

Systematic Literature Review of Sustainable Assessment Model in Vocational Higher Education

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ABSTRACT

Indonesia prioritizes vocational education to achieve the Golden Indonesia 2045 vision by producing competent, work ready graduates. Despite strategic policies, vocational enrollment remains low relative to academic pathways, and sustainability focused assessment model for vocational higher education are scarce. Therefore, this study aims to map and critically analyze existing sustainability assessment model for vocational higher education using a PRISMA based Systematic Literature Review and bibliometric analysis with VOSviewer. A total of 8,035 records (2018–2024) were retrieved, and the 20 articles that met the inclusion criteria were analyzed for thematic coverage, methodological approach, and integration of sustainability dimensions. The results showed that although many assessment model integrate economic, social, and environmental dimensions partially, few comprehensively addressed work readiness, sustainability literacy, and socio environmental impacts in vocational contexts. Bibliometric mapping further shows a dominance of general higher education studies and an underrepresentation of vocational-specific investigation. This study proposed a contextualized conceptual framework consistent with the Triple Bottom Line (economic, social, environmental) and selected SDG targets characterized by vocational competencies and institutional assessment practices. The framework offers guidance for policymakers and vocational institutions to design assessment systems that improve graduate relevance and institutional sustainability. The study contributes a systematic scientific map and a foundation for empirical testing of the proposed model.

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1. Introduction

Vocational education is a national priority to achieve Golden Indonesia 2045 vision, which emphasizes the need for superior and globally competitive human resources. Despite these policies, vocational higher education remains underrepresented. In 2023, only 25% of students enrolled in vocational pathways, compared to 75% in academic programs, far below countries such as Germany and Switzerland, where vocational students comprise nearly 50% (OECD, 2020; Statistik, 2025; UNESCO, 2022). This shows the urgent need to strengthen both the capacity and quality of vocational education in Indonesia.

Although sustainability in higher education has been widely studied, the application in vocational education remains underexplored (Corvo et al., 2021; Keppo et al., 2021; Sacchi et al., 2022). Existing studies tend to focus on competencies and efficiency, with little integration of sustainability literacy,

socio environmental impacts, and SDG alignment (Haniza et al., 2021; Lestari et al., 2023). This shows a critical study gap between general higher education and vocational contexts (Gao, 2024; Wei, 2024; Wu et al., 2024).

Therefore, this study was aimed at conducting a Systematic Literature Review (SLR) using the PRISMA protocol, complemented by bibliometric analysis (VOSviewer), to identify, classify, and analyze sustainability oriented assessment models for vocational higher education. The main contribution is the development of a contextualized conceptual framework that integrates the Triple Bottom Line and SDGs into vocational education assessment (Baharum et al., 2019; Mathiyazhagan et al., 2019; Suleiman et al., 2023; F. Zhang et al., 2024; S. Zhang et al., 2023).

2. Method

2.1. SLR based on PRISMA protocol

This study used SLR following the PRISMA protocol, which consists of five main stages, namely identification, screening, eligibility, inclusion, and analysis (Keppo et al., 2021; Veroniki et al., 2025). A systematic search was carried out in three major databases, Scopus, Web of Science, and Google Scholar, for publications dated 2018–2024 (OECD, 2020; UNESCO, 2022). Keyword strings included “sustainable assessment model,” “vocational education,” “higher vocational education,” “assessment framework,” along with related synonyms such as TVET and vocational training (Haniza et al., 2021; Studiyananti et al., 2020):

From the initial search, a total of 8.035 articles were identified (Scopus = 3.120; Web of Science = 2.415; Google Scholar = 2.500). After duplicates were removed and titles/abstracts screened, 200 articles remained. Among these, 50 full-text articles were assessed for eligibility based on predefined inclusion and exclusion criteria, resulting in 20 articles that were included in the final synthesis (Corvo et al., 2021; Wu et al., 2024). A PRISMA flow diagram in Fig. 1, shows the data flow, while a concise search summary Table 1, presents the databases, keywords, period, initial hits, and final selections (Qian et al., 2022; Sacchi et al., 2022).

Data extraction was performed using a standardized form that captured bibliographic details, study aims, methods, model components, sustainability dimensions, and vocational relevance. The extraction form was piloted on five articles and refined before use (Nguyen & Macchion, 2023). To ensure validity and reliability, two reviewers independently screened and extracted data, with disagreements resolved through discussion or arbitration by a third reviewer (Rahman et al., 2021).

The analysis combined bibliometric mapping (using VOSviewer) to identify keyword co-occurrences and thematic clusters (Baharum et al., 2019; Susilawati et al., 2022), with iterative thematic content analysis to classify assessment model by sustainability dimensions (economic, social, environmental), methodological approaches, and vocational relevance (work-readiness, sustainability literacy, socio-environmental impacts). Validity checks included double-coding, piloting of the extraction instrument, and consensus meetings, while thematic saturation was considered achieved when no new themes emerged (Mathiyazhagan et al., 2019; Wu et al., 2024).

Table 1. Search Summary of Databases, Keywords, and Results

Database	Primary keywords (example)	Period	Initial results	Final selected
Scopus	sustainable assessment model; vocational education	2018–2024	3,12	9
Web of Science	higher vocational education; sustainability assessment	2018–2024	2,415	7
Google Scholar	vocational college sustainability; assessment model	2018–2024	2,5	4
Total			8,035	20

Table 1 shows a summary of the literature search process across databases. Final numbers were calculated after screening, eligibility checks, and cross-referencing (Pamucar et al., 2022; Sacchi et al., 2022).

2.2. Inclusion/Exclusion Criteria

Inclusion criteria: peer-reviewed journal articles, conference proceedings, and official reports related to sustainability assessment model in higher or vocational education, publications from 2018–2024 (Lestari et al., 2023; Wei, 2024); English or Indonesian language, and full text available.

Exclusion criteria: duplicates, non-scholarly sources such as blogs or opinion pieces, studies not focused on assessment model or vocational education, and publications outside the specified period or language (S. Zhang et al., 2023).

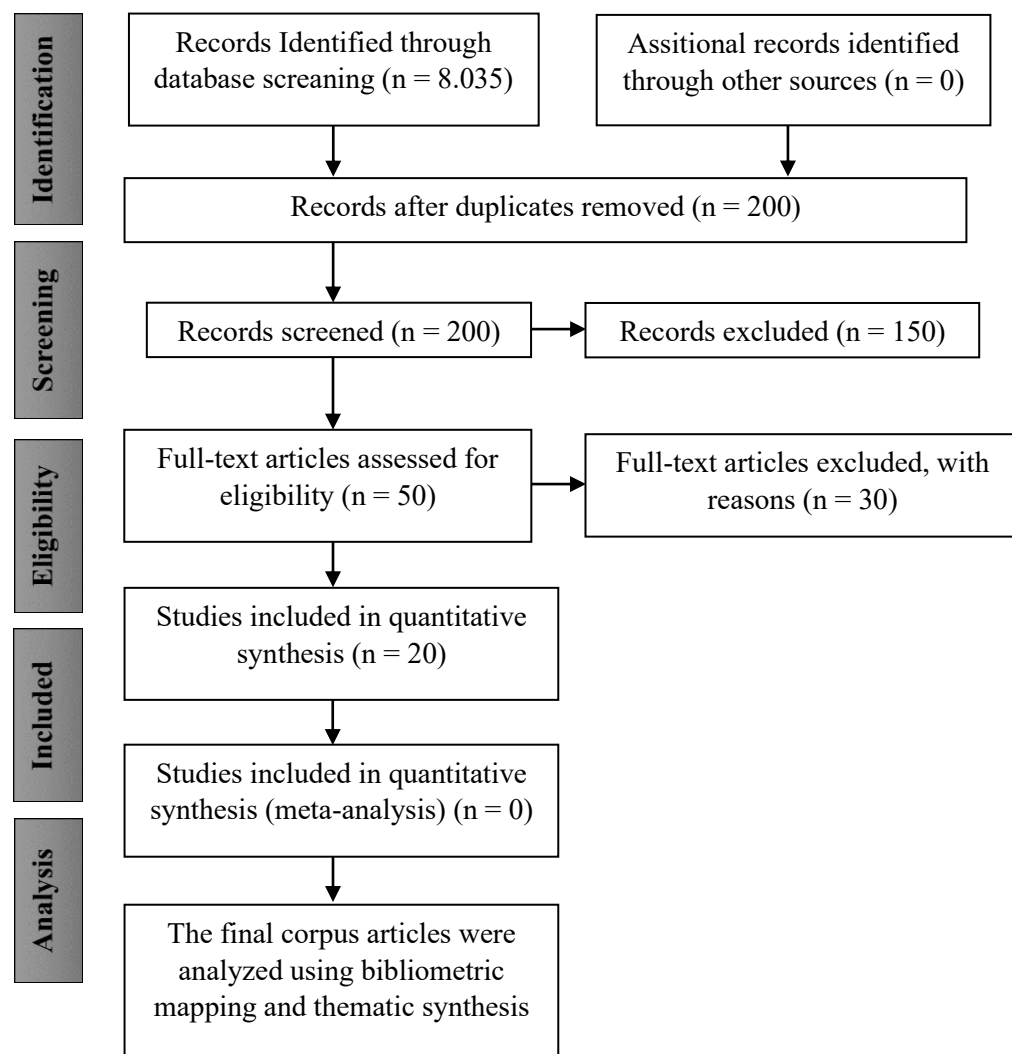


Fig. 1. PRISMA Flow Diagram of the Study Selection Process

The search across Scopus, Web of Science, and Google Scholar (2018–2024) identified 8,035 articles. After duplicate removal and title/abstract screening, 200 articles remained. Among these, 50 full-text articles were assessed for eligibility, and 20 met the inclusion criteria. Cross-referencing did not add further studies. The final 20 articles were analyzed using bibliometric mapping and thematic synthesis (F. Zhang et al., 2024).

3. Results and Discussion

3.1. Bibliometric analysis

Bibliometric mapping using VOSviewer was conducted on 500 articles with keywords such as college sustainability, university sustainability, vocational college sustainability, and higher education. The analysis produced ten clusters, where “sustainability” and “higher education” appeared as the most dominant terms, as shown by larger nodes in the network visualization (Corvo et al., 2021; Keppo et al., 2021).

Although studies on sustainability in higher education were abundant, keywords such as “vocational higher education” or “vocational colleges” were absent from the mapping. This underrepresentation can be explained by several factors:

1. Publication access: vocational studies are often published in local or practice-oriented journals not indexed in Scopus/WoS (Studiyaniti et al., 2020).
2. Policy priorities: sustainability studies are more frequently funded and emphasized in academic universities than in vocational institutions (UNESCO, 2022).
3. Terminology: some studies use TVET or technical training terms, which fragment the literature and reduce keyword visibility (OECD, 2020).
4. Methodological bias: vocational studies rely more on case-based or applied reports, less visible in bibliometric datasets (Lestari et al., 2023).

The factors show both a real gap and a visibility problem for vocational-focused sustainability studies. This reinforces the urgency of systematically developing sustainability-oriented assessment model for vocational higher education, specifically in Indonesia where vocational pathways are strategically prioritized in national education policies (Committee, 2022; Regulation, 2022).

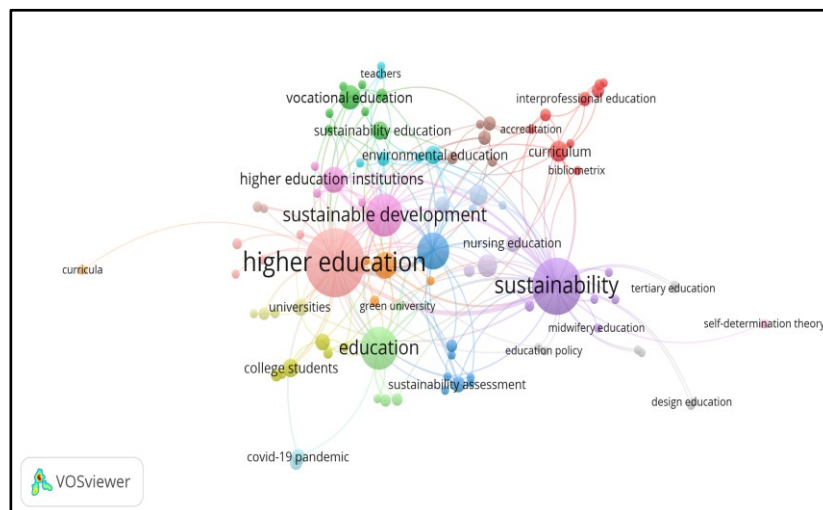


Fig. 2. Co-occurrence Vosviewer

Fig. 2 shows the co-occurrence mapping where “sustainability” and “higher education” dominate the network, while vocational-related keywords are missing. This indicates that vocational contexts are marginalized in global sustainability discourse, confirming previous findings by (Sacchi et al., 2022) that vocational education research tends to remain peripheral in indexed international publications.

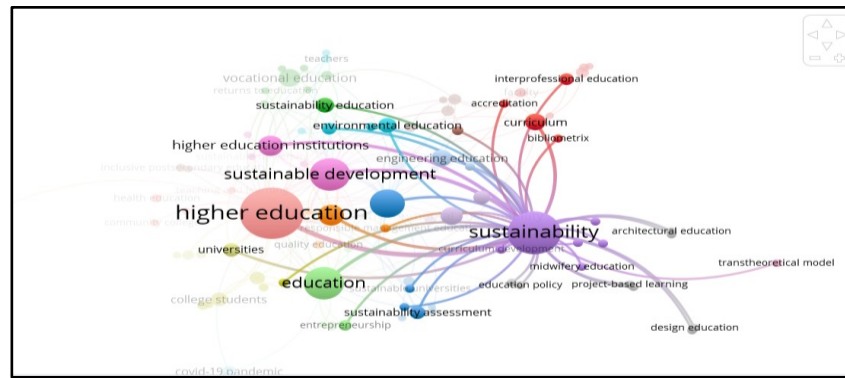


Fig. 3. Sustainability Study Position

Fig. 3 show this gap: dense networks around “sustainability” and “higher education,” but almost no linkage to vocational terms, emphasizing the underrepresentation of vocational contexts.

3.2. Assessment Model

Assessment model can be grouped into three main categories:

Table 2. Categories of Assessment Model

Category	Representative Studies	Core Focus & Sustainability Integration
General assessment model	(Sacchi et al., 2022); (Pamucar et al., 2022); (Qian et al., 2022)	Broad evaluation frameworks, often sectoral; some TBL integration
Sustainable assessment model	(Mathiyazhagan et al., 2019); (Baharum et al., 2019); (F. Zhang et al., 2024)	Explicit Triple Bottom Line (TBL) in construction, transport, and environment
Vocational education model	(Wu et al., 2024); (Gao, 2024); (Wei, 2024)	Competencies, efficiency, employability, limited sustainability

Table 2 shows that although general and sectoral model already apply sustainability frameworks, vocational education model remains fragmented and primarily competency-oriented, without fully integrating social or environmental indicators (Haniza et al., 2021). This aligns with (Baharum et al., 2019), who found that many sectoral models incorporate TBL comprehensively, while in vocational contexts integration remains partial, limiting long-term sustainability outcomes for sustainability transitions.

3.3. Vocational Assessment Model

Table 3. Selected Vocational Assessment Model

Study	Method	Focus	Limitation (sustainability)
(Wu et al., 2024)	Empirical skills evaluation	Student competencies, work literacy	No environmental/social indicators
(Gao, 2024)	POA & DEA (efficiency analysis)	Management input-output efficiency	Ignores sustainability dimensions
(Wei, 2024)	Holistic assessment model	Competence & applicability	Limited integration of TBL

Existing vocational model emphasize employability and efficiency but overlook sustainability literacy and socio-environmental outcomes. This gap emphasizes the lack of systemic sustainability integration in vocational contexts (Susilawati et al., 2022). As seen in Table 3, for instance, (Wu et al., 2024) confirms that while vocational models strengthen employability, they neglect ecological competencies, consistent with (Tabatabaee et al., 2022) who argue that without environmental literacy, vocational graduates risk being unprepared for sustainability transitions.

3.4. Sustainability Dimensions

Table 4. Sustainability Indicators for Vocational Higher Education

Economic	Social	Environmental
Institutional strategy, efficiency, industry partnerships, employability metrics	Accessibility, inclusiveness, teacher/student competencies, sustainability literacy, stakeholder engagement	Curriculum integration, resource management, ecological awareness

As seen in Table 4, the indicators emphasize the multidimensional nature of sustainability and the urgent need for vocational education to embed Triple Bottom Line dimensions into the evaluation system (Sarwar, 2023; Tabatabaee et al., 2022). The findings are consistent with Sarwar (2023), who demonstrated that institutions adopting a balanced economic, social, environmental integration achieve higher institutional resilience and student readiness for green economies. This underscores the necessity for Indonesian vocational education to adopt a similar multidimensional approach.

3.5. Proposed Conceptual Framework

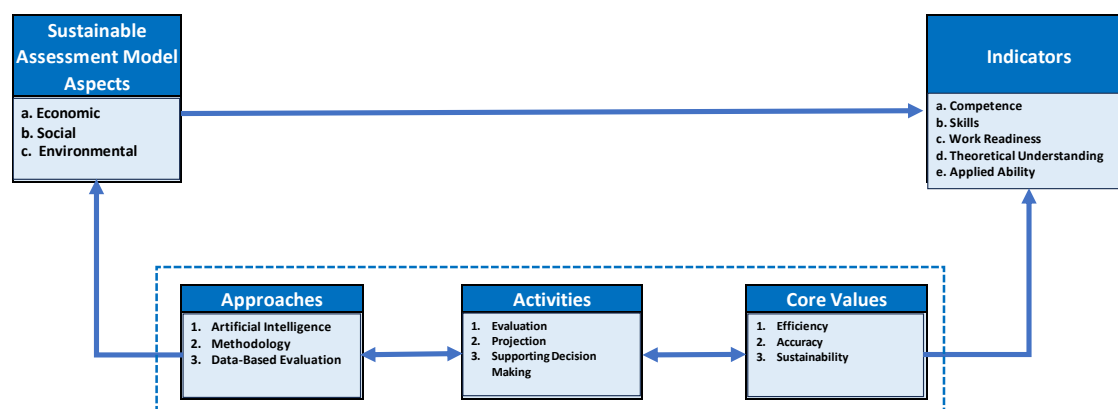


Fig. 4. Sustainability Assessment Model for Vocational Higher Education

Fig. 4 shows the Sustainability Assessment Model for Vocational Higher Education. The model integrates:

1. Work-readiness and sustainability literacy with the Triple Bottom Line (economic, social, environmental) (Kumar Mohapatra et al., 2022).
2. Alignment with SDGs, specifically SDG 4 (Quality Education), SDG 8 (Decent Work), SDG 12 (Responsible Consumption), and SDG 13 (Climate Action) (UNESCO, 2022).
3. Participatory stakeholder participation (government, industry, community) (Pratiwi et al., 2023).
4. Relevance to Indonesia policy agenda (Presidential Regulation No. 68 of 2022; (Regulation, 2022).

In contrast to previous model that focus only on one or two aspects, this framework holistically integrates sustainability literacy, socio-environmental awareness, and employability into vocational education (S. Zhang et al., 2023). The novelty strengthens both the theoretical foundation (TBL, SDGs) and practical applicability in the Indonesian context.

3.6. Comparative Analysis and Critical Gaps

Compared to previous studies that emphasize either economic efficiency (Haniza et al., 2021), social participation, or environmental initiatives in isolation (Lestari et al., 2023), the proposed model

integrates all three TBL pillars while embedding vocational-specific outcomes such as work readiness (Wei, 2024).

Gap analysis:

1. Theoretical gap: vocational model have not been systematically framed within sustainability theories (Keppo et al., 2021).
2. Methodological gap: many rely on small-scale, descriptive studies, limiting generalizability (Corvo et al., 2021).
3. Operational gap: standardized indicators for vocational sustainability, specifically literacy and socio-environmental impact, are lacking (F. Zhang et al., 2024).

3.7. Implications

1. Theoretical: extends TBL and SDG frameworks into vocational higher education, enriching sustainability literature (Mathiyazhagan et al., 2019).
2. Practical: vocational institutions can adopt this model for curriculum redesign, self-assessment, and strategic planning (Wu et al., 2024).
3. Policy: provides evidence-based tools to help Indonesia achieve the target of 7.3 million vocational graduates by 2030, in line with the Golden Indonesia 2045 vision (Statistik, 2020, 2025).

3.8. Recommendations for Future Studies

Future studies should empirically test the proposed model through Structural Equation Modeling (SEM), Delphi techniques, and comparative case studies. More contextual sustainability indicators tailored for vocational institutions are also needed, as well as specific themes including digitalization in education, green technology adoption, and carbon reduction in vocational industries (Sajid, 2021; Sarwar, 2023).

4. Conclusion

In conclusion, this study is one of the first to systematically map a sustainability assessment model in vocational higher education in Indonesia. The results confirm that although sustainability studies in higher education have grown, vocational institutions remain underrepresented. To address this gap, the proposed framework integrates vocational competencies skills, work literacy, and readiness with economic, social, and environmental dimensions of sustainability. Theoretically, this study contributes by introducing a framework that bridges vocational education and sustainability assessment, rarely explored in previous studies. Practically, vocational institutions can use the model to design strategies such as embedding sustainability literacy into curricula, promoting inclusiveness, fostering industry collaboration, and advancing eco-conscious campus initiatives. The results provide a foundation for empirical validation of a continuous assessment model in vocational higher education. Future investigations should test the model through case studies, quantitative approaches, and refinement of contextual indicators, including the use of digital technologies. Consequently, vocational institutions can become more consistent with sustainable development goals while preparing graduates to meet global challenges.

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