indicates that vocational graduates often experience higher unemployment rates compared to general education graduates, primarily due to mismatches between acquired skills and industry requirements (Kholifah *et al.*, 2025). This mismatch is further exacerbated by the rapid transformation of labor market demands, which increasingly prioritize innovation, creativity, and entrepreneurial capabilities alongside traditional technical skills (Okoye *et al.*, 2026). Consequently, vocational education systems face mounting pressure to redesign curricula, pedagogical approaches, and institutional frameworks to align more closely with evolving industry needs.

One of the most critical challenges in this context is the insufficient integration of innovation and entrepreneurship education within vocational higher education. While vocational institutions traditionally focus on skill-based training, there is growing recognition that fostering innovation and entrepreneurial competencies can significantly enhance graduate employability. Innovation, in this sense, extends beyond technological advancement to include creative thinking, problem-solving, and the ability to generate value in diverse contexts (Ahmid, Tiew and Abdullah, 2023). Similarly, entrepreneurship education equips students with the mindset and skills necessary to identify opportunities, manage risks, and create employment, thereby serving as both a direct and indirect pathway to employability (Bahaw *et al.*, 2026).

Recent studies highlight the importance of experiential and work-based learning approaches in bridging the education-employment gap. For instance, extended internship programs and teaching factory-based learning models have been shown to significantly improve employability outcomes by providing students with authentic workplace experiences and industry-relevant skills (Prianto *et al.*, 2025; Çağlar *et al.*, 2026). Additionally, the integration of digital technologies, such as e-portfolios and online collaborative platforms, has been identified as a key factor in enhancing students' ability to demonstrate competencies and engage with the labor market (Al Idrus, Abdul Razak and Mohsin, 2024). These findings underscore the need for a holistic approach to vocational education that combines technical training with innovation, entrepreneurship, and digital competencies.

However, despite the growing body of literature on employability, innovation, and entrepreneurship education, existing research remains fragmented. Many studies focus on isolated aspects, such as employability skills, entrepreneurial intention, or curriculum design, without providing an integrated perspective on how these elements interact within vocational higher education systems. For example, research on employability often emphasizes soft skills and digital competencies (Fetahu and Lekli, 2023), while studies on entrepreneurship education primarily examine its impact on entrepreneurial intention rather than broader employability outcomes (Suhartini *et al.*, 2026). Similarly, investigations into innovation in vocational education tend to focus on pedagogical approaches without explicitly linking them to employability (Nikoloudakis and Rangoussi, 2024). This lack of integration limits the ability to develop comprehensive models that capture the complex relationships between innovation, entrepreneurship education, and employability.

Furthermore, there is a notable absence of systematic and bibliometric analyses that synthesize existing knowledge in this field. While individual empirical studies provide valuable insights, they often lack a broader perspective on research trends, thematic developments, and

knowledge gaps. Systematic literature reviews (SLRs) and bibliometric analyses are essential for addressing this limitation, as they enable researchers to map the intellectual structure of a field, identify dominant themes, and highlight emerging research directions. Despite their importance, such approaches remain underutilized in the context of vocational higher education, particularly in relation to innovation and entrepreneurship education.

In recent years, several emerging trends have begun to reshape the discourse on vocational education and employability. These include the integration of green skills and sustainability principles, the adoption of blended and cooperative learning models, and the convergence of vocational and higher education pathways (Farran and Nunez, 2025; Hsu, 2025). Additionally, extracurricular activities and career development initiatives have been recognized as important contributors to employability, as they enhance students' social, emotional, and professional competencies (Nguyen *et al.*, 2025). These developments highlight the increasing complexity of employability as a multidimensional construct influenced by a wide range of factors.

Given these challenges and opportunities, there is a pressing need for a comprehensive synthesis of the role of innovation and entrepreneurship education in enhancing graduate employability within vocational higher education. This study addresses this need by conducting a systematic literature review combined with bibliometric analysis to examine existing research from 2021 to 2026. By integrating findings from diverse studies, this research aims to develop a holistic understanding of how innovation and entrepreneurship education contribute to employability, identify key research trends and gaps, and propose a conceptual framework to guide future research and practice.

The significance of this study lies in its potential to provide both theoretical and practical contributions. Theoretically, it advances the literature by offering an integrated perspective that connects innovation, entrepreneurship education, and employability within a single analytical framework. Practically, it provides insights for policymakers, educators, and institutional leaders on how to design and implement effective educational strategies that enhance graduate employability. In an era where the nature of work is continuously evolving, such insights are critical for ensuring that vocational education remains relevant, responsive, and impactful.

METHOD

This study employed a Systematic Literature Review (SLR) combined with bibliometric analysis to examine the role of innovation and entrepreneurship education in enhancing graduate employability in vocational higher education. The SLR approach was chosen for its ability to provide a structured, transparent, and replicable synthesis of literature while minimizing bias through systematic identification, evaluation, and interpretation of relevant studies (Tripathy, 2024; Ma and Ismail, 2025). The dataset was obtained exclusively from the Scopus database, known for its comprehensive coverage of high-quality peer-reviewed publications. A keyword-based search using “innovation education” OR “entrepreneurship education” AND “employability” AND “vocational education” in titles, abstracts, and keywords yielded 41 documents published between 2021 and 2026, which were considered representative of the current research landscape.

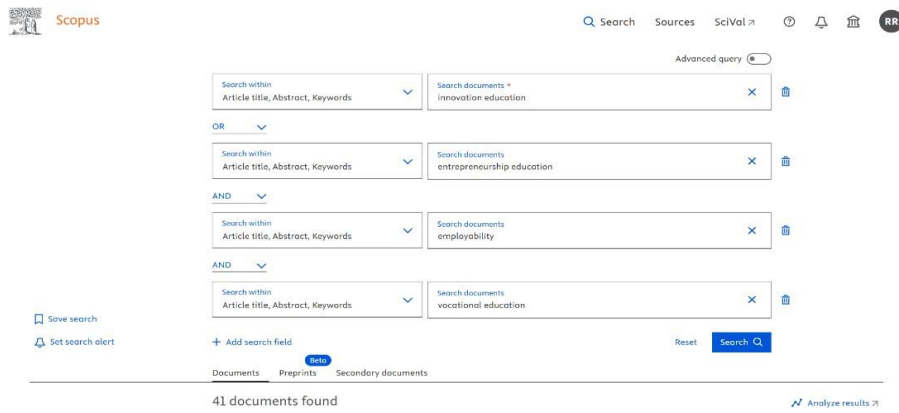


Figure 1. Scopus Search Strategy and Document Selection Process
 Source: Scopus dataset, processed by the authors (2026)

The inclusion criteria consisted of: (1) publications indexed in Scopus, (2) articles published between 2021–2026, (3) relevance to innovation, entrepreneurship education, employability, and vocational education, and (4) availability of full-text access. To complement the SLR, a bibliometric analysis was performed using VOSviewer software, which enables the construction and visualization of bibliometric networks such as co-authorship, co-citation, and keyword co-occurrence (Van Eck and Waltman, 2023). Bibliometric methods are essential for quantitatively analyzing scientific literature, identifying research trends, and mapping knowledge structures within a specific field (Hapsari, Sari and Nugroho, 2024). In this study, VOSviewer was used to analyze publication trends, keyword relationships, and thematic clusters, providing a macro- level understanding of the research domain.

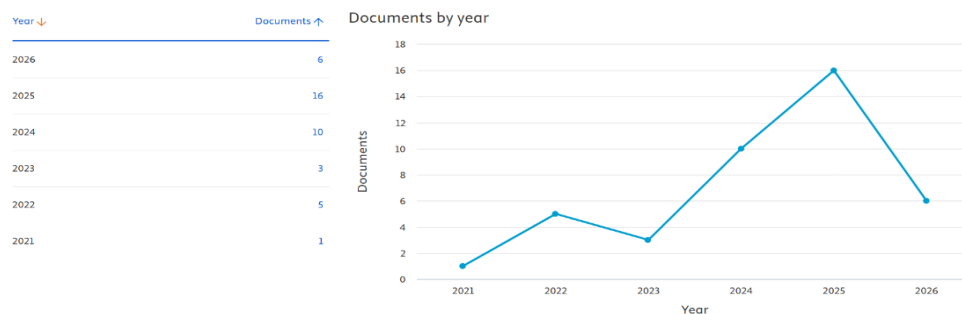


Figure 2. Annual Publication Trends (2021–2026)
 Source: Scopus dataset, processed by the authors (2026)

The analysis revealed a significant increase in publications, particularly after 2023, indicating growing scholarly interest in employability, innovation, and entrepreneurship education. This trend aligns with broader academic developments where bibliometric approaches are increasingly used to map emerging research fields and identify knowledge gaps (Erlangga et al., 2026).

Table 1. Descriptive Characteristics of Publications Included in the Bibliometric Review

No	Authors	Title	Year	Source Title	Cited by
1	Acharya, S.R., Chandra, Y.	Impact of International EVET Capacity-Building Programs on Entrepreneurial Competencies	2025	SCMS Journal of Indian Management	0

		and Policy Outcomes			
2	Ahmid, S.S., Chun, T.C., Abdullah, M.N.L.Y.	The Influence of Innovative Characteristics, Work Readiness, and Vocational Self-Concept on	2023	International Journal for Research in Vocational Education and Training	14
		Employability of Vocational College Students			
3	Al Idrus, S., Razak, R.A., Mohsin, N.	Design of E-Portfolio to Enhance Career Development for TVET Graduates	2024	International Journal of Computing and Digital Systems	2
4	Al-Saadi, S., Al-Abri, A., Khairunnas, R., Al-Shukaili, A.	Analysis of Skills Needed by Unemployed Fresh Graduates in Business Administration: Evidence from Oman	2024	Review of Business and Economics Studies	2
5	Bahaw, P., Sadiq, G., Mack, A., Stephens, A.	Inclusive Teaching, Institutional Support, and Entrepreneurial Intentions: The Mediating Role of Persistence of Effort	2026	International Journal for Research in Vocational Education and Training	0
6	Boi, A.D., Kiro, E.S., Athuman, A.K., Athuman, J.I., Lupeja, T.L.	The perceptions of key stakeholders on the adequacy and relevance of employability skills in vocational education in Tanzania	2025	Journal of Vocational Education and Training	3
7	Brown, P., Sadik, S., Xu, J.	Higher education, graduate talent and the prospects for social mobility in China's innovation nation	2021	International Journal of Educational Research	30
8	Çağlar, A., Alp, E., Çetinkaya, E., Karadeniz, O.	Enhancing graduate employability through extended internships in vocational higher education: Evidence from Türkiye	2026	International Journal of Educational Development	0
9	Čepar, Ž., Likar, B., Kunc, P.	Connecting secondary education system with the needs of industry: the case of Slovenia	2022	International Journal of Innovation and Learning	1
	Dávid, H., Gábor, K., Katalin, L.	Training to help public workers enter the labour market in Borsod-Abaúj-Zemplén County, 2016–2020	2022	Területi Statisztika	1
11	Farran, I., Nunez, I.	Converging pathways: new approaches to integrate vocational education training and higher education	2025	Journal of Vocational Education and Training	4
	Fatokun, J.O., Gumbo, M.T.	Integrating Emerging Technologies into Electrical and Electronics Technology in VET Curriculum: A Need for Employability and Future-Ready Skills	2024	Eurasian Journal of Educational Research	0
13	Fetahu, E., Lekli, L.	Developing Soft Skills, the Intangible Qualities Empowering Competitiveness and Success in the Labor Market	2023	WSEAS Transactions on Business and Economics	2
14	Ghosh, P., Goel, G., Bhomogode, A.	Skilling the Indian youth: a State-level analysis	2022	Benchmarking	2
15	González, F.C.	Difficulties and success factors in the development and application of the professional project and personal brand	2024	Revista Complutense de Educación	1
16	González-Ferniz, F.	Integrating Challenge-Based Learning and Agile Methodologies to Transform Vocational Training	2025	Revista Academia y Negocios	0
17	Hariono, Ramadhani, D.G., Haryani, S., Wicaksono, I., Hestinarsari, I.	Self-assessment instrument for measuring employability skills in chemistry vocational students	2025	Science Talks	0
18	Hsu, T.-C.J.	Redesigning a Career	2025	Education Sciences	3

Development Course in Post-Pandemic Higher Education					
19	Juma, A.A.	Bridging skills gaps: evaluating VET reskilling and curriculum reforms for employability in Tanzania	2025	International Journal of Training Research	0
20	Kholifah, N., Nurtanto,	Unlocking workforce readiness	2025	Social Sciences and	13

	M., Sutrisno, V.L.P., Daryono, R.W., Achmadi, A.	through digital employability skills		Humanities Open	
21	Liu, Y., Liang, P., Ma, J.	An Empirical Study on the Quality of Industry-Linked Education in Vocational Colleges	2025	Neutrosophic Sets and Systems	0
22	Magadza, I.	Integrating curriculum reform, faculty development, and graduate employability in South Africa	2026	Cogent Education	0
23	Moreno, N.I., Callueng, R.Z., Portez, A.P.	Exploring Technical Vocational Teacher Education: Inputs to Curriculum Model Development	2025	Journal of Technical Education and Training	1
24	Muravyeva, A.A., Oleynikov, O.N.	Micro-credentials as an alternative means of recognising qualifications in education	2024	Obrazovanie i Nauka	0
	Nguyen, T.T., Vu, H.T.T., Le, N.H., Phan, L.T.	Awareness, implementation, and participation in extracurricular educational activities at University	2025	Multidisciplinary Science Journal	0
26	Nikoloudakis, N., Rangoussi, M.	Introducing Green, Eco-Friendly Practices and Circular Economy Principles in Vocational Education	2024	International Journal for Research in Vocational Education and Training	4
	Okoye, M.C., Yao, L., Anim Mante, D., Hui, X.	Assessing the impact of TVET on career choice intentions	2026	Acta Psychologica	0
28	Olaniyan, Y.D.	Apprenticeship by another name? Media discourses and vocational turn in Nigerian higher education	2025	Higher Education, Skills and Work-Based Learning	1
29	Pickens, J.L., Dymond, S.K.	Keys to the employment services castle: Needed skills and experiences	2022	Journal of Vocational Rehabilitation	5
30	Prianto, A., Firman, Mayasari, D., Widoyoningrum, S.	Teaching Factory-Based Learning and its Impact on Students' Employability Skills	2025	International Journal of Learning, Teaching and Educational Research	0
	Rufus, O.S., Grace, A.M., Olalekan, A.O., Jwasshaka, S.K., Bakare, S.F.	Systematic development of entrepreneurship skills framework	2024	Environment and Social Psychology	0
32	Stadler, A., Alberton, A., Smith, A.M.J.	Entrepreneurship education in Brazil	2022	Journal of Small Business and Enterprise Development	7
33	Suhartini, R., Ekohariadi, Suparji, Ramadhani, B.Y.A., Mahar, D.H.	The influence of learning culture and motivation on entrepreneurial intention	2026	Multidisciplinary Reviews	0
34	Toutain, O., Loi, M., Opizzi, M.	Entrepreneurial competencies in vocational education	2026	Entrepreneurship and Regional Development	0
35	Velu, S.R.	Design Thinking Approach for Increasing Innovative Action in Universities	2023	Sustainability	15
36	Wahyudin, D., Hanafi, I., Ahmad, M.	Enhancing vocational education through teaching factory model	2025	Edelweiss Applied Science and Technology	1
37	Wen, Z., Ye, Y.	Work values, perceived employability and rural employment intention	2024	Asia Pacific Journal of Education	2
38	Yang, H.	Research on the impact of WTO trade policy on employability	2024	Edelweiss Applied Science and Technology	0
39	Zhang, L.	Developing a competency model for hospitality management education	2025	International Journal of Education and Practice	0
40	Zheng, L., Xiao, Y.	The Effect of High-Impact Practices on Vocational College Students	2025	European Journal of Education	0

The blue cluster reflects the role of higher education and digital transformation, incorporating keywords such as “*higher education*,” “*graduate employability*,” and “*digital disruption*.” This cluster indicates the growing importance of digital competencies in shaping employability outcomes. Meanwhile, the yellow cluster highlights soft skills and unemployment, suggesting that non-technical competencies remain a critical determinant of employability.

Additionally, the purple and orange clusters represent emerging themes such as “*educational innovation*,” “*curriculum reform*,” “*entrepreneurship education*,” and “*VET*.” These clusters demonstrate that innovation and entrepreneurship are increasingly integrated into vocational education as strategic approaches to enhancing employability. The network visualization suggests that the research field is shifting from a traditional skills-based perspective toward a more holistic approach that integrates innovation, entrepreneurship, and digital transformation in vocational education.

Distribution of Documents by Author

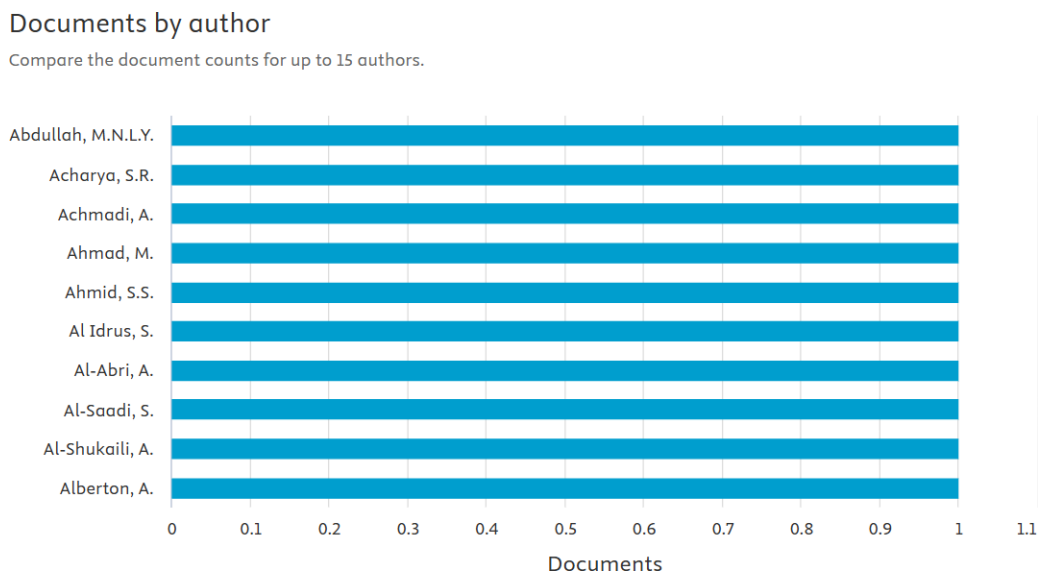


Figure 4. Distribution of Documents by Author in the Scopus Dataset
Source: Scopus dataset, processed by the authors (2026).

The distribution of documents by author demonstrates that research in this field is relatively decentralized, with no single author dominating the publication landscape. As shown in Figure 4, most authors contributed only one document within the dataset, indicating a dispersed authorship pattern. Authors such as *Abdullah, M.N.L.Y.*, *Acharya, S.R.*, *Ahmid, S.S.*, and *Al Idrus, S.* appear among the contributors; however, their publication counts remain limited. This suggests that the research area is still emerging, with contributions coming from a wide range of scholars rather than being concentrated within a specific research group or leading authority. This pattern is typical in interdisciplinary research areas, where multiple domains—such as education, management, and social sciences—converge. The absence of dominant authors also indicates opportunities for future researchers to establish strong contributions and leadership in this field.

Distribution of Documents by Institutional Affiliation

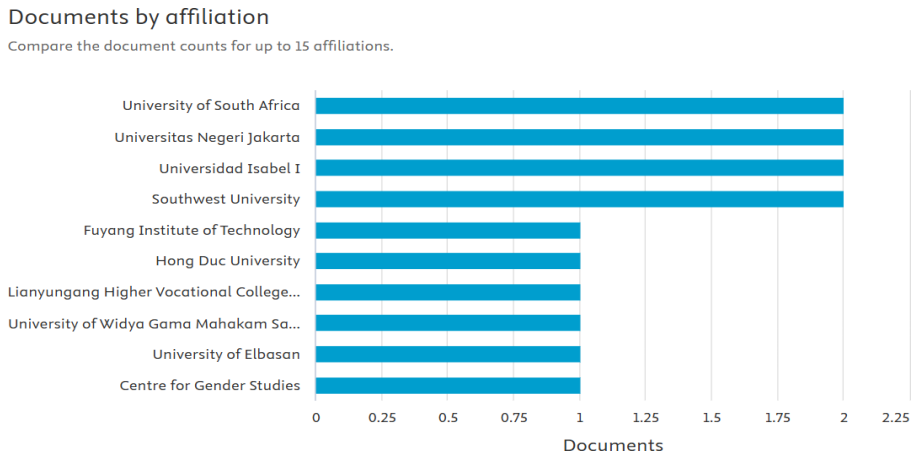


Figure 5. Distribution of Documents by Institutional Affiliation
Source: Scopus dataset, processed by the authors (2026).

The analysis of institutional affiliations reveals that research contributions are distributed across various universities worldwide. As presented in Figure 5, institutions such as the University of South Africa, Universitas Negeri Jakarta, Universidad Isabel I, and Southwest University are among the most active contributors, each producing multiple publications within the dataset. Other institutions, including Fuyang Institute of Technology, Hong Duc University, and Lianyungang Higher Vocational College, contribute smaller but notable numbers of publications. This distribution indicates that research on employability and vocational education is not confined to a specific geographical or institutional context but is instead globally distributed. The presence of institutions from Asia, Africa, and Europe highlights the global relevance of employability issues, particularly in developing and transitional economies. It also reflects the growing importance of vocational education as a strategic tool for economic development and workforce competitiveness.

Distribution of Documents by Country

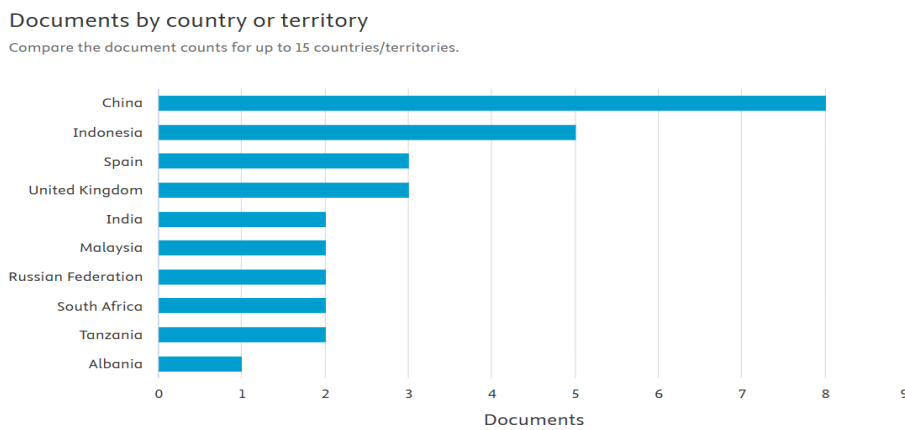


Figure 6. Distribution of Documents by Country or Territory
Source: Scopus dataset, processed by the authors (2026)

The country-level analysis further supports the global nature of this research field. China emerges as the leading contributor, followed by Indonesia, Spain, and the United Kingdom. Other countries such as India, Malaysia, South Africa, Tanzania, and Albania also contribute to the dataset, albeit with fewer publications. This distribution suggests that research on vocational education and employability is particularly prominent in countries experiencing rapid economic transformation and workforce restructuring. The strong representation of developing countries indicates that employability challenges are more acute in these regions, thereby attracting significant academic attention.

Summary of Key Findings

The findings of this study highlight that graduate employability serves as the central theme within the research landscape of vocational higher education. The bibliometric analysis demonstrates that employability is closely interconnected with multiple dimensions, particularly innovation, entrepreneurship education, digital skills, and work-based learning, indicating a shift toward a more holistic and competency-based approach. The keyword network analysis reveals that recent studies increasingly emphasize the integration of innovation and entrepreneurship as strategic components in vocational education, rather than treating them as separate domains. At the same time, the distribution of authors and institutions suggests that this field is still emerging and decentralized, with contributions spread across diverse scholars and global institutions.

Furthermore, the geographical distribution of publications confirms that employability issues are globally relevant, especially in developing and transitional economies where the mismatch between education and labor market demands remains a critical challenge.

The findings indicate that enhancing graduate employability in vocational higher education requires an integrated ecosystem approach, combining curriculum innovation, entrepreneurial learning, and industry alignment to better prepare graduates for the evolving world of work.

DISCUSSION

Keyword Co-occurrence Network Analysis

The findings from the keyword co-occurrence network reveal that *employability* functions as the central construct within the research landscape of vocational higher education. This dominance reflects a broader shift in educational discourse, where employability is no longer viewed as a secondary outcome but as a primary objective of vocational systems (Kholifah *et al.*, 2025). The strong linkage between employability and keywords such as *vocational education*, *job market*, and *students* indicates that employability is deeply embedded within the transition from education to work.

The emergence of clusters related to innovation and entrepreneurship education suggests a paradigm shift from traditional skill-based training toward more dynamic and adaptive learning models. Innovation, as reflected in the network, is closely associated with creative thinking and problem-solving, which are increasingly recognized as essential competencies in modern labor markets (Ahmid, Tiew and Abdullah, 2023). Similarly, entrepreneurship education appears as a critical enabler of employability, not only by fostering business creation but also by enhancing students' resilience,

initiative, and opportunity recognition (Rufus *et al.*, 2024; Bahaw *et al.*, 2026).

Furthermore, the presence of digital-related keywords such as *digital disruption* and *digital skills integration* highlights the growing importance of digital competence in shaping employability outcomes. This aligns with previous studies indicating that digital literacy has become a fundamental requirement for workforce readiness in the Industry 4.0 era (Zheng, 2024). The integration of digital tools, such as e-portfolios, has been shown to enhance students' ability to showcase competencies and engage with employers (Al Idrus, Abdul Razak and Mohsin, 2024).

Another significant insight is the prominence of *soft skills* within the network. Despite advancements in technical education, non-cognitive skills such as communication, teamwork, and adaptability remain critical determinants of employability (Fetahu and Lekli, 2023). This finding reinforces the argument that employability is a multidimensional construct requiring a balance between hard and soft skills. Overall, the keyword network supports the notion that vocational education is evolving into an integrated ecosystem where innovation, entrepreneurship, and digital transformation collectively contribute to employability. This holistic perspective extends beyond traditional human capital theory by incorporating elements of adaptability and lifelong learning (Magadza, 2026).

Distribution of Documents by Author

The analysis of authorship distribution reveals a highly fragmented and decentralized research landscape, with most authors contributing only a single publication. This pattern indicates that the field of innovation and entrepreneurship in vocational education is still in its developmental stage. Unlike mature research domains, where a few dominant scholars shape the discourse, this field is characterized by diverse contributions from multiple researchers across disciplines.

This decentralization can be interpreted as both a challenge and an opportunity. On one hand, the absence of dominant authors suggests a lack of theoretical consolidation and standardized frameworks. On the other hand, it reflects the interdisciplinary nature of the field, which integrates perspectives from education, management, psychology, and economics (Donthu *et al.*, 2021). The diversity of authorship also aligns with the global relevance of employability issues. Researchers from different regions contribute context-specific insights, enriching the overall understanding of vocational education systems. For example, studies from developing countries often emphasize structural challenges such as resource limitations and curriculum misalignment, while research from developed contexts focuses more on innovation and digital transformation (Farran and Nunez, 2025).

Moreover, the fragmented authorship pattern suggests that the field is open to new contributions and theoretical advancements. Future research has the potential to establish more cohesive frameworks that integrate innovation, entrepreneurship, and employability into a unified model. This is particularly important given the increasing complexity of labor market demands and the need for interdisciplinary solutions (Zupic and Čater, 2022).

Distribution of Documents by Institutional Affiliation

The findings related to institutional affiliations indicate that research on employability and vocational

education is globally distributed across a wide range of universities. Institutions such as the University of South Africa and Universitas Negeri Jakarta demonstrate significant contributions, highlighting the active role of universities in addressing employability challenges.

This distribution reflects the growing recognition of vocational education as a strategic tool for economic development. Universities are increasingly expected to align their curricula with industry needs, foster innovation, and promote entrepreneurial competencies among students (Magadza, 2026). The presence of institutions from diverse geographical regions suggests that employability is not confined to a specific context but is a universal concern. The variation in institutional contributions also highlights differences in research capacity and priorities. Institutions in emerging economies tend to focus on practical solutions to unemployment and skill mismatches, while those in developed regions emphasize innovation-driven education and digital transformation (Hsu, 2025). This divergence underscores the importance of contextualizing vocational education policies and practices. Additionally, the findings suggest the importance of institutional support systems in enhancing employability. Universities that invest in curriculum reform, faculty development, and industry partnerships are more likely to produce graduates with higher employability (Bahaw et al., 2026). Collaborative initiatives, such as teaching factories and work-based learning programs, further strengthen the link between education and employment (Prianto *et al.*, 2025).

Distribution of Documents by Country

The country-level analysis reveals that research output is concentrated in countries such as China, Indonesia, Spain, and the United Kingdom. This distribution reflects the varying levels of economic development and labor market dynamics across regions. In countries like China and Indonesia, rapid economic transformation has created a strong demand for skilled labor, prompting increased research on vocational education and employability (Okoye *et al.*, 2026). These countries face significant challenges related to skill mismatches and youth unemployment, which drive academic interest in developing effective educational strategies. Meanwhile, European countries such as Spain and the United Kingdom focus on integrating vocational and higher education systems, as well as promoting innovation and entrepreneurship within curricula (Farran and Nunez, 2025). This reflects a more advanced stage of educational development, where the emphasis is on enhancing the quality and relevance of education rather than addressing basic skill gaps.

The global distribution of research highlights the importance of cross-country comparisons in understanding employability. Different countries adopt diverse approaches based on their socio-economic contexts, suggesting that there is no one-size-fits-all solution. Instead, effective strategies must consider local labor market conditions, institutional capacities, and cultural factors (Nguyen *et al.*, 2025). Furthermore, the strong representation of developing countries indicates that employability remains a critical issue in these regions. Vocational education plays a crucial role in addressing unemployment and promoting economic growth, making it a key area of policy and research focus (Ghosh, Goel and Bhongade, 2022).

Summary of Key Findings

The discussion of findings underscores the need for an integrated approach to vocational education, where innovation, entrepreneurship education, and digital competencies are systematically embedded within curricula. The centrality of employability in the keyword network confirms its importance as a primary outcome, while the interconnected clusters highlight the multidimensional nature of the concept. This aligns with recent studies emphasizing that employability is increasingly shaped by the integration of cognitive, technical, and socio-emotional competencies in education systems (Jackson, 2021).

The fragmented authorship and global distribution of research suggest that the field is still evolving, with significant opportunities for theoretical and empirical contributions. The variation in institutional and country-level findings further emphasizes the importance of context in shaping employability outcomes. In particular, cross-national differences in vocational education systems highlight how policy, institutional capacity, and industry collaboration influence graduate readiness (Cedefop, 2022).

Ultimately, the results support the argument that enhancing graduate employability requires a holistic ecosystem, involving collaboration between educational institutions, industry, and policymakers. Such an approach not only addresses current labor market demands but also prepares graduates for future challenges in an increasingly complex and dynamic world of work. This perspective is reinforced by recent research suggesting that sustainable employability depends on continuous learning, adaptability, and innovation-oriented educational frameworks (Tomlinson, 2022).

CONCLUSION AND SUGGESTION

CONCLUSION

This systematic literature review and bibliometric analysis confirm that innovation and entrepreneurship education play a significant role in enhancing graduate employability in vocational higher education. The analysis of 41 Scopus-indexed publications published between 2021 and 2026 shows that employability has become the central theme in contemporary vocational education research. More importantly, employability is no longer understood merely as technical readiness for work, but as a multidimensional construct that includes innovation capacity, entrepreneurial mindset, digital competence, adaptability, communication, collaboration, and problem-solving skills.

The keyword co-occurrence network demonstrates that employability is closely linked to vocational education, job market needs, soft skills, digital transformation, and entrepreneurship education. This indicates a clear shift from a conventional skills-based orientation toward a more integrated educational approach. Vocational higher education institutions are increasingly expected not only to prepare students for existing jobs, but also to equip them with the capacity to respond creatively to change, identify opportunities, and sustain relevance in rapidly evolving labor markets. In this regard, innovation and entrepreneurship education serve as strategic components for strengthening graduate competitiveness.

The study also reveals that the research field remains globally relevant but fragmented. Contributions come from diverse authors, institutions, and countries, with particularly strong engagement from developing and transitional economies. This suggests that concerns about employability are universal, yet responses remain context-dependent. Overall, the study concludes

that graduate employability in vocational higher education can be strengthened most effectively through a holistic ecosystem that integrates curriculum innovation, entrepreneurial learning, digital capability development, and strong alignment between educational institutions and industry.

SUGGESTION

Based on the findings, vocational higher education institutions should redesign their educational strategies by embedding innovation and entrepreneurship education more systematically into the curriculum. These elements should not be treated as supplementary subjects, but as core components integrated across learning experiences, especially in ways that connect technical competence with creativity, initiative, problem-solving, and opportunity recognition. Curriculum reform should also emphasize digital literacy, soft skills, and adaptive learning to better reflect current and future labor market demands.

In practical terms, institutions are encouraged to strengthen work-based learning models such as internships, teaching factories, project-based learning, and industry-linked programs. These approaches can provide authentic workplace exposure and improve students' readiness to transition into employment. In addition, universities should invest in supportive institutional ecosystems, including faculty development, career services, digital platforms such as e-portfolios, and partnerships with employers, so that employability development becomes a shared institutional responsibility rather than an isolated academic objective. For future research, scholars should move beyond fragmented discussions and develop integrative conceptual and empirical models that explain how innovation education, entrepreneurship education, digital competence, and employability interact within vocational higher education. More comparative and context-sensitive studies are also needed across countries and institutions, particularly in developing economies where skill mismatch and graduate unemployment remain pressing concerns. Such research will help generate more grounded and applicable strategies for aligning vocational education with the changing world of work.

REFERENCES

- Ahmid, S.S., Tiew, C.C. and Abdullah, M.N.L.Y. (2023) 'The influence of innovative characteristics, work readiness, and vocational self-concept on employability of vocational college students', *International Journal for Research in Vocational Education and Training*, 10(3), pp. 288–317. Available at: <https://doi.org/10.13152/IJRVET.10.3.1>.
- Bahaw, P. *et al.* (2026) 'Inclusive teaching, institutional support, and entrepreneurial intentions: The mediating role of persistence of effort', *International Journal for Research in Vocational Education and Training*, 13(2), pp. 287–312. Available at: <https://doi.org/10.13152/IJRVET.13.2.6>.
- Çağlar, A. *et al.* (2026) 'Enhancing graduate employability through extended internships in vocational higher education: Evidence from Türkiye', *International Journal of Educational Development*, 121(C). Available at: <https://doi.org/10.1016/j.ijedudev.2026.103515>.
- Cedefop (2022) *Vocational education and training in Europe: Towards a common framework*. Publications Office of the European Union.
- Donthu, N. *et al.* (2021) 'How to conduct a bibliometric analysis: An overview and guidelines', *Journal of Business Research*, 133, pp. 285–296. Available at: <https://doi.org/10.1016/j.jbusres.2021.04.070>.

- Van Eck, N.J. and Waltman, L. (2023) 'VOSviewer manual and advanced bibliometric mapping techniques'. Leiden University Centre for Science and Technology Studies.
- Erlangga, H. et al. (2026) 'Bibliometric analysis of research trends in education and employability studies', *Journal of Educational Research and Evaluation*, 10(1), pp. 45–58.
- Farran, I. and Nunez, I. (2025) 'Converging pathways: New approaches to integrate vocational education training and higher education', *Journal of Vocational Education & Training*, 77(4). Available at: <https://doi.org/10.1080/13636820.2024.2428769>.
- Fetahu, E. and Lekli, L. (2023) 'Developing soft skills, the intangible qualities empowering competitiveness and success in the labor market: Case study, Elbasan, Albania', *WSEAS Transactions on Business and Economics*, 20, pp. 965–976. Available at: <https://doi.org/10.37394/23207.2023.20.89>.
- Ghosh, P., Goel, G. and Bhongade, A. (2022) 'Skilling the Indian youth: A state-level analysis', *Benchmarking: An International Journal*, 29(10), pp. 3379–3395. Available at: <https://doi.org/10.1108/BIJ-06-2021-0315>.
- Hapsari, R., Sari, D.P. and Nugroho, Y. (2024) 'Mapping research trends using VOSviewer: A bibliometric approach in education studies', *Journal of Bibliometric Studies*, 5(2), pp. 112–125.
- Hsu, T.-C.J. (2025) 'Redesigning a career development course in post-pandemic higher education: Integrating blended and cooperative pedagogies for enhanced student engagement and employability', *Education Sciences*, 15(7), p. 895. Available at: <https://doi.org/10.3390/educsci15070895>.
- Al Idrus, S., Abdul Razak, R. and Mohsin, N. (2024) 'Design of e-portfolio to enhance career development for TVET graduates', *International Journal of Computing and Digital Systems*, 15(1), pp. 139–151. Available at: <https://doi.org/10.12785/ijcds/150112>.
- Jackson, D. (2021) 'Employability skill development in work-integrated learning: Barriers and best practice', *Studies in Higher Education*, 46(10), pp. 2097–2110.
- Kholifah, N. et al. (2025) 'Unlocking workforce readiness through digital employability skills in vocational education graduates: A PLS-SEM analysis based on human capital theory', *Social Sciences & Humanities Open*, 11. Available at: <https://doi.org/10.1016/j.ssaho.2025.101625>.
- Ma, L. and Ismail, N. (2025) 'Systematic literature review in education research: Methodological considerations and applications', *Educational Process: International Journal*, 14(1), pp. 1–15.
- Magadza, I. (2026) 'Integrating curriculum reform, faculty development, and graduate employability in South Africa's higher education: A qualitative study in the Fourth Industrial Revolution', *Cogent Education*, 13(1). Available at: <https://doi.org/10.1080/2331186X.2026.2637210>.
- Nguyen, T.T. et al. (2025) 'Awareness, implementation, and participation in extracurricular educational activities at University: A cross-sectional study', *Multidisciplinary Science Journal* [Preprint]. Available at: <https://doi.org/10.31893/multiscience.2025658>.
- Nikoloudakis, N. and Rangoussi, M. (2024) 'Introducing green, eco-friendly practices and circular economy principles in vocational education through a novel analysis-synthesis method: Design, implementation and evaluation', *International Journal for Research in Vocational Education and Training*, 11(3). Available at: <https://doi.org/10.13152/IJRVET.11.3.5>.
- Okoye, M.C. et al. (2026) 'Assessing the impact of technical and vocational education and training on career choice intentions: The mediating role of general skills and competencies and the moderating role of learning environment', *Acta Psychologica*, 264. Available at: <https://doi.org/10.1016/j.actpsy.2026.106313>.
- Prianto, A. et al. (2025) 'Teaching factory-based learning and its impact on students' employability skills', *International Journal of Learning, Teaching and Educational Research*, 24(12). Available at: <https://doi.org/10.26803/ijlter.24.12.10>.
- Rufus, O.S. et al. (2024) 'Systematic development of entrepreneurship skills framework for students of electrical technology in Nigeria', *Environment and Social Psychology*, 9(3). Available at:

<https://doi.org/10.54517/esp.v9i3.1829>.

- Suhartini, R. *et al.* (2026) 'The influence of learning culture, individual characteristics and motivation on entrepreneurial intention and its impact on student business startups', *Multidisciplinary Reviews* [Preprint]. Available at: <https://doi.org/10.31893/multirev.2026447>.
- Tomlinson, M. (2022) 'Graduate employability in context: Charting a complex, contested and multi-faceted policy and research field', in *Higher Education Policy*, pp. 1–18.
- Tripathy, A. (2024) 'Systematic literature review and meta-analysis methods in social sciences research', *Renewable and Sustainable Energy Reviews*, 189.
- Zheng, S. (2024) 'Combined application of employment education and big data internet technology based on the context of vocational education reform', *Applied Mathematics and Nonlinear Sciences*, 9(1). Available at: <https://doi.org/10.2478/amns.2023.1.00124>.
- Zupic, I. and Čater, T. (2022) 'Bibliometric methods in management and organization research: Methods and applications', *Organizational Research Methods*, 25(2), pp. 429–472.