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Evaluation of the Curriculum for the Untirta Electrical Engineering Vocational Education Study Program Referring to the Needs of the World of Work and the Industrial World

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Abstract

This research aims to review and improve the curriculum of the Electrical Engineering Education Department at Sultan Ageng Tirtayasa University in accordance with developments in science and technology and the needs of stakeholders. Curriculum review and development is carried out by referring to graduate competencies in accordance with the Indonesian National Qualifications Framework (KKNI) in the field of Electrical Engineering and Electrical Engineering Education. This research is an evaluation research on curriculum implementation using the TIPP (Context, Input, Process, Product) model, and curriculum development through content analysis and discussion. The research results show that in general the implementation of the 2019 curriculum for the Vocational Education Department in Electrical Engineering is classified as appropriate (good) according to lecturer/alumni respondents, and quite appropriate (fairly good) according to student respondents. There are quite a lot of deficiencies, both in the content of the curriculum and the implementation of the curriculum, especially in the Input, Process and Product aspects. Based on the study of the evaluation results of the implementation of the curriculum and KKNI as well as the vision & mission and objectives of the Vocational Education Department of Electrical Engineering FKIP Untirta, a competency design can be formulated which should be mastered by undergraduate graduates majoring in Electrical Engineering Education as well as the draft curriculum framework. This design needs to be studied further and validated adequately so that a curriculum device can be produced that has relevance, quality and adequate benefits for students/graduates, society and the world of work.

Keywords: *Evaluation, PVTE Curriculum, World of Work and Industry*

Abstrak

Penelitian ini bertujuan untuk mengkaji dan menyempurnakan kurikulum Jurusan Pendidikan Teknik Elektro Universitas Sultan Ageng Tirtayasa sesuai dengan perkembangan ilmu pengetahuan dan teknologi serta kebutuhan*stakeholders*. Telaah dan pengembangan kurikulum dilakukan dengan mengacu pada kompetensi lulusan sesuai dengan Kerangka Kualifikasi Nasional Indonesia (KKNI) bidang Teknik Elektro dan Pendidikan Teknik Elektro. Penelitian ini merupakan penelitian evaluasi pelaksanaan kurikulum dengan model TIPP(*Context, Input, Process, Product*), dan pengembangan kurikulum melalui analisis isi dan diskusi. Hasil penelitian menunjukkan bahwa secara umum pelaksanaan kurikulum 2019 Jurusan Pendidikan Vokasional TeknikElektro tergolong sesuai (baik) menurut responden dosen/alumni, dan termasuk cukup sesuai (cukup baik) menurut responden mahasiswa. Terdapat cukup banyak kekurangan, baik dari isi kurikulum maupun pelaksanaan kurikulum tersebut, terutama pada aspek *Input, Process,* dan *Product*.Berdasarkan pengkajian hasil evaluasi pelaksanaan kurikulum dan KKNI serta visi & misi dan tujuan Jurusan Pendidikan Vokasional Teknik Elektro FKIP Untirta, dapat dirumuskan rancangan kompetensi yang seharusnya dikuasai lulusan S1 Jurusan Pendidikan Teknik Elektro serta draf kerangka kurikulumnya. Rancangan tersebut perlu dikaji lebih lanjut dan divalidasi secara memadai sehingga dapat dihasilkan perangkat kurikulum yang memiliki relevansi, mutu dan kemanfaatan memadai bagi mahasiswa/lulusan,masyarakat, dan dunia kerja.

Kata-kata kunci: Evaluasi, Kurikulum PVTE, Dunia Kerja dan Dunia Industri

1. Introduction

Based on the results of the self-evaluation analysis regarding stakeholder demands (development of science and technology, globalization, policy on changes in high school ratios, National Education and Vocational Standards), Sultan Ageng Tirtayasa University (Untirta) needs to follow up by equipping its graduates with adequate competencies, both in hard skills and soft skills. In the concept of competence in the world of work, the abilities of undergraduate students and graduates from the Department of Electrical Engineering Education and FKIP Untirta need to be adjusted to the Indonesian National Qualifications Framework (KKNI) so that they can be on par with graduates from other universities, both at home and abroad [1]

Government Regulation no. 17 of 2010 Article 97 mandates that the higher education curriculum developed and implemented must be competency-based (KBK). This statement is confirmed in Kepmendiknas No. 232 of 2012 concerning guidelines for preparing higher education curricula and assessing student learning outcomes, as well as Minister of National Education Decree No. 45 of 2012 concerning curriculum in universities. Referring to this legal basis, the Department of Electrical Engineering Education has tried to improve the old curriculum (2019) to develop a competency-based curriculum for the industrial world in 2024 which will be implemented in the next year. This adjustment was made in order to correct the gap between the competencies produced by universities and the competencies required by industry [2]

In line with the development of science and technology in the field of Electrical Engineering, especially in electronics, computers and information technology, the KBK curriculum prepared in 2019 was developed by revising several parts and was named the 2019 curriculum. Since 2014, the Department of Electrical Engineering Education, FKIP Untirta has been developing and implementing the KBK. In reality, much of the learning carried out is still the same as in the previous curriculum. The application of the KBK is in accordance with the Decree of the Minister of National Education No. 232/U/2000 and No. 45/U/2012 cannot yet be implemented optimally. This is caused by various factors, such as lecturers' varying understanding of CBC and its implementation in learning.

With the establishment of the KKNI by the government through Presidential Decree no. 8 of 2012 as a reference in preparing learning outcomes for graduates at each level of education nationally, the Department of Electrical Engineering Education needs to review the implementation of the current curriculum, reformulate learning outcomes, and build a curriculum structure that refers to the KKNI.

Based on the description above, it is necessary to study the implementation of the existing curriculum and reconstruct the competency-based curriculum in the Department of Electrical Engineering Education, FKIP Untirta. By developing a curriculum that refers to the KKNI, it is

hoped that graduates will meet the qualifications set by the world of work, so that they have the opportunity to work at national and international levels[3]. This research focuses on three main aspects, namely:

1. The implementation of the 2019 Curriculum that has been used so far is seen from the suitability of context, input, process and product;
2. Competencies required by graduates of the Electrical Engineering Education Department according to the KKNI;
3. Curriculum design for the Department of Electrical Engineering Education, FT Untirta, which refers to the KKNI.

The vision of the Department of Electrical Engineering Education, FKIP Untirta is to become a leading department in education and training in the field of electrical engineering, producing graduates who are intelligent, professional, independent, conscientious, and adaptive to developments in science and technology [4]. Graduates of the Electrical Engineering Education Department are expected to have educational and non-educational competencies. Educational competence includes planning, management, implementation and evaluation of education and training, both in schools and industry. Non-educational (engineering) competencies include planning tender documents, selecting materials and equipment, designing and installing automatic control installations in industry, as well as operating and developing the performance of automatic control systems based on information and communication technology (Ilham Akbar Darmawan, 2016).

In order to achieve this goal, the strategies developed include strengthening adaptive curriculum permeability, developing IT-based learning models, developing computer-based teaching materials, improving the quality of academic services to the ISO 9000 standard, increasing collaboration with stakeholders to improve the quality of graduates, as well as developing certification-based tests. life skills [6]. The government regulates education issues in the National Education System Law no. 20 of 2003, which explains that education is a conscious and planned effort to develop the potential of students in order to form spiritual strength, intelligence, noble morals and skills needed by society.

The Indonesian National Work Competency Standards (SKKNI) is a work ability formulation that includes knowledge, skills and work attitudes that are relevant to work tasks. SKKNI is a competency standard that applies nationally, and is not an individual competency standard for a particular company. SKKNI is designed to be applicable to all similar companies. SKKNI was developed in the Regional Model Competency Standard (RMTS) format, which was formulated by APSDEP – ILO in 1998. KKNI is a competency leveling framework to equalize and integrate education and work experience in recognizing work competencies, according to job structures in

various sectors [7]. The packaging of SKKNI into KKNI is very important for comparison, equalization of qualifications, and recognition of qualifications at national and international levels (Aprilianty, 2012).

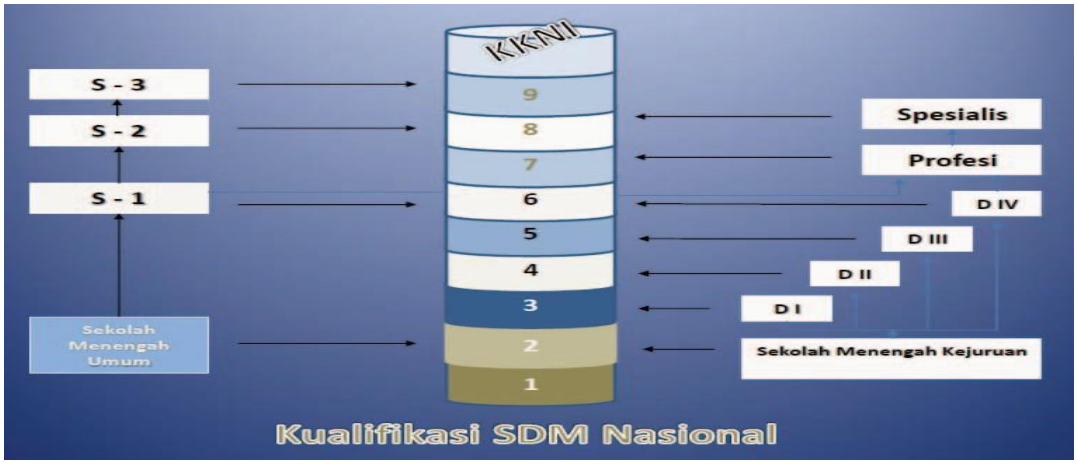

Figure 1. Cualification SDM Indonesia

2. Method

The aim of this research is to evaluate the curriculum in the Department of Electrical Engineering Education, FKIP Untirta based on four main aspects of evaluation, namely context, input, process and results. This research uses an evaluation method (evaluation research). Apart from that, this research also conducted an assessment of the competencies that graduates of the Electrical Engineering Education Study Program (S1 and D3) should have, by referring to the results of curriculum evaluations and standards KKNI.

This research was carried out at the Department of Electrical Engineering Education, FKIP, Sultan Ageng Tirtayasa University, with a research duration of six months, starting from May to October 2024. This research activity includes: research preparation, implementation of curriculum evaluation using the CIPP method (Stufflebeam, 2007),(data collection), analysis of research data, study of KKNI, assessment of competencies of graduates of the Department of Electrical Engineering Education FKIP Untirta, identification of main and supporting competencies, assessment of curriculum based on main competencies and support, as well as developing a curriculum framework.

The data sources for this research consist of lecturers, students and alumni of the Electrical Engineering Education Department, FKIP Untirta, as well as employees and leaders from companies or educational institutions (SMK) whose fields of work are relevant to graduate qualifications. In an effort to design a curriculum that is in accordance with the KKNI, an in-depth analysis is needed regarding the main and supporting competencies required by graduates. Data regarding main and supporting competencies was obtained through discussions and

brainstorming with various related parties, including alumni, graduate users in the business and work world, government representatives, and lecturers. The instruments used in this research include observation, questionnaires, documentation and interviews, to collect data in accordance with the research objectives.

3. Results and Discussion

Results and discussion can be created as a single unit containing research findings and explanations.

3.1. Curriculum Evaluation viewed from the CIPP aspect

The suitability of the 2019 Curriculum for Electrical Engineering Education at FKIP Untirta needs to be analyzed thoroughly based on these four aspects. The evaluation results show that, according to lecturer and alumni respondents, this curriculum has a suitability level of 75.81%, which is classified as appropriate. Meanwhile, the percentage obtained from student respondents was 64.64%, with a fairly suitable category.

The 2019 curriculum implemented shows several shortcomings in every aspect. From the context aspect, it is necessary to pay attention to the suitability of the department's vision and mission with the needs of the world of work and society. The competencies taught must continue to be adapted to developments in the outside world[10].

In the input aspect, it is necessary to increase lecturers' understanding of the curriculum used and the suitability of the material to the handbook. Lecturers' understanding of the curriculum is very important, because the curriculum has gone through a long preparation process. The handbook must also be in line with existing competencies and syllabus.

From the process aspect, the facilities available for practical lectures and the allocation of discussion time provided by lecturers still need to be improved[11]. Adequate facilities are very important for the smooth running of practical learning. Discussion time is also considered insufficient by most students, even though discussions are important to open their insight and understanding [12]

Meanwhile, in the product aspect, there are still a small number of undergraduate program graduates who are less interested in working in the education sector and prefer to enter the industrial world. Competencies Required by Graduates of the Electrical Engineering Education Department of Undergraduate Program Based on Needs Analysis and KKNI

After evaluating the implementation of the curriculum and getting the results, the next step is to develop the competencies of graduates of the Electrical Engineering Education Department. The competencies of graduates of the Bachelor's Program are developed through several stages, namely: (1) Examining the vision, mission and objectives of the Department of Electrical Engineering

Education for Bachelor's Degrees (2) Analyzing the competencies needed in the world of work, including the field of education; (3) Prepare a draft curriculum framework for the Department of Electrical Engineering Education for the PVTE Undergraduate Program based on the KKNI. This development involves a team of lecturers from the Electrical Engineering Education Department, related alumni, and leaders from the world of work in industry and vocational schools.

3.2. Competencies required by PVTE graduates based on KKNI

After the curriculum evaluation is complete and the results are obtained, the next step is to develop the competencies of graduates of the Electrical Engineering Education Department at FKIP Untirta. Graduate competencies for the Electrical Engineering Education Department's Undergraduate Program are designed through several stages of assessment, namely: (1) Reviewing the vision, mission and objectives of the Electrical Engineering Education Department for the PVTE Undergraduate Program; (2) Conduct an analysis of the competencies needed in the world of work, including in the field of education; (3) Develop a curriculum framework for the Electrical Engineering Education Department for the Undergraduate Program which refers to the Indonesian National Qualifications Framework (KKNI). This development process involved a team of lecturers from the Department of Electrical Engineering Education, a number of relevant alumni, and management from the world of work, both from industry and vocational schools [13]

The vision of the FKIP Untirta Electrical Engineering Education Study Program is to become a superior study program in education and training in the field of electrical engineering that produces graduates who are intellectual, professional, independent, with integrity, and adaptive to developments in science, technology and the arts.

By paying attention to various local, national and global aspects and issues, the mission of the Electrical Engineering Education Study Program is as follows:

1. Organizing synergistic quality education and learning between educational and non-educational programs in the field of electrical engineering.
2. Preparing academic and professional staff in the field of electrical engineering in accordance with the demands of the world of work and developments in science and technology.
3. Develop excellence in the field of electrical engineering education based on competency and life skills.
4. Building synergistic cooperation in an effort to provide quality education.
5. Increase research and community service in the field of electrical engineering to develop an academic culture and independence of the academic community that is innovative, creative and competitive.
6. Strengthen a sustainable department management system by utilizing information technology.

7. Develop a collaborative network with government agencies, educational institutions, as well as the business and industrial world, both at the local and regional levels.

Based on this vision and mission, the objectives of the Electrical Engineering Education Study Program are:

1. Improving the quality of educational provision for the development of intellectual, attitudinal, social and professional abilities of the academic community.
2. Increasing the relevance of the curriculum so that it can produce independent, creative and innovative graduates that society needs.
3. Organizing education that contains moral values and life skills by paying attention to local and global issues.
4. Improving the quality of research and scientific work in the field of electrical engineering that supports the development of science and technology and the needs of society.
5. Improving the quality of community service based on research and community needs.
6. Developing information technology-based institutional communication and management systems.
7. Establish synergistic cooperation with various related institutions, including the government, the world of education, as well as the world of business and industry.

Graduates of the Bachelor of Electrical Engineering Education Program are expected to have competencies in the educational and non-educational fields as follows:

a. Educational Competencies:
    1. Plan and manage technology and vocational education, both formal and non-formal.
    2. Manage vocational education and training in schools and industry.
    3. Implement and evaluate vocational education teaching in schools and industry.
    4. Manage education and training based on Information and Communication Technology (ICT).
b. Non-Educational Competencies (Electrical Engineering):
    1. Solve problems in the field of electrical engineering, including electrical power systems and control systems.
    2. Read, install, and test electrical power or control systems.
    3. Diagnose and repair electrical system damage.
    4. Maintain the electrical system so that it is always ready for use.
    5. Choose the appropriate method or tool for solving electrical engineering problems.
    6. Analyze measurement results for decision making.
    7. Master the basics of electrical engineering, including generation, transmission, energy distribution, installation and protection.
    8. Know the principles of K3 in the field of electrical engineering and their impact on work quality.

9. Understand the planning and design of residential and industrial electrical installations and master installation skills.
10. Understand the relationship between humans, machines and the work environment.
11. Be aware of the professional aspects of electrical engineering and its role in society, including work safety.
12. Have an entrepreneurial spirit to develop commercially viable products.
13. Master planning, project management and cost control.
14. Utilize information technology to support work.
15. Communicate ideas effectively.

3.3. PVTE Curriculum Framework

<table>
<tr><td>Fourth Year</td><td rowspan="6">Pedagogics (37 sks)</td><td colspan="6">Industrial Electric Systems</td></tr>
<tr><td>Third Year</td><td colspan="3">ELECTRITAL POWER</td><td colspan="3">INDUSTRIAL CONTROL</td></tr>
<tr><td></td><td>Generation</td><td>Power Transmission</td><td>Power Distribution</td><td>Dinamic Systems</td><td>Controllers</td><td>Automation & Instrumentation</td></tr>
<tr><td>Second Year</td><td colspan="6">COMPUTER CONTROL</td></tr>
<tr><td></td><td colspan="3">Computer Programming</td><td colspan="3">Information Technology</td></tr>
<tr><td></td><td colspan="6">BASIC TECHNOLOGY</td></tr>
<tr><td>First Year</td><td colspan="2">Basic Sciences</td><td>Elektrical Technology</td><td>Basic Computer</td><td>Basic Controls</td><td>Industrial Technology</td></tr>
<tr><td colspan="2">37 sks</td><td colspan="5">110 – 113 sks
Teori (40%); Praktik (60%)</td></tr>
</table>

Based on the table provided, the curriculum for the Electrical Engineering Education Study Program at FKIP Untirta is designed to equip students with various competencies in the field of electrical engineering which become increasingly specific as the years of study increase.

First Year:

The main focus is on the basics of science and technology, with the Basic Sciences and Basic Technology categories. This year's courses include:

- Electrical Technology: Basics of electricity to understand the main concepts that will become the foundation of electrical engineering knowledge.
- Basic Computer and Basic Controls: Basic understanding of computer technology and control systems relevant to the electrical engineering industry.*Industrial Technology*:

  Introduction to industrial technology that is useful in electrical applications in the world of work.

In this first year, students receive a theoretical foundation and basic skills that will later be developed in advanced courses.

Second Year:

Primary focus on developing information technology and computer control skills, including:

- *Computer Programming and Information Technology: Students learn the basics of programming and information technology that will be used in the operation and control of electrical systems.*
- *Computer Control: This course discusses computer-based control techniques, which are needed for various applications in industry.*

At this stage, theory and practice are combined to improve students' abilities in computer technology-based programming and control.

Third Year:

Students begin to focus on industrial power and control systems, including:

- *Electrical Power: Covers components such as Generation, Power Transmission, and Power Distribution to provide an understanding of the production, transmission, and distribution of electric power.*
- *Industrial Control: Students learn about Dynamic Systems, Controllers, and Automation & Instrumentation, which are important in industrial control processes.*

This year is focused on applying theoretical knowledge into real practice through the study of electrical power and industrial control systems.

Fourth Year:

In the final year, the curriculum focuses on pedagogy as well as advanced industrial applications, including:

- Industrial Electric Systems: Application of knowledge learned to more complex situations in industrial environments.
- Pedagogics: Students study pedagogy to prepare them to become competent educators in electrical engineering education.

Overall Curriculum Structure: This curriculum consists of a credit load with a total of around 111-113 credits, consisting of 40% theory and 60% practice. This division shows that practice is prioritized in the learning process so that students are competently prepared to face situations in the field.

4. Conclusion

In general, the results of the evaluation of the implementation of the 2019 Curriculum in the Department of Electrical Engineering Education, FKIP Untirta showed quite good results. Based on accumulative assessments from lecturers and alumni, the level of curriculum suitability reached 75.81%, falling into the "suitable" category. Meanwhile, assessments from students showed a suitability level of 64.64%, which was classified as "quite suitable."

However, the implementation of the 2019 curriculum still has several aspects that need to be improved. From a context perspective, it is necessary to improve the compatibility between the department's vision and mission and the applied curriculum, including adjustments to the needs of the world of work and society. The competencies taught must also always follow dynamic industrial and technological developments.

In terms of input, some lecturers still do not have sufficient understanding of the existing curriculum, and the suitability between the material taught and the guidebook also needs to be improved. In the process aspect, facilities for practical courses need to be improved, and the time provided by lecturers for discussions with students is felt to be insufficient. Adequate discussion is essential so that students can exchange views, which will help broaden their horizons.

Through studies involving lecturers from the Department of Electrical Engineering Education, alumni, and practitioners from various industries and vocational schools, the competencies needed by graduates were formulated, along with a Curriculum design for the Department of Electrical Engineering Education for the D3 Electrical Engineering program and the Bachelor of Electrical Engineering Education program. . The competency design and curriculum structure produced in this research requires refinement and validation so that the resulting curriculum is of high quality and relevant to all relevant parties.

Corrective steps needed for future curriculum implementation include curriculum outreach to lecturers, students and related parties; development of lecture tools in accordance with curriculum content; fulfillment of practical facilities and materials; as well as improving the lecture system to support optimal learning processes.

The conclusion contains a summary of research results or research findings, which correlate with the research objectives written in the introduction section. Then, state the main points of the discussion. A conclusion generally ends with a statement about how the research work contributes to the field of study as a whole (showing how it advances current knowledge). Common mistakes in this section are repeating experimental results, abstracting them, or presenting them very listically. The conclusion section must provide clear scientific truth. Apart from that, the conclusion section can also provide suggestions for future experiments.

5. *Acknowledgement*

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References

[1] S. Böhn and V. K. Deutscher, "Development and Validation of a Learning Quality Inventory for In-Company Training in VET (VET-LQI)," *Vocations and Learning*, vol. 14, no. 1, pp. 23–53, Apr. 2020, doi: 10.1007/s12186-020-09251-3.

[2] Putu Sudira, "Praksis Pendidikan Vokasional di Indonesia Unggul dan Bermartabat," in *Prosiding Seminar Nasional Pendidikan Vokasional (SNPV) FT UNY*, Yogyakarta: UNY, FT, 2017, pp. 1–11.
[3] A. M. Zakaria, "Peluang Alumni LPTK dan Pendidikan Vokasi Dalam Pemenuhan Kebutuhan Tenaga Guru," in *Prosiding SNPV*, Yogyakarta: FT UNY, 2017, pp. 12–16.
[4] N. Z. Zakaria, N. A. Md. Jizat, and N. Zakaria, "Leadership Skills among Technical and Vocational Educators.," *Journal of Education and Practice*, vol. 6, no. 16, pp. 50–55, 2014, [Online]. Available: http://eric.ed.gov/?id=EJ1079940
[5] Ilham Akbar Darmawan, "Efektifitas Kepemimpinan Vokasi untuk Produktivias Pembangunan Sumber Daya Manusia di Balai Latihan Kerja," in *Prosiding Seminar Nasional Penguatan Manajemen Pendidikan Menuju Kebangkitan Pendidikan Nasional*, Jakarta: Himpunan Doktor Manajemen Pendidikan Indonesia (HIDMAPI), 2016, pp. 113–124.
[6] Purnawati, "Peningkatan Kemampuan Melalui Pelatihan Berbasis Kompetensi (Competency-Based Training) Sebagai Suatu Proses Pengembangan Pendidikan Vokasi," *Jurnal Medtek*, vol. 3, pp. 1–13, 2011.
[7] A. Abdelhak, T. Mohammed, R. Mohammed, S. Khalid, and T. Abderrahim, "Quality Management in Vocational Training: Evaluation of A Specialized Institution in Ict," *Procedia Soc Behav Sci*, vol. 191, pp. 1928–1933, 2015, doi: 10.1016/j.sbspro.2015.04.261.
[8] E. Aprilianty, "Pengaruh Kepribadian Wirausaha, Pengetahuan Kewirausahaan dan Lingkungan Terhadap Minat Berwirausaha Siswa SMK," *Pendidikan Vokasi*, vol. 2, no. 3, pp. 311–324, 2012, doi: 10.1007/s11365-012-0246-x.
[9] D. L. Stufflebeam, "Cipp evaluation model checklist," 2007.
[10] N. Awni ALBELBISI, A. Samed AL-ADWAN, and A. Habibi, "A QUALITATIVE ANALYSIS OF THE FACTORS INFLUENCING THE ADOPTION OF MOOC IN HIGHER EDUCATION," *Turkish Online Journal of Distance Education-TOJDE*, vol. 24, no. 2, 2023.
[11] S. Donitsa-Schmidt, R. Ramot, and B. Topaz, "Shaping the future of distance learning in teacher education: MOOCS during COVID-19," *Perspectives in Education*, vol. 40, no. 1, pp. 250–267, 2022, doi: 10.18820/2519593X/PIE.V40.I1.15.
[12] A. Bangga, "Peran Balai Latihan Kerja dalam Meningkatkan Kompetensi Calon Tenaga Kerja dan Implikasinya terhadap Ketahanan Pribadi Siswa (Studi di Balai Besar Pelatihan Vokasi dan Produktivitas Serang, Kota Serang, Provinsi Banten)," *Jurnal Ketahanan Nasional*, vol. 28, no. 3, Dec. 2022, doi: 10.22146/jkn.76540.
[13] A. A. Şendoğdu and A. Diken, "A Research on the Problems Encountered in the Collaboration between University and Industry," *Procedia Soc Behav Sci*, vol. 99, pp. 966–975, Nov. 2013, doi: 10.1016/j.sbspro.2013.10.570.