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OBE Curriculum Design Integrated with SKKNI as a Pillar for Implementing Merdeka Belajar in the Mechanical Engineering Vocational Education Program

Bayu Ariwibowo*, Fahmy Zuhda Bahtiar, Budiyanto, Moh Arif Setiawan

Universitas Ivet, Indonesia

Keywords

OBE, MBKM, SKKNI, Curriculum, Mechanical Engineering Education

Abstract

Graduates of the Vocational Education in Mechanical Engineering (PVTM) program at Ivet University have predominantly pursued careers in relevant fields of expertise. A total of 87% of alumni work as educators. According to the graduate profile, PVTM alumni are also projected to become industry instructors and entrepreneurs. However, a key issue arises regarding the implementation of the Indonesian National Qualification Framework (KKNI) curriculum in PVTM, which remains focused on less adaptable skills, leading to concerns about graduates' competencies in the industry. By integrating the concept of Outcome-Based Education (OBE) with the Indonesian National Work Competency Standards (SKKNI) in the technical schema, graduate competencies are expected to be strengthened and better recognized in the industry. This study aims to design an OBE-integrated curriculum aligned with SKKNI to support the implementation of the *Merdeka Belajar Kampus Merdeka* (MBKM) initiative in the Vocational Education in Mechanical Engineering program at Ivet University. The research employed the Borg and Gall research and development methodology, culminating in a hypothetical model represented by a draft curriculum ready for trial implementation. The findings resulted in an OBE-integrated curriculum draft aligned with SKKNI, targeting the Level IV Welding Inspector occupational schema, comprising: (1) Eighteen study topics forming eight core courses within the program; (2) A curriculum integrated with three key concepts: OBE, SKKNI, and Welding Inspector; (3) Study topics applicable to *Merdeka Belajar* activities such as independent studies, student exchange programs, and projects; (A survey of 10 expert respondents, where 83% strongly agreed, 12% agreed, and 5% were neutral regarding the draft curriculum's feasibility. Thus, it can be concluded that the developed curriculum draft is suitable for trial implementation.

*Correspondence Address:
E-mail:
bayuariwibowo778@ivet.ac.id

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INTRODUCTION

Higher education is expected to produce graduates equipped not only with academic competence but also with practical skills relevant to workforce demands in the era of Industry 4.0 (Suwandi, 2020). In Indonesia, the *Merdeka Belajar Kampus Merdeka* (MBKM) policy, introduced by the Ministry of Education and Culture, aims to provide students with flexibility in developing skills and competencies aligned with labor market needs (Pembelajaran, 2021). One approach that supports this policy is Outcome-Based Education (OBE), which emphasizes learning outcomes specifically designed to meet workforce demands (Aminuddin et al., 2021).

The OBE approach offers a new orientation in curriculum development, wherein the entire learning process is designed to achieve desired outcomes. In the context of vocational education, integrating OBE with the Indonesian National Work Competency Standards (SKKNI) is a strategic step to ensure that graduates possess competencies aligned with national industry standards (Arifin & Yanto, 2018). SKKNI serves as a reference framework for determining job qualifications across various professions (Perpustakaan & Republik, 2016).

The Vocational Education in Mechanical Engineering (PVTM) program at Ivet University previously implemented the Indonesian National Qualification Framework (KKNI) curriculum. However, the KKNI curriculum has limitations in producing graduates who are adaptable. OBE is an advancement of the KKNI curriculum concept that focuses on graduate outcomes (Sutrisna et al., 2024). To date, PVTM alumni have worked in relevant fields, with 87% of graduates employed as educators in mechanical engineering or automotive sectors. Besides becoming educators, PVTM graduates are projected to work as industry instructors or entrepreneurs, although these roles are underrepresented. The KKNI curriculum's focus on rudimentary skills has resulted in alumni possessing technical skills that are less adaptable to industry needs. By incorporating the OBE curriculum concept and integrating it with SKKNI in the technical schema, graduate competencies can be enhanced and better recognized by the industry (Gea, Deswanda, Rizki & Koto, 2024). The implementation of OBE is believed to address challenges faced by alumni in securing better job opportunities. OBE prepares students to adapt efficiently and effectively in workplace environments (Pritasari et al., 2023).

The PVTM program at Ivet University operates a certification body that manages the Welding Inspector schema. This schema corresponds to Level IV of the KKNI occupational standards, which closely relates to mechanical engineering as it pertains to the supervision of welding programs (Khery et al., 2024). A major focus of curriculum development is the Level IV Welding Inspector occupational schema, a field with high demand in manufacturing and construction industries. The welding inspector schema can be integrated into the curriculum, which is designed to support MBKM activities. Through this integration, students are provided opportunities to engage in internships, research, independent projects, and other activities relevant to the workforce.

Integrating work competencies into higher education curricula can enhance graduate employability. Research has shown that outcome-based learning enables students to simultaneously develop technical and non-technical skills. Therefore, the development of an OBE-based curriculum integrated with SKKNI represents a strategic response to the challenges facing higher education in the modern era (Felder & Brent, 2016).

Furthermore, the MBKM policy provides opportunities for students to study outside their primary programs and gain real-world work experience through internships and competency certifications. This integration enables students to develop interdisciplinary skills highly demanded in today's workforce. In the context of Vocational Education in Mechanical Engineering, the curriculum must accommodate these needs by integrating study materials, SOP-based learning tools, and evaluations adopting Performance Criteria (KUK) in SKKNI.

This study aims to design an OBE-based curriculum integrated with SKKNI to support MBKM activities. The study employs a research and development (R&D) methodology, involving stages ranging from preliminary studies to the preparation of a draft curriculum. The results are expected to make a significant contribution to vocational curriculum development in Indonesia.

METHODS

This study employed the Research and Development (R&D) method (Borg & Gall, D, 1984), chosen for its ability to develop products based on actual field needs. This research followed several key stages, culminating in the development of a hypothetical model, which was achieved through the following steps:

a. Preliminary Study

This phase involved gathering initial data through a literature review, expert interviews, and observations of curriculum needs in the Vocational Education in Mechanical Engineering (PVTM) program. The literature consulted included books, journals, and policy documents related to Outcome-Based Education (OBE), the Indonesian National Work Competency Standards (SKKNI), and the *Merdeka Belajar Kampus Merdeka* (MBKM) initiative.

b. Conceptual Model Design

At this stage, the researchers developed a draft OBE-based curriculum integrated with SKKNI. The draft included the curriculum structure, study materials, learning tools, and evaluation instruments. Each component was designed to support MBKM activities and meet competency standards set by SKKNI.

c. Expert Validation

The curriculum draft was validated by 10 experts, comprising two academics, two industry practitioners, two alumni, two employers, and two policymakers. The validation process assessed the relevance, feasibility, and alignment of the draft curriculum with workforce needs and MBKM policies. Indicators for evaluating the curriculum draft's feasibility included: (1) Relevance; (2) Integration; (3) Flexibility; (4) Feasibility of data sources; (5) Sustainability.

d. Evaluation and Revision

Based on expert feedback, the draft curriculum was revised to improve its quality and relevance. The revision process was conducted iteratively until a final hypothetical draft was developed, ready for trial implementation.

Data collection methods included surveys and focus group discussions (FGDs). Surveys measured the respondents' acceptance level of the curriculum draft, while FGDs provided deeper insights and suggestions from experts and practitioners.

RESULTS AND DISCUSSION

The research findings resulted in a curriculum draft encompassing graduate profiles, which include roles as educators, instructors, and entrepreneurs in the field of mechanical engineering. These profiles were derived from Ivet University's graduate profile framework. Based on input from experts and stakeholders, a strategic approach to achieve these profiles involves integrating the curriculum with the welding inspector occupational schema outlined in the Indonesian National Work Competency Standards (SKKNI). SKKNI ensures that students' technical competencies are nationally standardized (Tampubolon et al., 2021).

Additionally, experts emphasized the importance of integrating MBKM activities to enhance graduates' soft skills. The MBKM program is believed to comprehensively improve students' soft skills (Ariwibowo et al., 2020). Specifically, the curriculum development process focused on the following aspects: relevance, integration, flexibility, feasibility of data sources, and sustainability (Sudrajat, 2019).

This process resulted in the integration of 30% of the study materials from core engineering courses into the curriculum. Through FGDs and curriculum development, 18 competency units were identified as the primary study materials for designing courses. These competencies align with the welding inspector competency units and are distributed across courses in the mechanical engineering field.

a. The identified competency units for integration include:
b. Performing job preparation.
c. Participating in quality systems.
d. Preparing welding maps.
e. Creating detailed work drawings.
f. Interpreting processes, equipment, and products.
g. Reviewing base materials and consumables based on the Welding Procedure Specification (WPS).
h. Interpreting assembly joint construction designs in accordance with general assembly procedures.
i. Ensuring welding process quality.
j. Identifying WPS.
k. Conducting visual welding inspections.
l. Reviewing work documents related to supervision.

m. Assessing tools, machinery, and welding consumables.
n. Coordinating fabrication welding processes.
o. Supervising prefabrication and fabrication welding processes.
p. Supervising assembly processes and welded products.
q. Controlling welding fabrication processes.
r. Supervising repair processes for welding outcomes.
s. Preparing supervision reports.

Course No	Topic	Integrated Competency Units	MBKM Activity Options	Course Code	Course Name
1	Standards and Machine Drawing Tools	C.25LAS01.002.1, C.25LAS01.013.01	PP, SI	1	Engineering Drawing 1
2	Geometry Synthesis	C.25LAS01.017.01	PP, SI		
3	Types of Lines		PP, SI		
4	Projections		PP, SI		
5	Material Engineering	C.25LAS01.018.01	SI, PP	2	Material Engineering
6	Material Structure & Properties		SI, PP		
13	Industrial Metrology		PP	7	Metrology and Workshop Practice
14	Workshop Practice	C.25LAS01.001.1	PP		
15	Sketch Drawing	C.25LAS01.011.01	SI	8	Engineering Drawing 2
16	Auxiliary Views & Sectional Drawings	C.25LAS01.020.01	SI		
17	Dimensioning and Tolerancing		SI		
18	Simplified Machine Element Drawings		SI		
19	Assembly & Detail Drawings	C.25LAS01.019.01, C.25LAS01.022.01	SI		
49	SMAW & OAW	C.25LAS01.031.01	PYK	21	Basic Welding
50	GTAW & GMAW		PYK		
125	Supervising Work Documents	JIP.WS02.001.01	PYK	67	Technical Work Supervision
126	Welding Tools Assessment	JIP.WS02.002.01	PYK		
127	Coordination of Welding Fabrication	JIP.WS02.003.01	PYK	69	Technical Work Coordination
128	JIGS Design		PYK		
129	JIGS Welding Process	JIP.WS02.005.01	PYK		
130	Theory of Appropriate Technology		PYK	71	Welding Project
131	Practice of Appropriate Technology	JIP.WS02.006.01, JIP.WS02.007.01	PYK		
132	Reporting of Appropriate Technology Results	JIP.WS02.009.01, JIP.WS02.010.01	PYK		

PP: Internships *(Program Pertukaran)*
SI: Independent Studies *(Studi Independen)*
PYK: Independent Projects *(Proyek Mandiri)*

Based on the matrix scaffolding analysis, a total of 74 courses were identified within the OBE-oriented curriculum, including core, supporting, elective, and program-specific courses. Among these, eight courses were found to incorporate elements of standardized competency units from the SKKNI Welding Inspector schema, with the majority included as elective courses. These eight courses are: Technical Drawing 1, Engineering Materials, Metrology and Auxiliary Work, Technical Drawing 2, Basic Welding Work, Technical Work Supervision, Technical Work Coordination, and Welding Project. Each course produces learning tools based on Standard Operating Procedures (SOP) aligned with the Performance Criteria outlined in SKKNI.

The curriculum structure was designed to support MBKM activities through matrix scaffolding, which connects courses with internship programs, research, and independent projects (Rodin et al., 2024). Matrix scaffolding is considered an effective tool for providing precise recommendations in course selection (Alfarizi et al., 2022). Validation of the curriculum draft revealed its comprehensive design, aligning with both learning outcomes and graduate user needs. A survey distributed to 10 expert respondents showed that 83% strongly agreed, 12% agreed, and 5% were neutral regarding the feasibility of the curriculum draft. Eighteen relevant study topics were identified to shape core courses. These study topics are integral to forming the curriculum's core academic subjects. Respondents indicated that the curriculum is highly relevant to current conditions and developments in science and technology. The draft also demonstrated a strong alignment between the study topics and the competency units within the welding inspector schema.

Furthermore, the curriculum's learning activities are predicted to be flexible and supportive of MBKM initiatives. With competency standards based on SKKNI, the drafted curriculum provides a clear framework of competencies (Nirwana et al., 2021). The advancement of Indonesia's competency testing systems is expected to contribute positively to ongoing curriculum development in future periods (Hakim, 2023). The integration of the curriculum with MBKM enables students to gain learning experiences directly relevant to the workforce through Student Exchange (PP), Independent Studies (SI), and Independent Projects (PYK). This integration aligns with MBKM's objective of enhancing graduate employability.

CONCLUSION

The designed OBE curriculum integrates with the SKKNI Welding Inspector schema and MBKM activities, encompassing the following elements:

a. Eighteen study topics form the foundation for eight core academic courses within the program.
b. The curriculum is structured around three key concepts: Outcome-Based Education (OBE), SKKNI, and Welding Inspector competencies.
c. The identified study topics can be implemented in *Merdeka Belajar Kampus Merdeka* (MBKM) activities, including Independent Studies (SI), Student Exchange (PP), and Projects (P).
d. A survey distributed to 10 expert respondents indicated that 83% strongly agreed, 12% agreed, and 5% were neutral regarding the feasibility of the curriculum draft.

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