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Essential competences contribution of the S2-PTE course in Universitas Negeri Yogyakarta to work competence

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ABSTRACT

This study aims to determine the essential competencies contribution of each vocational course and engineering course in the curriculum to the competence needs of education, training, and engineering work in the electrical power competencies. The research was carried out using a goal-oriented evaluation approach. The object of this research is to the essential competencies of the electrical engineering education Master Program's courses at Universitas Negeri Yogyakarta, including engineering and vocational education courses. Data collection used a questionnaire, then analyzed descriptively. Furthermore, it was presented in the form of categorical data and graphs. The research results show that each essential competence contributes 70.0% to electrical education and training jobs. Referring to the Indonesian National Work Competency Standards, each essential competency contributes more than 66.7%. Thus it can be concluded that the essential competencies of the electrical engineering education Master Program's courses in Universitas Negeri Yogyakarta have contributed to the electricity sector jobs.

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INTRODUCTION

Indonesian workers are not ready to face the ASEAN Economic Community (AEC). According to Rieke Dyah Pitaloka in Sudarno (2016), the reason why Indonesian workers are not ready to face MEA is due to a lack of skills. Goldrick-Rab (2010) revealed that the key factors for student accomplishment success in following this practice and its acceptance in the business world and industry will lead to increased success. The enthusiasm to follow the practice and do the practice requires teamwork, actively accepting suggestions from superiors is essential in industrial practice. Bentley (2012) stated that in the current era of science and technology, the existence of educational institutions is increasingly being felt as an urgent need in responding to various challenges and current demands for change. This can be achieved if educational activities are carried out responsibly and with quality. Competence is something that cannot be separated from education and teaching activities (Hamdani & Krismadinata, 2017). The quality in question lies in the design and

management of the educational process which is based on the concepts of growth, development and renewal (Morgan, 2007). The process of providing education must be managed professionally.

The qualities, skills and understandings a university community agrees its students should develop during their time with the institution (Meda & Swart, 2017). Competencies has an important role in the human resource process, because in general competence concerns a person's basic abilities in doing a job (Adam et al., 2021). The fulfillment of competencies according to the needs of the business and industrial world carried out by educational institutions is largely determined by human resources and the adequacy of infrastructure that supports the formation of graduate competencies (Sugandi et al., 2022). This condition needs to be of concern to tertiary institutions in implementing learning programs so that they pay attention to skills competency needs in the labor market, in Indonesia, especially according to the Indonesian National Qualifications Framework (KKNI).

KKNI cannot be separated from the determination of the National Higher Education Standards (SNPT). According to the Ministry of Education and Culture of the Republic of Indonesia (2013), the level of higher education that is applied in the KKNI starts from qualification level 3 to qualification level 9. KKNI has a very broad dimension in the process of forming human resources qualified, competent and empowered competitive. This standard can be used reference in development curriculum, syllabus and modules competency based training (Hadi, 2018). In the Appendix to Presidential Decree No. 8 of 2012 also states that at level 8 which is equivalent to graduates of applied masters, masters, or specialist one have a description of the qualifications at that level.

Description Level 8 of the KKNI is being able to develop knowledge, technology, or art in their scientific fields through research, solving science, technology, or arts problems in their scientific fields through inter or multidisciplinary approaches, and managing research and development that is beneficial to society and knowledge, and able to gain national and international recognition. Referring to the Indonesian National Work Competency Standards (SKKNI), the electricity sector is divided into three sub-sectors, namely: the electric power transmission sector, the electricity distribution sector, and the electricity utilization installation sector. SKKNI is expected to be a benchmark for tertiary institutions to determine the competences that students must provide, so it is hoped that after studying at university students will have competences that can compete in the world of work (Abdelaziz, 2014).

Postgraduate Program in Universitas Negeri Yogyakarta, which organizes master and doctoral's programs, has opened 33 master programs and 8 doctoral programs. Master of Electrical Engineering Education is one of the new study programs that opened in the 2015/2016 academic year. Master of Electrical Engineering Education Study Program (S-2 PTE), is a study program that was officially opened based on the Decree of the Minister of Education and Culture of the Republic of Indonesia. As a consequence, learning programs that are designed need to pay attention to issues of relevance to the demands of the labor market.

S-2 PTE is designed to produce professional educators in electrical engineering vocational learning, as well as a continuation of studies for bachelor degree (S1) in electrical engineering education, electrical engineering, or cognates. S-2 PTE is increasingly demanded so that the graduates produced have competence skills that are relevant to the needs of the job market both at home and abroad, so the S-2 PTE curriculum was developed oriented to the Indonesian National Qualifications Framework (KKNI), it is hoped that graduates will be able to adapt to the demands accordance with the qualifications of the labor market.

The electrical engineering curriculum is designed to provide comprehensive expertise for students and prospective students so that they have competency skills after fulfilling the basic competencies for all fields of electrical engineering (Santika & Mukhaiyar, 2020). The competence standards for graduates of the master of electrical engineering education study program are: (1) Have pedagogical and andragogical abilities to plan, implement, and evaluate learning electrical engineering skills in vocational education and training; (2) Master electrical engineering skills to plan, implement and evaluate programs within the scope of vocational education and training work; (3) Able to plan, organize scientific activities and manage research within the scope of learning which is his responsibility and national institutions; (4) Able to make managerial decisions in the field of electrical engineering vocational education and training based on scientific methods in institutional

tasks that become responsibilities institutionally and between national institutions; and (5) having commitment, loyalty, integrity, honesty and discipline to carry out managerial tasks assigned on an institutional and inter-agency scale (Universitas Negeri Yogyakarta, 2019).

In order to prepare for employment needs, the competence standards for graduates of the master of electrical engineering education study program are: (1) Having pedagogical and andragogical abilities to plan, implement, and evaluate learning electrical engineering skills in vocational education and training; (2) Mastering electrical engineering skills to plan, carry out and evaluate programs within the scope of work of vocational education and training; (3) Able to plan, organize scientific activities and manage research within the scope of learning which is his responsibility and institutional nationally; (4) Able to make managerial decisions in the field of electrical engineering vocational education and training based on the method scientific in institutional tasks which are institutionally and inter-national institutions' responsibilities; and (5) Having commitment, loyalty, integrity, honesty, and discipline to carry out managerial tasks imposed on an institutional and inter-institutional scale (Universitas Negeri Yogyakarta, 2019).

RESEARCH METHOD

This research was carried out using the goal-oriented program evaluation model developed by Tyler (1976). This goal-oriented approach was first introduced by Tyler (1976) as a new standard for educational evaluation. Previously, to evaluate the field of education, a test was conducted using reference criteria. Tyler used a more complex methodology to relate student achievement results to the desired learning outcomes. Tyler formulated the evaluation of learning outcomes from learning objectives based on the taxonomy of learning objectives developed by Bloom and Krathwohl (Fauzobihi et al., 2022). Currently, evaluation in education is greatly paid attention when the quality of education and the improvement that needs to be made to educational programs are the main concern of the whole educational system (Anh, 2018).

This approach collects information from stakeholders consisting of (1) SMK leaders (Head of Study Programs, Deputy Principal), (2) Education and Training Leaders (BLK and BLPT), (3) Polytechnic/Academic Leaders (Head of Study Progtram), (4) Associations Indonesian Electrical Professionals (APEI), (5) Association of Indonesian Electrical Contractors (AKLI), and (6) Professional Certification Institute for Work in a State of Voltage (LSP Gema PDKB). Information from these stakeholders is used to evaluate the contribution of course content in the master of electrical engineering education to the needs of education and training in the field of electrical engineering and jobs in the electricity sector. The steps of Tayler's goal-oriented evaluation model as quoted by Marsh (1978) are explained in Figure 1.

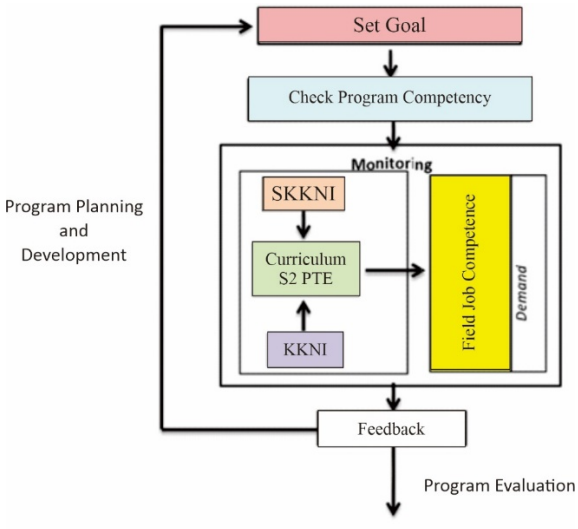

Figure 1. Steps of Taylor's Goal Oriented Evaluation Method

There are two types of locations when viewed from data collection. The two types of locations are (1) vocational education and training institutions; and (2) association institutions or certification institutions. Vocational education and training institutions consist of a vocational high school group, vocational schools/academies and polytechnics, and 10 vocational training centers. Data collection for the second type of location are in 3 association institutions or electricity certification institutions.

The object of this study is a essential competence of each course in the S2-PTE Study Program's Curriculum, which includes groups of vocational courses and expertise towards the demands of work competence in the field of electrical engineering education and training, as well as the field of electricity work based on SKKNI. Furthermore, research subjects and data sources were from: (1) heads of study programs/departments/fields from the vocational high school group, vocational schools/ academies/ polytechnics, and job training centers as many as 10 people, and (2) heads/managers of association institutions/electricity certification institutions as many as 3 people. So, a total of 13 research subjects. Collection methods and tools can be explained in Table 1.

Table 1. Research Data Collection

Data Types	Data Source	Instrument	Number of Respondent
Expertise and Vocational Education	Head of the Vocational High School Study Program Head of Electrical Engineering Training Center Head of Electrical Engineering Study Program (Vocational/Academic)	Questionnaire	10
Electricity Competence vs SKKNI	Head of APEI (Asosiasi Profesionalis Elektrikal Indonedia) Head of AKLI (Asosiasi Kontraktor Listrik Indonesia) Head of LSP Gema PDKB Semarang	Questionnaire	3

The summary of the questionnaire grid for each type of course group data and the number of essential competence items is shown in Table 2.

Table 2. Summary of the Questionnaire Grid

No.	Courses	Electricity Engineering Group Based on SKKNI			
		Number of Basic Competency Items (CI)	Number of Items CI Transmission	Number of Items CI Distribution	Total Item CI Electrical Installation
1	Electrical Power System	7	21 (2)	38 (1)	18 (3)
2	Energy Management	10	-	-	22 (1)
3	Electric Power Automation System	10	18 (4)	13 (3)	20 (3)
4	Protection System	5	21 (2)	39 (1)	9 (3)
5	Utilization of Electrical Energy	6	-	-	23
6	Management of Vocational Education and Training	6	-	-	-
7	Curriculum Development for Vocational Training and Education	8	-	-	-
8	Vocational Learning Model	7	-	-	-
9	Evaluation of Vocational Learning	7	-	-	-

The data analysis technique used in this study is descriptive analysis by taking the mode value. Descriptive analysis is intended to interpret the description of the data represented by the respondents' answers. Data processing was carried out with the help of SPSS and Excel programs. The results of the research data are presented in graphs and the mode frequency distribution is in the form of a percentage (%). Empirical data is obtained from the number of essential competence items from the two course groups as shown in Table 2. Empirical data were analyzed based on four categories, namely: highly relevant (score 4), relevant (score 3), less relevant (score 2), and irrelevant (score 1).

FINDINGS AND DISCUSSION

Findings

Essential Competences Data for Vocational and Expertise Course Groups

Data obtained from vocational and expertise groups, this data is grouped based on two groups of courses, namely: (1) Groups of expertise courses, which consist of courses: electric power systems, energy management, electric power automation systems, electrical energy utilization protection systems, and utilization of electrical energy; and (2) Vocational course groups, which consist of courses: vocational education and training management, vocational training and education curriculum development, vocational learning models, and vocational learning evaluation. Obtaining data on essential competences from these course can be seen in Table 3.

Table 3. Essential Competences Data for Expertise and Vocational Course Groups

Course Group	Course	Category (%)		
		High Relevant	Relevant	Less Relevant
Expertise	Electrical Power System	70	30	0
	Energy Management	70	20	10
	Electric Power Automation	70	10	20
	Protection System	70	20	10
	Utilization of Electrical Energy	70	30	0
Vocational	Management of Vocational Education and Training	60	40	0
	Development of Vocational Education and Training Curriculum	60	40	0
	Vocational Learning Model	70	30	0
	Evaluation of Vocational Learning	60	40	0

Essential Competences Data for Expertise Group Based on SKKNI

Data obtained from the electricity engineering group based on SKKNI. This data is derived based on groups of expertise course areas, which consist of courses; electric power systems, energy management, electric power automation systems, electrical energy utilization protection systems, and electrical energy utilization in terms of competence units in the SKKNI. Data acquisition on the essential competences of this course group against SKKNI can be seen in Table 4.

Table 4. Essential Competence Data for Expertise Course Groups with SKKNI

No.	Course	Relevancy Level of SKKNI (%)								
		Transmission			Distribution			Utilization of Electrical Installation		
1	Electrical Power System	0	100	0	33	67	0	0	100	0
2	Energy Management	0	0	0	0	0	0	33	67	0
3	Electric Power Automation	67	33	0	33	67	0	33	67	0
4	Protection System	33	67	0	33	33	33	33	67	0
5	Utilization of Electrical Energy	0	0	0	0	0	0	33	67	0

Discussion

Essential Competences for Vocational and Expertise Course Groups

Research data related to the contribution of essential competences in the expertise course groups can be illustrated in Figure 2. Overall, Figure 2 can be explained that all essential competences in the skill course groups contribute by an average percentage of 70% which is included in the "Highly Relevant" category. Yet there are two courses that have essential competences that are "Less Relevant" by 10%, namely the energy management and protection systems course, and essential competences that are "Less Relevant" by 20% in the electric power automation system course.

Based on the data in Figure 2, those can be stated that some of the expertise course groups essential competences (70.0%) in the S2-PTE study program are be able to contribute to jobs in the field of electrical engineering education and training.

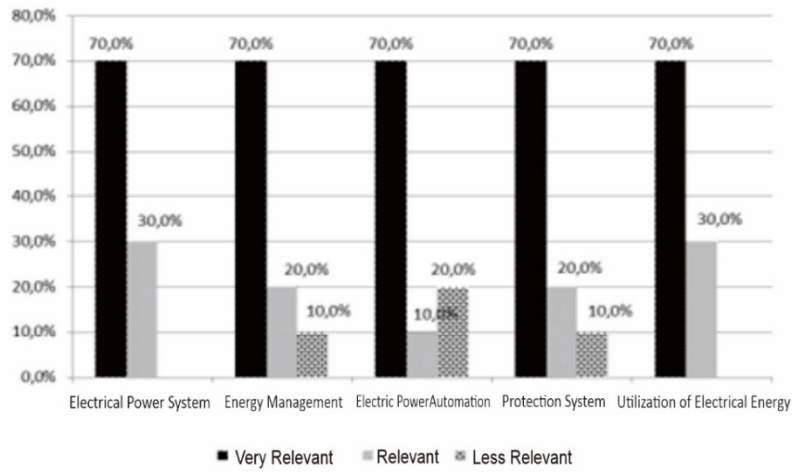

Figure 2. Contribution of Expertise Course Groups

Research data related to the contribution of essential competences in the vocational course group can be illustrated in Figure 3. Overall in the Figure 3, those explains that all essential competences in the vocational course groups contribute by an average percentage of 62.5% which is included in the "Very Relevant" category and an average of 37.5 which is included in the "Relevant" category. These mean that all the essential competences in the vocational course groups have a contribution to job in the field of electrical engineering education and training.

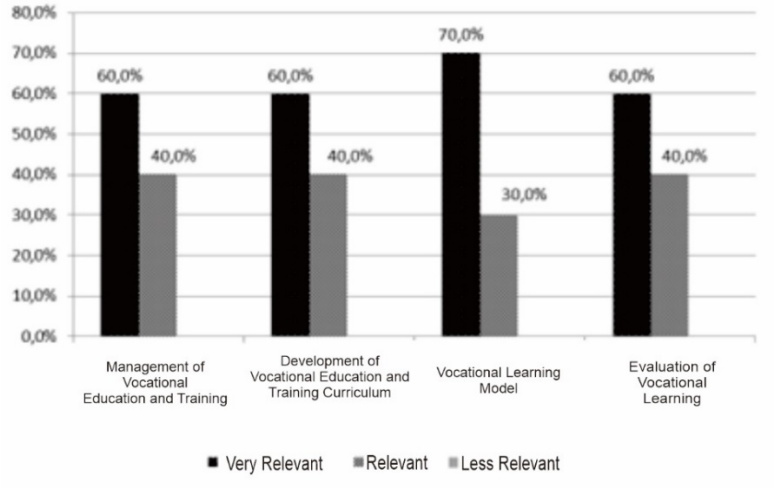

Figure 3. Contribution of Vocational Course Groups

Essential Competences for Expertise Course Groups Based on SKKNI

There are five courses included in this group, namely: electric power systems, energy management, electric power automation systems, protection systems, and electrical energy utilization. The electric power system course has 7 essential competences, and it is related to the competences in the SKKNI subfields of transmission, distribution and utilization of electrical installations with 21, 38, and 18 competences respectively. The energy management course has 10 essential competences, and it is related to competences in the SKKNI installation subfield of 22 competences.

The electric power automation system course has 10 essential competences, and it is related to the competences in the SKKNI subfields of transmission, distribution and utilization of electrical installations with 18, 13, and 20 competences respectively. The protection systems course has 5 essential competences and it is related to the competences in the SKKNI subfields of transmission, distribution, and utilization of electrical installations with 21, 39, and 9 competences respectively. The electrical energy utilization course has 6 essential competences and it is related to competences in the SKKNI subfield of installation utilization as many as 23 competences.

Research data related to the contribution of the electric power system's essential competences with SKKNI can be illustrated in Figure 4. Figure 4 explain that the essential competences of this course have contributed to the competences of transmission, distribution, and utilization of electrical installations in SKKNI respectively: 100% in the “Relevant” category, 66.7% in the more than “Relevant” category, and 100% in the “Relevant” category. Based on the Figure 4, the data can be stated that the essential competences in the electric power system course have relevance to electricity work based on the competences in SKKNI.

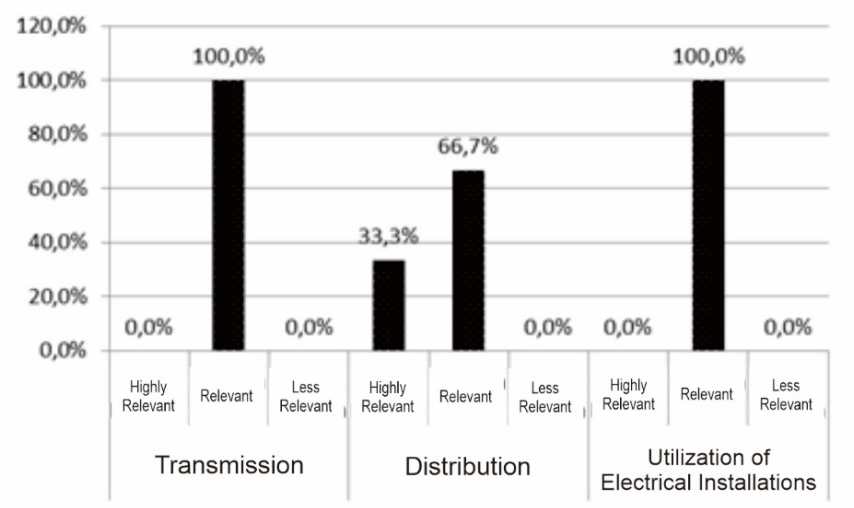

Figure 4. Contribution of the Electric Power System in SKKNI

Research data related to the contribution of the energy management's essential competences with SKKNI can be illustrated in Figure 5. In SKKNI this course is only related to the subfield of electricity installation utilization. Referring Figure 5, the data can be explained that the essential competence of this course has a contribution to the competence of utilizing electrical installations in SKKNI by 66.7%, so this is categorized as more than "Relevant". Based on Figure 5 can be stated that the essential competences in the energy management course have relevance to electricity work based on the competences in SKKNI.

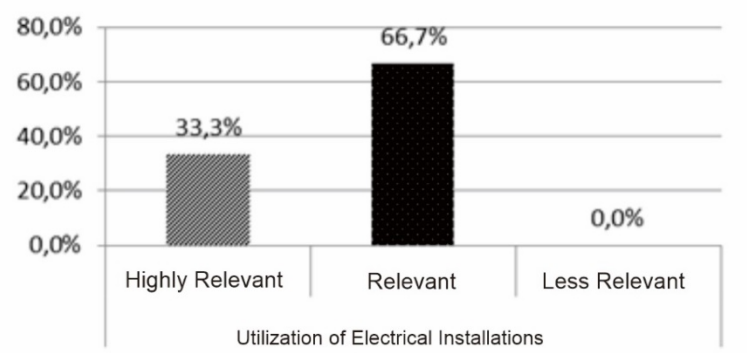

Figure 5. Contribution of Energy Management in SKKNI

Research data related to the contribution of the electric power automation system's essential competences with SKKNI can be illustrated in Figure 6. Refer to Figure 6, the data can be explained that the essential competences of this course have contributed to the competences of transmission, distribution and utilization of electrical installations in SKKNI respectively: 66, 7% in the "Highly Relevant" category, 66.7% in the more than "Relevant" category, and 66.7% in the more than "Relevant" category. Referring from Figure 6, it can be stated that the essential competences in the electric power automation system course have relevance to electricity work based on the competences in SKKNI.

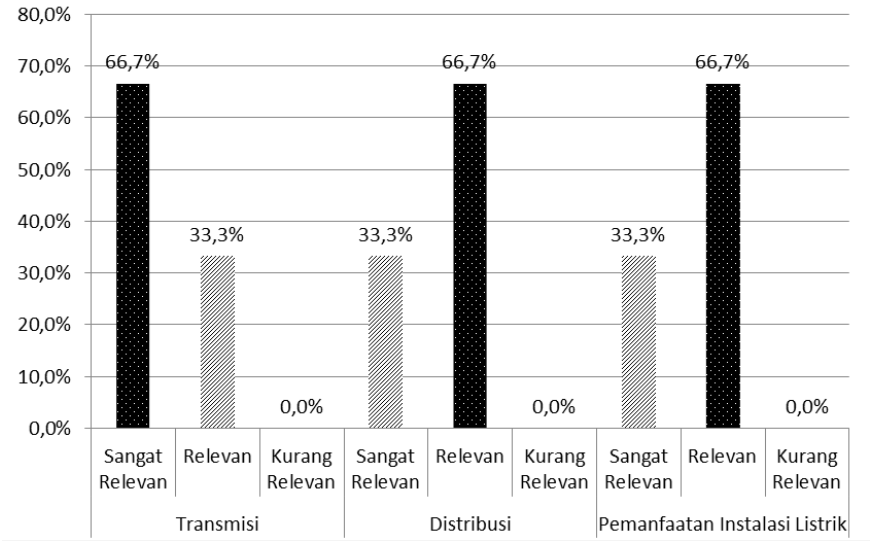

Figure 6. Contribution of the Electric Power Automation System in SKKNI

Research data related to the contribution of the protection system's essential competences with SKKNI can be illustrated in Figure 7. Based on Figure 7, the essential competences of this course have contributions to the competences of transmission, distribution, and utilization of electrical installations in SKKNI respectively: 66.7% are in the more than "Relevant" category, 66.7% are in the more than "Relevant" category, 33.3% are in the "Less Relevant" category, and 66.7% are in the more than "Relevant" category. Based on Figure 7, some of the expertise course groups in the S2-PTE study program can contribute to jobs in the field of electrical engineering education and training.

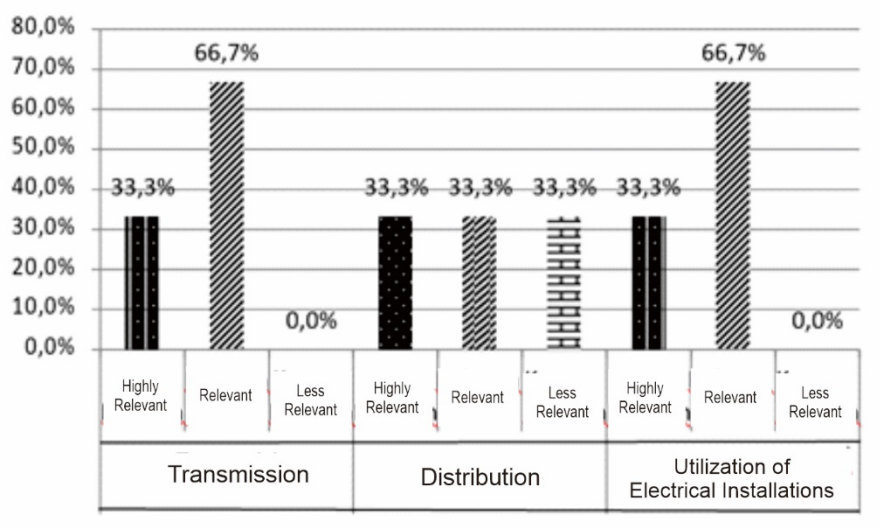

Figure 7. Protection System Contribution in SKKNI

Research data related to the contribution of the energy management's essential competences with SKKNI can be illustrated in Figure 8. Based on Figure 8, the data can be explained that the essential competence of this course has a contribution to the competence of utilizing electrical installations in SKKNI by 66.7% in the category of more than "Relevant".

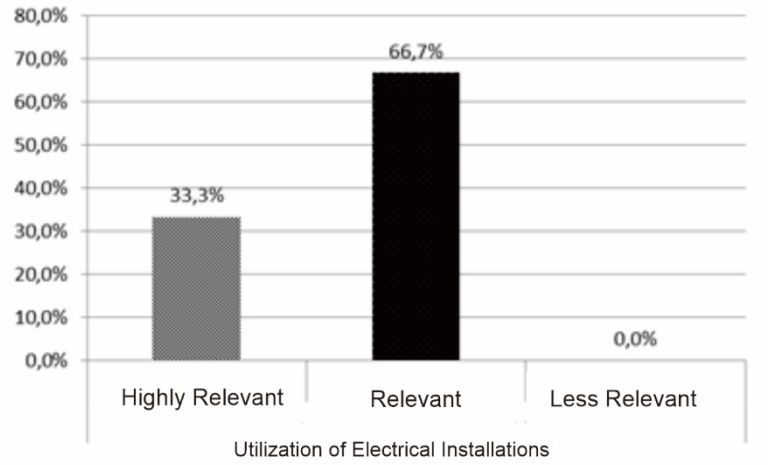

Figure 8. Contribution of Electrical Energy Utilization in SKKNI

The description of the essential competences of the five courses in the course group of expertise above can be concluded that the essential competences in the courses; electric power systems, energy management, power automation systems, protection systems, and electrical energy utilization have a contribution of more than 66.7 % including more than the "Relevant" category, but the protection system course's essential competence in the electrical installation utilization subfield is still being studied further because it is included in the "Less Relevant" category by 33.3%.

CONCLUSION

Based on the analysis and discussion of the study results, it can be concluded as follows. First, all essential competences in the expertise course group have a contribution by 70.0%, each included in the "Very Relevant" category, and all essential competences in the vocational course groups have an average contribution by 62.5% which are included in the "Very Relevant" category, and an average of 37.5% which is included in the “Relevant” category. These mean that all essential

competences in the expertise and vocational course groups in the electrical engineering education Master Program have a contribution to a work in the field of electrical engineering education and training. Second, all courses in the course groups of expertise, which include: electric power systems, energy management, electric power automation systems, protection systems, and electrical energy utilization have contributed more than 66.7%, so they are included in the "Relevant" category. However, the essential competences in the protection system course of the electrical installation utilization subfield still need to be studied further because it is included in the "Less Relevant" category. Thus all the essential competences in the expertise course group of the electrical engineering education study program have a contribution to a work in the electricity sector based on the SKKNI.

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