Descriptive review curriculum study of vocational education in electrical engineering

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Received: 06 March 2025; *Revised:* 02 April 2025; *Accepted:* 05 April 2025

Cite this https://doi.org/10.24036/jptk.v8i2.43423

Abstract: Educational institutions aim to produce the best professional graduates in their fields. Educational institutions cannot achieve these goals by themselves, they need the participation of the community. This situation forces education to continue to be sensitive to the needs of society, the demands of the times and government policies and to anticipate them by continuing to improve various related components in it. One of the components involved in the framework of the education system is the curriculum. This research is descriptive qualitative which aims to find out the picture, situation, a thing by describing it in as much detail as possible according to the existing facts of the Electrical Engineering Vocational Education curriculum. The results of this study indicated that the curriculum structure of the electrical engineering vocational education study program has characteristics based on the composition of the course consisting of general courses, engineering courses, and professional expertise courses. Based on the study material, engineering courses can be grouped into mandatory engineering courses, basic courses, supporting courses, and additional courses.

Keywords: curriculum; vocational education; electrical engineering; descriptive analysis

1. Introduction

Vocational higher education has a very strategic role in preparing human resources (HR) who are competent and ready to face the world of work, especially in responding to the challenges of the industrial revolution 4.0 and 5.0 (Damayanti 2021) ; (Ade Octaviany et al. 2022) ; (Tri, Hoang, and Dung 2021). In the midst of rapid technological development and the demands of globalization, the vocational education system is required to be more adaptive and responsive to dynamic industrial needs (Njonge 2023); (Sudira, 2019). In addition, technological developments and the industrial revolution 4.0 have significantly changed the employment landscape. The industrial world now demands that graduates produced by vocational higher education not only master technical abilities (hard skills), but also have good soft skills such as critical thinking, collaboration, communication, creativity, and digital literacy (Sulistyo et al., 2022). In addition, it also puts forward the concept of society 5.0, where the role of humans as the center of innovation is becoming increasingly important. Under these circumstances, universities play an important role in creating competitive and skilled human resources in accordance with industry needs (H & Somosot, 2024). So in this case, education is forced to continue to be sensitive to industry needs and technological developments that occur and anticipate them by continuing to improve and develop various related components in it.

Curriculum is one of the important components involved in the framework of the education system

(Shimray 2023) ; (Dazeley et al. 2024). Vocational higher education needs to design a curriculum that is able to produce graduates who have high adaptability, innovative spirit and character (Hutahaean et al., 2024). This certainly cannot be achieved without a comprehensive update and review of the current curriculum. In a vocational higher education institution, all parties involved will collaborate to develop and monitor the curriculum needed by the study program to produce high-quality graduates (Nurlaela et al. 2022) ; (Fauna et al. 2024). A strong, mature and dynamic curriculum from each study program will create graduates who are competent and confident with their experience.

In addition, in terms of policy, the Indonesian government has established various regulations that form the basis for the implementation of higher education, such as the Merdeka Belajar-Kampus Merdeka (MBKM) policy (Supriati et al., 2022). This policy directly requires vocational higher education to adjust its curriculum to be in line with the direction of national policy and future needs. The implementation of Merdeka Belajar-Kampus Merdeka, for example, encourages the creation of a flexible and contextual curriculum, where students can learn not only on campus, but also through internships and other activities that directly involve the industrial world (Veltri et al. 2011);(Yoto et al. 2024);(Fuadi and Irdalisa 2022). On the other hand, the changing characteristics of students as a digital generation are also an important factor that must be considered in designing the curriculum. Therefore, vocational higher education needs to periodically review the curriculum to adjust to the evolving characteristics of students.

Curriculum review is also important to respond to feedback from stakeholders such as alumni, graduate users and partners (Papanai & Poolkrajang, 2023). The feedback provided often indicates that there are certain aspects of the curriculum that are not maximized in supporting student work competencies. The results of this curriculum review can later be used as a basis for decision making in the process of continuous curriculum improvement (Yang and Yeh 2024) ; (Veltri et al. 2011). By considering these various dynamics, it is necessary to review the Electrical Engineering Vocational Education curriculum. This descriptive review aims to determine the characteristics of the Electrical Engineering Vocational Education curriculum itself and to ensure that the applied curriculum is always up-to-date, relevant and responsive to technological developments and government policies and can also facilitate all elements of the main and basic abilities for each graduate of Electrical Engineering Vocational Education.

2. Methods

The research used descriptive analysis method. The descriptive analysis method is an approach that aims to provide an accurate and comprehensive description of a phenomenon, event or certain variables as in this study describing data but also using simple analysis to reveal the characteristics contained therein (Yang & Yeh, 2024). The data collection is in the form of qualitative data by using interviews, observations and ither literature.

2.1 Informant

In this study, informants are people who can provide information about existing situations or conditions so that the data generated can be accurate and reliable. The data is in the form of statements, information and data that can help to achieve research objectives. The selection of respondents was carried out using purposive sampling technique, namely taking data sources with certain considerations, namely that the informant was considered to know best about what the researcher expected so as to get accurate information (Sugiyono, 2013). The informants in this study were three senior lecturers in the electrical engineering department. The lecturers had more

than 15 years of teaching experience. One of them was the head of the electrical engineering vocational education study program.

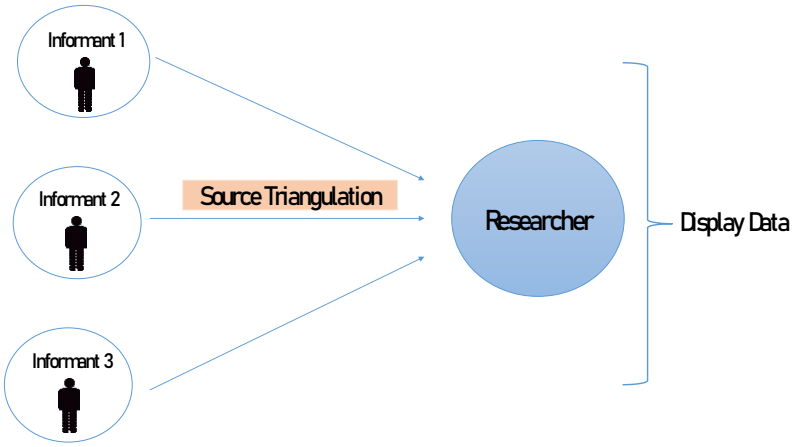

Figure 1. Research design

2.2 Instrument

Research instruments were used, namely :

a. The main instrument is the researcher himself, where the researcher has an important role in determining the data to be obtained.
b. Supporting instruments are interview guidelines, notebooks, voice recorders, and other literature in the form of journals, books, or other reading sources relevant to this research.

2.3 Data collection

The data sources used in this research are data obtained from interviews conducted, the curriculum of the electrical engineering vocational education study program and other literature in the form of journals or books.

2.4 Data analysis technique

Based on the objectives of this study, the data analysis techniques used are (Sugiyono, 2013):

a. Data collection
   Researchers collected data in the form of interviews with several respondents and literature studies obtained from journals, documentation books, the internet and other libraries.

b. Data reduction
   Data reduction from previous data collection. Data reduction is defined as the process of selecting data that focuses on research objectives. Data reduction activities take place continuously during the qualitative research process until an analysis is formed that refines, classifies, directs, discards unnecessary data so that the final conclusion can be drawn and verified.
c. Presentation of data
   Researchers can present data after data reduction. Presentation of data in the form of structured information conclusions that allow conclusions to be drawn.

d. Verification and confirmation of conclusions
Researchers carried out the last data analysis stage, namely verification and confirmation of conclusions obtained from the previous data presentation. Conclusions were reached after the research was completed and the reporting process was completed.

3. Results

Electrical Engineering Vocational Education is a study program that equips students with technical and specific abilities as teachers in the Electrical Engineering vocational field. The Electrical Engineering Vocational Education curriculum is prepared in accordance with the objectives of the study program, namely to produce vocational teachers in Electrical Engineering, applied researchers in the field of electrical technology, or produce human resources in the field of coaching according to their expertise. In the current era of globalization with increasingly fierce competition in the world of work, graduates of Electrical Engineering Vocational Education are required to have specific and relevant expertise in accordance with the objectives of the study program. With the existence of a government policy, namely the Merdeka Belajar-Kampus Merdeka policy, the Electrical Engineering Vocational Education study program is required to harmonize the existing curriculum. This study uses the results of interviews and analysis of the Education University curriculum, among others: Universitas Negeri Padang, Universitas Negeri Yogyakarta and Universitas Negeri Jakarta.

3.1 Curriculum overview of the electrical engineering vocational education study program

The results of the review of the Electrical Engineering Vocational Education curriculum viewed based on the course structure consist of general courses, professional expertise courses, and engineering courses. The engineering course structure is divided into compulsory engineering courses, basic engineering courses, supporting engineering courses, and additional engineering courses.

3.1.1 Engineering compulsory course group

This compulsory engineering course is a course that provides general engineering knowledge and skills competencies that must be possessed by engineering students. In accordance with the results of interviews with several informants which can be summarized in table 1.

Table 1. Competencies of the engineering compulsory course group

Informant	Compulsory engineering courses
Informant 1	Compulsory engineering courses in the current curriculum structure are in the group of compulsory faculty courses, so it can be said that compulsory engineering courses are courses that must be taken by engineering faculty students. Compulsory engineering courses aim to provide general engineering competencies for engineering faculty students. In other words, compulsory engineering courses should not be eliminated.
Informant 2	Compulsory engineering courses aim to provide basic engineering knowledge competencies that will be useful to support further engineering science. In the government policy that must be aligned with the MBKM curriculum, this compulsory engineering course cannot be converted to various existing MBKM programs. This compulsory engineering course is implemented in the early

	semester. One of the compulsory engineering courses in the current curriculum is Engineering Physics.
Informant 3	Compulsory engineering courses where this course provides basic knowledge that must be owned by all engineering students. Compulsory engineering courses are useful to support further engineering scientific knowledge according to the student's major. Compulsory engineering courses are grouped in compulsory faculty courses. If curriculum reconstruction is carried out, for example by adjusting government policies, namely the Merdeka Belajar Kampus Merdeka policy, then compulsory engineering courses are required to remain as the purpose of the compulsory engineering course group provides basic knowledge and can support further engineering scientific understanding for engineering students.

It can be concluded from the data from interviews conducted with several informants that compulsory engineering courses are courses that must be owned by engineering students in general. Compulsory engineering courses provide basic general knowledge competencies for an engineering student. In the reconstruction of the curriculum into the MB-KM curriculum, the compulsory engineering course group cannot be included in the courses converted to the Merdeka Belajar-Kampus Merdeka program, in other words, this compulsory engineering course must be fulfilled so that basic general competencies in engineering can be achieved.

3.1.2 Basic course group

After fulfilling the mandatory engineering courses, students of the Electrical Engineering Vocational Education study program are given basic knowledge and skills competencies in the field of Electrical Engineering. These basic electrical engineering competencies are grouped in the basic courses. Every graduate of the Electrical Engineering Vocational Education study program is required to have this basic competency. In accordance with the results of interview data conducted with several informants summarized in table 2.

Table 2. Competencies of the basic course group

Informant	Basic electrical courses
Informant 1	Basic courses are a group of compulsory courses in the study program. Basic courses in electrical engineering are courses that aim to provide basic knowledge and skills competencies in the field of electrical engineering. Basic competence is the identity of expertise that must be possessed by graduates. In accordance with the current government policy, namely the MB-KM curriculum, one of which requires students to carry out a learning load for 4 - 5 semesters or as many as 84 credits, the basic courses in electrical engineering can be applied in the early semesters.
Informant 2	The basic course group must be fulfilled in the curriculum structure. The group of basic courses in electrical engineering aims to provide minimum standard competencies in the field of electrical engineering that must be met by students of the Electrical Engineering Vocational Education study program. The existence of government policies and technological developments that occur, the curriculum is required to harmonize it. The point here is that the curriculum is not changing but in curriculum construction only the content is reconstructed. In this case, the basic course group which is the identity of the study program expertise must be fulfilled.

Informant 3	The group of basic courses in electrical engineering aims to provide basic competencies of knowledge and skills in the field of electrical engineering, where this becomes the identity of the expertise of students of the Electrical Engineering Vocational Education study program. In reconstructing the curriculum to align with industrial developments and government policies, this group of basic courses must be owned and fulfilled by graduate students.

Based on interview data from several informants, it can be concluded that the basic course group is a group of courses that aims to provide basic competencies in the field of electrical engineering which will later become the identity of expertise that must be possessed by each student of the Electrical Engineering Vocational Education study program. If the competencies of this basic course group are not met, it will be difficult for students to fulfill further competencies such as supporting competencies and additional competencies in the field of electrical engineering. In the current curriculum structure, some of the courses that are included in the group of basic courses in electrical engineering include: 1) Science of electrical materials, 2) Electrical circuits, 3) Analog and digital electronics, 4) Applied mathematics, 5) OHS and labor law, and 6) Measuring and measuring instruments.

3.1.3 Supporting course group

To support the basic competencies in the field of electrical engineering for students of the Electrical Engineering Vocational Education study program based on the study material, supporting courses are given to increase student knowledge and skills. Supporting courses are a group of courses that aim to provide advanced competencies in the field of electrical engineering. In line with what was conveyed by several informants in the interviews conducted, it can be summarized in table 3.

Table 3. Supporting course group competencies

Informant	Supporting courses
Informant 1	In the preparation of the curriculum, there are several stages that are carried out including determining the study material so that it can determine the course. Several groups of courses, one of which is a group of supporting courses. This group of supporting courses aims to provide expertise competencies in the field of electrical engineering. Supporting course groups can be developed based on the needs of the industrial world. The existence of the MBKM program policy, which frees students to take a study load outside the university for 1 semester or the equivalent of 20 credits, then the supporting course group is possible to be recognized by the MBKM program.
Informant 2	Expertise competencies in the field of electrical engineering are obtained from one of the supporting course groups. Some of the courses in this advanced course group are advanced competencies that have been obtained from the basic course group already owned by Electrical Engineering Vocational Education students. Advanced competencies obtained from this group of supporting courses are utilized later in the world of industrial work.
Informant 3	The supporting course group is an important group of courses where these courses provide expertise competencies in the field of electrical engineering. The existence of the MBKM policy, which provides freedom for students to take a learning load outside the study program or outside the original university, so to adjust to this policy it is possible for students to take a learning load at other education universities by converting the value in the supporting course group.

It can be concluded from the results of interview data obtained from several informants above, that the supporting course group is a group of courses that provide expertise competencies in the field of electrical engineering for students of the Electrical Engineering Vocational Education study program. This expertise competency is useful as a competency that supports, develops and adds to the knowledge and skills of the basic competencies of electrical engineering. Some of the courses that are included in the group of supporting courses include: 1) Residential installation, 2) Electrical machinery, 3) Maintenance of distribution substations and equipment, 4) Transmission and distribution of electric power, 5) Power Plant and many others.

3.1.4 Additional course group

Students of the electrical engineering vocational education study program are also given additional competencies according to student interests. Based on the study material, there are additional course groups. Additional course groups are courses that can be selected by students according to student interests which provide additional competencies for future graduates. In accordance with the results of interview data with several informants summarized in table 4.

Table 4. Additional course group competencies

Informant	Additional courses
Informant 1	Additional competencies are also given to students of the electrical engineering vocational education study program, where these additional competencies in the curriculum structure are grouped in additional course groups. This group of additional courses aims to provide additional competencies in the field of electrical engineering for future graduates. These additional courses are offered according to student interests.
Informan 2	Additional courses are in the final semester, meaning that additional courses can be taken when students have met the basic competencies and supporting competencies in the field of electrical engineering. With the current MBKM program policy, this group of additional courses is very possible to be converted to the existing MBKM program.
Informan 3	Additional courses provide additional competencies for students where students are given the freedom to choose additional courses according to their own interests.

So it can be concluded from the results of the interview data above that additional courses are a group of courses that provide additional competencies in the field of electrical engineering for students of the electrical engineering vocational education study program. In the group of additional courses, students are given the freedom to choose additional courses offered according to student interests. Some additional courses provided include: 1) Appropriate technology, 2) ICT, 3) Mechatronics.

4. Discussion

Some of the factors for the need to conduct a descriptive review of the curriculum are the demands of technological developments, the needs of business and industry and government policies. One of the government policies is the independent campus learning program. The curriculum is required to adjust to the applicable policies. In this research discussion, a descriptive review of the curriculum of education universities included Universitas Negeri Padang, Universitas Negeri Yogyakarta, and Universitas Negeri Jakarta was conducted. This research uses a meta-analysis of the education

university curriculum. The results of the descriptive review of the education university curriculum have characteristics based on the group of courses consisting of general courses, engineering courses and professional expertise courses. Engineering courses reviewed based on the study material are divided into compulsory engineering courses, basic courses in electrical engineering, supporting courses and additional courses.

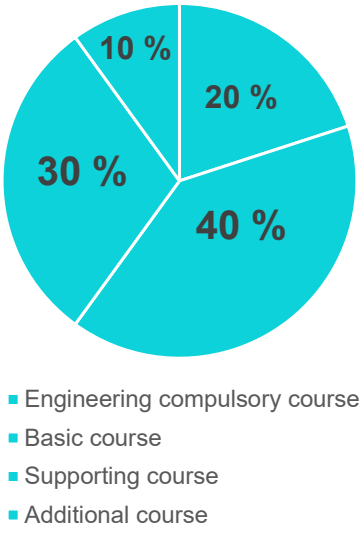

Figure 2. Course Structure Composition

The results of a descriptive review of the curriculum of the electrical engineering vocational education study program, namely compulsory engineering courses and basic electrical engineering courses, both groups of courses can be said to be core competencies and must be possessed by students of the electrical engineering vocational education study program to support the fulfillment of learning outcomes. The results of the above research are supported by previous research with the title feasibility study of the inclusion of Image Processing science in the electrical engineering education curriculum which explains that the characteristics of the electrical engineering education curriculum based on course composition consist of general courses, professional expertise courses and engineering courses (Utari and Mukhaiyar 2020) ; (Frismelly and Mukhaiyar 2022).

5. Conclusion

The results of the descriptive review of the curriculum of the electrical engineering vocational education study program can conclude that: the curriculum structure of the electrical engineering vocational education study program has characteristics based on the composition of the course consisting of general courses, professional expertise courses and engineering courses. Furthermore, based on the study material, engineering courses are divided into several groups, namely groups of compulsory engineering courses, basic courses, supporting courses and additional courses. The compulsory engineering course group is a group of courses that provide general engineering competencies and are mandatory for students of the electrical engineering vocational education study program. The basic course group is a group of courses that provide basic competencies of electrical engineering science for students. The supporting course group is a group of courses that provide advanced competencies to support the basic knowledge of electrical engineering possessed by students of the electrical engineering vocational education study program. Additional course groups are groups of courses that provide additional competencies according to the interests of students of the electrical engineering vocational education study program.

Author's declaration

Author contribution

Arinda Frismelly: conceptualization, methodology, writing -original draft. **Fenti Amelia Sari:** data validation, visualization, writing -review & editing.

Funding statement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgement

The authors gratefully acknowledge the lecturers of electrical engineering department, faculty of engineering, universitas negeri padang who have participated in the research.

Conflict of interest

The authors declare that there are no competing interests related to the research or publication of this article.

Ethical clearance

The Permission of conducting this research has been issued by the Department of Electrical Engineering number 2987/UN35.2.1/LT/2021. Lecturers have agreed to be subjects in this study and are willing for the data provided to be published.

AI statement

This article is the original work of the author without using AI tools for writing sentences and/or creating/editing tables and figures in this manuscript.

Publisher's and Journal's note

Universitas Negeri Padang as the publisher, and the Editor of Jurnal Pendidikan Teknologi Kejuruan state that there is no conflict of interest towards this article publication.

References

Ade Octaviany, R., Sihotang, W., Sanjaya Simarmata, P., Rahman, A., & Muliati, A. (2022). Human Resource Development Strategy As Preparation For The Industrial Revolution Era 5.0. *International Journal of Educational Research & Social Sciences*, *3*(3), 1157–1164. https://doi.org/10.51601/ijersc.v3i3.376

Damayanti, D. (2021). Human Resources Competency in the Era of Industrial Revolution 4.0Damayanti, D. (2021). Human Resources Competency in the Era of Industrial Revolution 4.0. Economics and Business Solutions Journal, 5(1), 13. https://doi.org/10.26623/ebsj.v5i1.3334

Dazeley, R., Goriss-Hunter, A., Meredith, G., Sellings, P., Firmin, S., Burke, J., & Panther, B. (2024). Agile Backward Design: A Framework for planning higher education curriculum.

Australian Educational Researcher, *52*(2), 1489–1508. https://doi.org/10.1007/s13384-024-00772-7

Fauna, A. M., Nikmatul, R., Saskia, H., Mochamad, P., & Awallillah, R. (2024). Contribution of competency-based curriculum development to improving the branding quality OF. *Proceedings of the 4th International Conference on Business & Social Sciences (ICOBUSS)*, *October 2024*, 26–27.

Frismelly, A., & Mukhaiyar, R. (2022). Rekonstruksi Kurikulum Program Studi Pendidikan Teknik Elektro. *Mimbar Ilmu*, *27*(1), 27–32. https://doi.org/10.23887/mi.v27i1.42490

Fuadi, T. M., & Irdalisa, I. (2022). Merdeka Belajar Kampus Merdeka: Application in Education Faculty. *AL-ISHLAH: Jurnal Pendidikan*, *13*(3), 2747–2756. https://doi.org/10.35445/alishlah.v13i3.1125

H, A. D., & Somosot, I. (2024). *Implementation of Strategic Planning in Vocational High Schools to Address the Challenges of the Industrial Revolution 4 . 0*. *7*(2), 29–38.

Hutahaean, B., Telaumbanua, S., Tamba, L., & Hutabarat, R. G. N. (2024). Analysis of Innovative and Adaptive Higher Education Curriculum Development to Education 5.0 Based Challenges in Indonesia. *International Journal of Learning, Teaching and Educational Research*, *23*(4), 76–98. https://doi.org/10.26803/ijlter.23.4.5

Njonge, T. (2023). *Influence of Psychological Well-Being and School Factors on Delinquency , During the Covid-19 Period Among Secondary School Students in Selected Schools in Nakuru County : Kenya*. *VII*(2454), 1175–1189. https://doi.org/10.47772/IJRISS

Nurlaela, L., Suhartini, R., Ekohariadi, Winanti, E. T., Buditjahjanto, I. G. P. A., & Munoto. (2022). Study of Vocational Education Curriculum for the Formation of Graduates Competency. *Proceedings of the International Joint Conference on Arts and Humanities 2021 (IJCAH 2021)*, *618*, 1245–1252. https://doi.org/10.2991/assehr.k.211223.216

Papanai, R., & Poolkrajang, A. (2023). The High Vocational Innovation Scholarship Program: A TVET Curriculum Continuous Quality Improvement Using Feedback from Stakeholders. *Journal of Technical Education and Training*, *15*(4), 1–10. https://doi.org/10.30880/jtet.2023.15.04.001

Shimray, C. (2023). An analysis of the national curriculum framework for school education 2023 in the context of environmental education. *Nature*, *123*(3110), 30–44. https://doi.org/10.1038/123861a0

Sudira, P. (2019). The Role of Vocational Education in the Era of Industrial Automation. *Journal of Physics: Conference Series*, *1273*(1). https://doi.org/10.1088/1742-6596/1273/1/012058

Sugiyono, S. (2013). Metode penelitian kualitatif. *Bandung: Alfabeta*.

Sulistyo, A. B., Soimun, A., Hidayat, D. W., Wijonarko, B., Ariesthana, P. D., & Widiangga, N. (2022). The vocational education governance at service college in the 4.0 industrial revolution era for preparing prime human resources for land transportation. *International Journal of Health Sciences*, *6*(March), 6618–6634. https://doi.org/10.53730/ijhs.v6ns1.6416

Supriati, R., Royani Dewi, E., Triyono, Supriyanti, D., & Azizah, N. (2022). Implementation Framework for Merdeka Belajar Kampus Merdeka (MBKM) in Higher Education Academic Activities. *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, *3*(2), 150–161. https://doi.org/10.34306/itsdi.v3i2.555

Tri, N. M., Hoang, P. D., & Dung, N. T. (2021). Impact of the industrial revolution 4.0 on higher education in Vietnam: challenges and opportunities. *Linguistics and Culture Review*, *5*(S3), 1–15. https://doi.org/10.21744/lingcure.v5ns3.1350

Utari, N., & Mukhaiyar, R. (2020). Konsep Penginjeksian Mata Kuliah Baru Pada Program Studi Pendidikan Teknik Elektro. *INVOTEK: Jurnal Inovasi Vokasional Dan Teknologi*, *20*(1), 93–102. https://doi.org/10.24036/invotek.v20i1.761

Veltri, N. F., Webb, H. W., Matveev, A. G., & Zapatero, E. G. (2011). Curriculum Mapping as a Tool for Continuous Improvement of IS Curriculum. *Journal of Information Systems Education*, *22*(1), 31–42.

Yang, S. Y., & Yeh, H. Der. (2024). A simple approach using Bouwer and Rice's method for slug test analysis. *Ground Water*, *42*(5), 781–784. https://doi.org/10.1111/j.1745-6584.2004.tb02732.x

Yoto, Marsono, Suyetno, A., Mawangi, P. A. N., Romadin, A., & Paryono. (2024). The role of industry to unlock the potential of the Merdeka curriculum for vocational school. *Cogent Education*, *11*(1). https://doi.org/10.1080/2331186X.2024.2335820