Eligibility of Certification Schemes for the Electrical Installation Competency of Electrical Engineering Education Study Program Students

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Abstract. The objectives of this study were to: (1) know the weaknesses of current certification model, (2) describe a Certification Scheme of Electrical Installation Competency for the Electrical Engineering Education Study Program (EEESP) Students’, Faculty of Engineering, Yogyakarta State University, and (3) know the eligibility of the Certification Scheme for Electrical Installation Competency of Electrical engineering Education Study program Students’. This research was conducted in the Department of Electrical Engineering Education, Faculty of Engineering, Yogyakarta State University from February to September 2020. This research is survey. The data collection used a questionnaire and an assessment of the feasibility of the certification scheme. The research respondents were lecturers, students, assessors, and practitioners in the field of Electrical Installation Competency. The validation of the research instrument was based on expert judgment by calculating the Aiken’s V index. The reliabilities of instrument were measured by Alpha Cronbach and Inter rater using interclass correlation coefficient (ICC). The data analysis technique used quantitative descriptive analysis, namely mean and percentage. The results of the research were as follows: (1) The weaknesses of current certification model were: (a) expensive competency test costs (77%), (b) there is no special certification scheme for the Electrical Engineering Education Study Program students as a prospective teacher (68%), (c) unclear competency test mechanism (52%), (d) inadequate competency test material (51%), and (f) the competency level tested was not suitable (32%); (2) The developed certification scheme is Low Voltage Electrical Installation Engineering Competency for EEESP Students’; (3) The Eligibility of the Electrical Installation Competency Certification Scheme for EEESP Students’ is very eligible with an average score of 3.66 out of 4.00.

Keywords: certification scheme; competency certification; electrical installation competency.

1. Introduction

Competition to enter employment both at domestic and abroad is getting tighter. Workers who have advantages and excellences who will be able to win the competition. Higher education graduates who have competence in a certain field of expertise have wider job opportunities than workers who only rely on a diploma as a prerequisite. Job opportunities do not only cover the domestic region but also go abroad.

Prospective college graduate students need to prepare as well as possible by equipping themselves with adequate knowledge, attitudes and skills in order to win the competition. Higher education institutions are also obliged to equip graduates with the competencies needed to compete for jobs in accordance with their fields. Furthermore, it is necessary to conduct a competency test to determine whether or not a student is
competent in a certain field that is relevant to his study program. This competency test will also encourage students to continue learning and practicing in order to be able and competent in this field.

Article 5 of the Regulation of the Minister of Education and Culture No 81/2014 states that diplomas are given to university graduates accompanied by at least an Academic Transcript and Letter of Statement Accompanying Diploma (SKPI). SKPI is a Certificate of Companion Diploma which contains additional information about the achievements of graduates during their status as a student and / or a position in the profession. The competency certificate is one of the contents or part of the SKPI. Thus, universities are required to provide guidance, facilitate, and conduct competency tests for certain fields relevant to student study programs so that students can obtain competency certificates.

The Electrical Engineering Education Study Program (EEESP), Faculty of Engineering, Yogyakarta State University (YSU), which has several concentrations, one of which is the Electrical Installation field, needs to conduct coaching and competency tests in the Electrical Installation field for current EEESP students’, EEESP has been appointed as one of the competency testing sites (TUK) for the Competency Certification Institute (LSK) from PT. ELESKA PEDEKABE. In addition, YSU has also established a P1 Professional Certification Agency under the National Competency Certification Agency (BNSP) to conduct internal competency tests for students.

The competency test of the Electrical Installation expertise for EEESP students’ has been carried out several times in the last three years by Profession Certification Institute (LSP) P1 UNY and several other certification bodies such as: Construction Services Development Institute (LPJK) and Competency Certification Institute (LSK) PT GEMA PEDEKABE. However, the implementation of the competency test has not been as expected. The certification scheme does not match the demands for the competency level of EEESP students based on the Indonesian National Qualifications Framework (KKNI). The certification scheme and competency test material being tested are still at a low level. In addition, the existing certification scheme does not match the level and demands of EEESP students’.

Based on the description above, a certification scheme is needed in accordance with the level and demands of EEESP students based on the KKNI. For this purpose, it is necessary to conduct research to develop an Electrical Installation competency certification scheme that is more suitable to the level and demands of students. For this reason, through this research, an Electrical Installation Competency certification scheme will be developed for EEESP Students’ to support the implementation of student skills competency tests that are more in line with the level and demands of student competencies.

Based on the above background, the problems to be discussed in this study are formulated as follows:

1. What are the weaknesses of current certification model?
2. What is the Electrical Installation Competency Certification Scheme for EEESP Students’?
3. How is the eligibility of the Electrical Installation Competency Certification Scheme for EEESP Students’?

The objectives of this study are to:

1. Knowing the weaknesses of current certification model.
2. Describe of an Electrical Installation Competency Certification Scheme for EEESP students;
3. Knowing the feasibility of the Electrical Installation Competency Certification Scheme for EEESP Students’.

Theoretically, this research is expected to enrich or strengthen the concepts and theories of the competency certification scheme, especially the electrical Installation expertise competency certification scheme for Electrical Engineering Education Study Program students.

Practically, the results of this research in the form of a certification scheme can be used as a reference for lecturers, students, and assessors in implementing the Electrical Installation expertise competency test
for EEESP Students'. In addition, the resulting certification scheme can be used as reference material for developing assessment tools or competency test materials.

The certification scheme is classified into the KKNI certification scheme, the national occupational certification scheme, and the cluster certification scheme. The naming of the KKNI scheme refers to the naming of the KKNI qualification levels which are stipulated in the work competency standard and or the naming of the qualification levels determined by technical agencies and /or by (BNSP) or Profession Certification National Agency through the mechanism of the BNSP Certification Scheme Committee. The naming of the national occupation / position scheme refers to the naming and / or designations stated in the SKKNI, or the naming of national positions determined by technical agencies and / or by BNSP. The name of the cluster certification scheme cannot be the same as the name of the KKNI certification scheme or the national occupation certification scheme. The naming in the cluster scheme must reflect the naming of tasks in accordance with the number of competency units tested, or be a special occupation of a particular industry and only used in the proposed industry.

The development of a certification scheme refers to the packaging of competencies along with specific requirements for a certain category of position or skill of a person. The naming of the KKNI scheme refers to the naming of the KKNI qualification levels set out in the work competency standards, and / or the naming of qualifications defined by technical agencies and / or by BNSP through the mechanism of the BNSP Certification Scheme Committee. The naming of the national occupation / position scheme refers to the naming and / or designations stated in the SKKNI, or the naming of a national position determined by technical agencies and / or by BNSP through the mechanism of the BNSP Certification Scheme Committee. The naming in the cluster scheme must reflect the naming of tasks in accordance with the number of competency units being tested, or be a special occupation in a particular industry / agency and only used in the proposed industry / agency. The name of the cluster scheme cannot be the same as the name of the KKNI certification scheme and the name of the national occupation certification scheme.

In this research, the development of a certification scheme uses a cluster certification scheme, because the packaging of qualifications (KKNI) and the national occupation is under the authority of the competent authority, namely BNSP and / or the competent technical agency. The cluster certification scheme is a competency certification scheme that is used as a reference in the implementation of professional competency certification, which consists of a group of competency units based on work competency standards and other requirements related to competency recognition to meet specific needs of user industries / agencies. The development of a certification scheme includes: formulation of a certification scheme, validation, verification and review of the certification scheme. In developing this certification scheme, it refers to BNSP Guidelines 210 concerning the Development and Maintenance of Professional Certification Schemes based on BNSP Regulation Number 2 / BNSP / VIII / 2017.

The development of a certification scheme is stated in the certification scheme document. The contents of the certification scheme document include: (1) background, (2) scope, (3) objectives, (4) normative reference, (5) competency packaging: type of packaging, scheme name, details of competency units, competency attainment, (6) basic requirements of the applicant, (7) the applicant's rights and obligations of the certificate holder, (8) certification fees, and (9) the certification process [1]. The developed certification scheme needs validation and verification. Validation of the certification scheme is carried out by reviewing the certification scheme from the aspects of: content, construction, and language. The study of language / culture is an examination of the certification scheme whether it uses communicative language and is in accordance with the rules of Indonesian, and does not cause misunderstanding. Furthermore, based on the guidelines for developing the certification scheme, the validated schemes are verified. Verification of the certification scheme includes
the following aspects: (1) conformity to the scope of the sector or profession, (2) clarity of the category of professional certification being targeted, (3) suitability of the choice of certification scheme packaging, (4) suitability of competency standards referred to, (5) The suitability of the assessment strategy and the selection of the assessment method, (6) the suitability of the determination of the certification process, and (7) the suitability of the preparation of the certification scheme with the provisions of the guidelines (BNSP, 2017).

The scope of electric power utilization installations starts from measuring and limiting devices (APP), namely KWH meter and MCB, to connection points and load points at consumers. Consumers of electric power utilization installations consist of simple housing installations, building installations and industrial installations. Thus, the competence of electrical power utilization installation expertise includes competences: planning, installing, operating, inspecting, and maintaining electricity utilization installations starting from APP to connection points and load points for consumers of simple home electrical installations, building/office electrical installations, and installations for industries.

The competency standards for electrical installations can also refer to the Competency Standards for Electricity Engineering Personnel or Standar Kompetensi Tenaga Teknik Ketenagalistrikan (SKTTK) set by the Ministry of Mineral Resources through the Decree of the Director General of Electricity Number 14/20 / DJL.1 / 2018. Dated January 23, 2018 concerning Guidelines for Competency Standards for Electricity Technicians in the Field of Electrical Power Utilization Installations. The defined Electricity Engineer Competency Standards are for the following work (sub-sector): (1) planning consultancy for electricity utilization installations, (2) consulting on electricity utilization installation supervision, (3) construction and installation of electric power installations, (4) inspection and testing electric power installations, (5) operation of electric power installations, and (6) maintenance of electric power installations.

Each type of work (sub-field) consists of competency units whose number varies depending on the extent and type of work in that sub-sector. Furthermore, the competency units in each of these sub-fields are packaged according to their occupation 9 (nine) Electricity Qualification Levels (JKK) in accordance with KKNI. The nine levels are: (1) young operator, (2) intermediate operator, (3) main operator, (4) young technician / analyst, (5) intermediate technician / analyst, (6) main technician/analysts, (7) young experts, (8) intermediate experts, and (9) main experts [2].

Each level of occupation consists of several competency units which are grouped into groups of core competencies and selected competencies. The competency units that are included in the core group are the job competency units and functional competencies that must be taken for the purpose of competency testing, while the selected competency units are functional competencies that can be selected from several choices of competency units offered. The occupational level grouping is based on the type of position identified from the jobs in the world of work.

The competency test kit refers to the work competency standards used as stated in the certification scheme. In addition, it must pay attention to the principles of assessment, the type of competency test material and the assessment method in accordance with the characteristics of the competence to be measured and assessed. The assessment used refers to a competency-based assessment, using criteria as a reference, evidence-based and participatory.

The description above shows that the expertise competency of the Electrical Power Utilization Installation is an extraction from the SKKNI and SKTTK which are adjusted to the level of demands of EEESP students'. Thus it can be interpreted that the competence of Electrical Installation expertise is being able to plan, install, operate, maintain, inspect, and be able to analyze the results of 1-phase and 3-phase electric power utilization installation work in an electric power utilization installation which includes: simple house installations, building installations, and industrial installations that represent electric lighting installations, electric power installations, and electric motor installations.
Competency certification is an important instrument in matters of information regarding the quality and quantity of skills possessed by workers through employer observations. According to [3] a competency certificate is taken as valid if it really represents the competencies that are possessed and demonstrated by the bearer, and if it is issued by an institution that is recognized and socially valued. However, competency certification requires commitment of institutional participation from companies, workers and workers’ associations in designing the content, mechanisms and models. The certification model has followed the evolution of educational practice, and in turn grew out of the cultural and heritage values that have accumulated throughout history. Each certification system states national / legal confidence in what the training model is to achieve the target / competency certificate.

From the explanation above, it can be concluded that individual expertise competency certification is the process of granting certificates to personnel which are carried out systematically and objectively through work competency tests in accordance with the work being performed. The professional competency certification system in Indonesia, developed by BNSP [4]. Supervision and development of professional human resources and work competency standards are carried out by BNSP. Competency standards known as the Indonesian National Work Competency Standards (SKKNI) are adjusted to other standards that apply regionally and internationally. This adjustment is made through mutual understanding. BNSP regulates the implementation and issuance of guidelines / regulations for the accreditation of training, education and training providers, LSP licenses for professional certificates and certification.

2. Method

This research is a survey research with quantitative descriptive approach. Data collection was held on 7-8 September 2020 in Yogyakarta. Data sources or respondents in this study are 37 students of Electrical Engineering Program, Yogyakarta State University and 9 Assessors, Lecturer, Work of world Practitioners in the field of Electrical Installation. Data collection methods conducted in this study using instruments in the form of questionnaires and assessment sheet of certification scheme. The validation of the research instrument was based on expert judgment by calculating the Aiken's V index. The Aiken's V index each item range from 0.83 to 0.96 (>0.75). Its mean that all item of the instrument were valid. Reliabilities of instrument were measured by Alpha Cronbach and Inter-rater using interclass correlation coefficient (ICC). The score of Alpha Cronbach was 0.855 (sig = 0.000). It means that the instrument was reliable. The score of ICC was 0.211 (sig = 0.000), it means that the assessment of inter-rater was consistent (reliable). The data analysis technique used quantitative descriptive analysis, namely mean and percentage.

3. Result and Discussion

3.1 Weaknesses of Current Skills Competency Test

To obtain data on weaknesses, the current competency test is carried out through a survey using the questionnaire. Data collection was carried out on 7-8 September 2020 at Yogyakarta State University. Data sources or respondents in the study were 37 students of the Electrical Engineering Education Study Program, Yogyakarta State University. The students' responses about the weaknesses of the current competency test are listed below.
Table 1. The weaknesses of Current Skill Competency Test

| No. | Type of Weaknesses                                                      | Percentage |
|-----|------------------------------------------------------------------------|------------|
| 1.  | Expensive competency test costs                                       | 77%        |
| 2.  | There is no special certification scheme for the EEESP students        | 68%        |
| 3.  | Unclear competency test mechanism                                      | 52%        |
| 4.  | Inadequate competency test material                                    | 51%        |
| 5.  | The competency level tested was not suitable                           | 32%        |

Based on table 1 above, the weaknesses of current skill competency test are as follows: (1) expensive competency test costs (77%), (2) there is no special certification scheme for the Electrical Engineering Education Study Program students as a prospective teacher (68%), (3) unclear competency test mechanism (52%), (4) inadequate competency test material (51%), (5) the competency level tested was not suitable (32%). Based on the findings, it is necessary to develop an electrical installation certification scheme in accordance with the demands and needs of the Electrical Engineering Education Study Program Students.

3.2 Certification Scheme

The developed certification scheme is Low Voltage Electrical Installation Engineering for Students of the Electrical Engineering Education Study Program. It reflects the role of an Electrical Installation Vocational School Teacher in carrying out a specific task to completing work in a broad scope, choosing the appropriate method from a variety options of existing standardized and not yet standardized by analyzing data, and able to show performance with measurable quality and quantity. Mastering theoretical concepts in general knowledge, and able to formulate procedural problem solving, Have the ability to manage work groups and compile comprehensive written reports. Responsible for their own work and can be given responsibility for the achievement of group work.

The certification scheme contains: background, benefits of certification, scope of the certification scheme, certification objectives, normative references, competency packaging, basic requirements for certification applicants, rights of certification applicants and obligations of certificate holders, certificate fees, certification process, evaluation and reporting. The competency packaging describes: the name of the certification scheme and the description of the competency packaging, work attitudes, job roles, possible positions, packaging rules, and details of the competency units used. The certification process describes the registration process and requirements to the examination to determine test participants, preparation, pre-testing, implementation of competency tests, certification decisions, control processes, appeals, and evaluation and reporting.

Competency test participants in this certification scheme are final year students for the Electrical Engineering Education Study Program for Electrical Power Concentration. The competency units used in the certification scheme for Electrical Engineering Education Students as Vocational Teacher Candidates are 7 competency units as listed in table 2 below. These competency units included in the certification scheme are essential competency units taken from standard competency, SKKNI and SKTTK, from various levels from level 2 to level 5 KKNI which are tailored to the needs and demands.
Table 2. Competency Units in the Certification Scheme

| No. | Unit Code     | Title of Competency Unit                                                                 | Competency Standard | Info  |
|-----|---------------|------------------------------------------------------------------------------------------|---------------------|-------|
| 1.  | KTL.IR02.301.01 | Designing Simple Electrical Installations (Houses, Schools and Houses of Worship)       | SKKNI               |       |
| 2.  | KTL.IK02.118.01 | Installing Simple Electrical Installations (Houses, Schools and Houses of Worship)      | SKKNI               |       |
| 3.  | KTL.IK02.220.01 | Installing Electrical Installations for Small Industrial Buildings with a Power up to 197 KVA | SKKNI               |       |
| 4.  | KTL.IO02.102.01 | Operating Connections Equipment (PHB) of Building Lighting (Campuses, Offices, Hotels, Apartments, Supermarkets, Sports Buildings) | SKKNI               | Practice |
| 5.  | KTL.II02.219.01 | Inspecting Building Electrical Installations (Campus, Offices, Hotels, Apartments, Supermarkets, Sports Buildings) | SKKNI               |       |
| 6.  | KTL.IH02.102.01 | Maintaining and Repairing Electrical Installations of Buildings (Campus, Offices, Hotels, Apartments, Supermarkets, Sports Buildings) | SKKNI               |       |
| 7.  | D.35.143.03.034.1 | Analyzing the Results Inspection and Testing of Low Voltage Electrical Power Utilization Circuit and Components of Circuit | SKTTK               | Case Study |

The assessment in this certification scheme uses integrated assessment or holistic assessment. Integrated assessment is an assessment carried out on several competency units which include knowledge, skills, and attitudes in one assessment activity by combining various assessment methods to measure and assess the types of competencies that are adjusted to the characteristics of competencies being measured and assessed. The assessment tool uses several assessment methods, namely self-assessment, written tests, practical tests (performance), case studies, and oral tests. The use of various types of tools is adjusted to the characteristics of the competency being assessed, the types of competency dimensions, and the level of competence in order to obtain a holistic and integrative assessment capable of describing the actual competence.

The competency test process is adjusted to the certification scheme and the assessment method used. The competency test process consists of several stages, namely: (1) registration, (2) checking the suitability of participant data, (3) preparation: participants, schedules, certification schemes, competency test kits, assessors, and competency test sites; (4) examination of competency test preparation; (5) Implementation of competency tests: independent tests, written tests, practical tests, case studies, and oral tests; (6) Assessment of competency test results; (7) recommendations; (8) appeal; (9) decisions; (10) documentation.
3.3 Eligibility of the Certification Scheme

To determine the eligibility of the certification scheme, an assessment of the product is carried out using a competency test scheme assessment instrument. The competency test scheme assessment instrument consists of 22 assessment aspects which include components: content, construction, and language. The results of the expert's assessment of the certification scheme product are summarized in the following table.

Table 3. Eligibility of Certification Scheme

| No. | Assessment Aspects                                      | Score | Category         |
|-----|--------------------------------------------------------|-------|-----------------|
| 1.  | Clarity of category and scheme name                    | 3,78  | Very Eligible   |
| 2.  | The correct choice of packaging scheme                 | 3,33  | Very Eligible   |
| 3.  | Competency standards referred to standards             | 3,67  | Very Eligible   |
| 4.  | Conformity with the demands of competence              | 3,56  | Very Eligible   |
| 5.  | Selection of units and levels of competence            | 3,78  | Very Eligible   |
| 6.  | The appropriateness of selecting the assessment method | 3,67  | Very Eligible   |
| 7.  | Compliance with process requirements                   | 3,56  | Very Eligible   |
| 8.  | Completeness of the components of the certif. scheme   | 3,67  | Very Eligible   |
| 9.  | Clarity of the scope of the certification scheme       | 3,78  | Very Eligible   |
| 10. | Clear description of the certification scheme          | 3,44  | Very Eligible   |
| 11. | Clarity of how to package competency units             | 3,67  | Very Eligible   |
| 12. | Clarity of competency unit details                     | 3,78  | Very Eligible   |
| 13. | Clarity of the basic requirements of the applicant     | 3,67  | Very Eligible   |
| 14. | Rights and obligations of the certificate holder       | 3,78  | Very Eligible   |
| 15. | Clarity of the stages of the certification process     | 3,67  | Very Eligible   |
| 16. | Clarity of evaluation and reporting processes          | 3,67  | Very Eligible   |
| 17. | Preparation in accordance with the provisions          | 3,78  | Very Eligible   |
| 18. | The arrangement is presented in a systematic manner    | 3,56  | Very Eligible   |
| 19. | Simple and easy to implement                           | 3,56  | Very Eligible   |
| 20. | Conformity with Indonesian language rules              | 3,56  | Very Eligible   |
| 21. | Use language that is easy to understand                | 3,78  | Very Eligible   |
| 22. | Does not cause misunderstanding                       | 3,78  | Very Eligible   |

Average: 3.66 Very Eligible

Thus it can be concluded that the answer to research question number 4 (four) regarding the eligibility level of the certification scheme for EEESP Students’ is very eligible with an average value of 3.66 from an assessment scale of 1 to 4. The average value range for each aspect of the assessment is 3.33 to 3.78. All aspects of the feasibility assessment of the certification scheme fall into the very feasible category.

The limitation of this study was the development of the certification scheme has not yet reached the verification stage from the competent authority institutions (BNSP / related technical agencies), but only at the validation stage from experts and practitioners from various elements, namely vocational education experts, educational evaluation research experts, education practitioners, practitioners in business and industry, assessors, master assessors.
4. Conclusions

The conclusions of the research were as follows:

a. The weaknesses of current certification model were: (a) expensive competency test costs (77%), there is no special certification scheme for the Electrical Engineering Education Study Program students as a prospective teacher (68%), (c) unclear competency test mechanism (52%), (d) inadequate competency test material (51%), and (e) the competency level tested was not suitable (32%).

b. The developed certification scheme is Low Voltage Electrical Installation Engineering Competency for EEESP Students’.

c. The Eligibility of the Electrical Installation Competency Certification Scheme for EEESP Students’ is very eligible with an average score of 3.66 out of 4.00.

5. Recommendations

Based on the results of this study it is recommended to stakeholders to:

a. The Low Voltage Electrical Installation Engineering Competency Certification Schemes for EEESP students can be used by LSP P1 YSU and other LSPs to expand existing certification schemes and can be used to test the competence of electrical installations for EEESP students.

b. LSP P1 managers can complete the Low Voltage Installation Engineering Competency Certification Scheme for EEESP students and validate the scheme to BNSP or competent authorized institutions.

c. Other researchers can develop other device certification schemes such as competency assessment instruments, competency tests guide, and so on.

6. References

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