

Learning Evaluation on Industrial Automation Field

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Learning Evaluation on Industrial Automation Field with CIPP Model

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Abstract. This study aimed at evaluating the level of conformity of the learning activities and any factors that causing mismatch of the learning activities of vocational subjects in Vocational High School with Electronics Industrial Engineering expertise program from SKKNI Number 631 Year 2016 with industrial automation field. This study was conducted in SMK Muhammadiyah Prambanan, SMK N 2 Pengasih, SMK N 4 Semarang, and SMK N 7 Semarang with CIPP model and quantitative descriptive analysis technique. The result showed that the level of conformity of the learning activities from the aspects of context, input, process, and product with teacher and student as respondent was categorized appropriate to very appropriate. Factors that causing mismatch of the learning activities with that SKKNI is the orientation of syllabus and RPP preparation, the facilities and infrastructure that support the learning activities, and the teacher's ability on supporting the competence expertise in industrial automation field.

1. Introduction

The potential of natural resources and human resources has not utilized to its full potential. It caused the national development in the education sector that has not been going according to objectives, one of which is the competence of graduates of the Vocational High School (VHS) also known as Sekolah Menengah Kejuruan (SMK). Based on statistical data issued by the Central Bureau of Statistics in 2017 states that the open unemployment rate of vocational high school graduates in August 2017 reached 11.41% from the total of the open unemployment (Central Bureau Of Statistics, 2017). It shows that the competencies of SMK graduates is not links and match with the expected competencies of the industry (Wibowo, 2016).

Based on the regulation of the Minister of Industry of the Republic of Indonesia Number 3 Year 2017, SMK has guidelines in organizing vocational education that links and match with the industry, through the arrangement of a curriculum refers to Indonesia National Occupational Competency Standards also known as Standar Kompetensi Kerja Nasional Indonesia (SKKNI). There was 518 of SKKNI title that has been compiled since the Year 2004 until 2016 (Wijanarka, 2016). One of them is the decision of the Minister of Employment Number 631 Year 2016 about SKKNI in the field of Industrial Automation. SKKNI Number 631 Year 2016 Industrial Automation Field consists of 45 units of competency required industrial automation system utilization. Based on the units of competency in



SKKNI with Industrial Automation Field, there is some level of education which corresponds to the needs of the field of industrial automation, which was a graduate of Industrial Electronics of Engineering experties program. In addition, with 518 SKKNI titles that have been drafted, yet there is a SKKNI that specifically review the various standards of competence related to the field of industrial electronics engineering.

SKKNI is used as one of the forms of assessment reference to SMK's student experties are implemented within the test of competence experties also known as Uji Kompetensi Keahlian (UKK). It will provide grater opportunities for graduates to work in the field that appropriate with SKKNI. However, it is known that the majority of the student's preparedness in carrying out UKK not yet maximazed (Sintawati, 2010). It shows that there was mismatch between the competencies taught and the industry needs.

According to Purwanto (2011), the achievement of the purpose of education is not only influenced the competencies taught in learning activities, but also various factors that affect the learning activities. When all these factors can be applied optimally in learning activities and relevant to work competency standards in related fields, then SMK graduates will have competencies that link and match with industry needs. Therefore, research was conducted to evaluate the learning activites at SMK with Industrial Electronics Engineering experties program, in terms of SKKNI industrial automation field.

The evaluation formulated on two main issues. First, the level of conformity in vocational subjects on learning activities at SMK with Industrial Electronics Engineering experties program, in terms of SKKNI industrial automation field. Second, to know any factors that causes of discrepancies in learning activities at SMK with SKKNI industrial automation field. The purpose of the research is to know the level of conformity of vocational subjects at learning activities and factors the causes of discrepancies between vocational subject at SMK with Industrial Electronics Engineering experties program with SKKNI industrial automation field. In addition as a reference for research with related topics, this research can be used as materials of evaluation or reference of educator in SMK to conducting the learning activities that related to the mastery of the competencies contained in SKKNI Number 631 Year 2016 industrial automation field.

Wiesner (2018) said that evaluation can be used to assess the efficiency of the learning activities as a program that become an element in vocational education improvement. In addition, one of the success indicator of an educational program can be seen from the result of the learning activities. The result of learning evaluation can be used to know the achievement of the purpose and the advantage to the target of learning activities (Yuniarti, 2016).

According to Arikunto (2013), there are several factors that can affect the results of the study. Some of these factors are learners as raw input, environmental input, and an instrumental input consisting of teachers, teaching methods, curriculum/materials, and tools. Input environment composed of human and non-human environment contained in the learning activities, but no directly effect against the results of the study. One form of the human environment is the support or advice given that related to learning activities. Non-human environment could be the availability of facilities and infrastructure, as well as the condition of the facilities and infrastructure that can affect student learning atmosphere. For example, the availability of the equipment and procedures of occupational health and safety in practical learning space that make the students feel safe and comfortable. In addition, there are some

standard educator at SMK/MAK, that has a minimum D4 or Degree as academic qualification, higher education as the background with relevance between courses and vocational subjects, and having a certificate of teaching profession at SMK/MAK (Mulyasa, 2009).

Based on the regulation of the Minister of Education and Culture of the Republic of Indonesia Number 81A Year 2013 about implementation of the curriculum, it is known that the implementation of learning consist of three phases. That phases consist of planning, process, and evaluation. Lesson plan also known as Rencana Pelaksanaan Pembelajaran (RPP) is structured in the planning stages based on the existing syllabus. Teachers have an important role in conducting of classroom management and implementation of the RPP or syllabus at process stages. According to the Directorate of Coaching of the SMK (2018), UKK was one form of learning evaluation against student achievement of the competencies. Based on the result of the competency test, the teacher can describe the student's mastery of competencies and determine lack of the learning process (Dwicahyono & Daryanto, 2014).

There are many different evaluation models that can be used in this research. One of them is CIPP (Context, Input, Process, and Product) model. According to Widoyoko (2009), the evaluation context is the depiction and specifications of the environmental program, the need for which has not been fulfilled, the characteristics of the sample and population served, as well as the purpose of the program being evaluated. Indicators of evaluation context in this research is the purpose of learning activities in vocational subject on Industrial Electronics Engineering experties program and learning devices like an RPP and syllabus is needed in support of these purpose, in terms of SKKNI industrial automation field. In addition, some components can be evaluated in the input evaluation are the characteristics and readiness of teachers, the completeness of the learning infrastructure and facilities, student characteristics, curriculum/learning materials, learning strategies, and the condition of the learning environment (Widoyoko, 2009). Input evaluation on this research is used to know the conformity of various input factors influential in learning activities with SKKNI industrial automation field.

According to Widoyoko (2009), the evaluation of the learning process consist of the effectiveness of the applied learning strategies, learning media, how to teach, as well as the interests, attitudes, and ways of learning in students. Some indicators of evaluation are used. That was the ability of the teacher to manage the learning process and competencies that is taught in learning process. Meanwhile, on the product evaluation, the evaluator collects a variety of information related to result on learning activities and compare the result with standard used (Hasan, 2009). Indicators of the product evaluation in this research was achievements of learning activities, which consist of student graduation rates in UKK, mastery of competencies by students related to competencies that was listed in SKKNI industrial automation field, as well as students interest and motivation against the competencies that have been taught or achieved in learning activities.

2. Method

This research was designed with quantitative approach. The study was conducted in four vocational high school. There are SMK Muhammadiyah Prambanan, SMK Negeri 2 Pengasih, SMK Negeri 4 Semarang, and SMK Negeri 7 Semarang. Vocational High School or SMK with Industrial Electronics Engineering experties program was the population in this research. After that, researchers using the purposive sample technique to determine the samples from a population. This technique is used to determine the subject matter based on the purpose of researchers. The purpose is to evaluating the

conformity of the learning activities SMK with Industrial Electronics Engineering expertise program, in terms of SKKNI Number 631 Year 2016 industrial automation field.

SMK Muhammadiyah Prambanan, SMK Negeri 2 Pengasih, SMK Negeri 4 Semarang, and SMK Negeri 7 Semarang selected from province Central Java and Special Region of Yogyakarta to fulfill the required characteristics. The characteristics consist of have Industrial Electronics Engineering expertise program, apply Curriculum of 2013 or Curriculum of 2013 Revision, and have some vocational subject that was being taught to support the competence of graduates. Learning activities was the object of this research and the source of data in this research consist of productive teachers of vocational subjects, student of Class XI, and Head of Department of Industrial Electronics Engineering expertise program.

The questionnaire are distributed to productive teachers of vocational subject and students of Class XI from each SMK. In addition, researchers conduct interviews with the Head of Department of Industrial Electronics Engineering expertise program from SMK and do documentation studies on document details contained in the guidelines that have been prepared. Researchers obtain quantitative and qualitative data. Quantitative data collected from the result of the questionnaire. Qualitative data are derived from the results of the interview with The Head Of Department of Industrial Electronics Engineering expertise program, meanwhile documentation studies with various related document, such as the RPP and the syllabus, document that was related to teacher background, list of UKK's grade, and a certificate of student's competence as proof of passed competency test.

Researchers using descriptive statistics to analyze the result of the evaluation and to describe the data analysis of the calculations on the context, input, process, and product aspect. The level of conformity of learning activities from each aspect known by identifying the value of achieving quality also known as Nilai Pencapaian Kualitas (NPK) against the table of category score respondent. NPK is the mean of the entire score of the respondent for all grains of each aspect. The category indicated the result of the research from the questionnaire. In addition, researchers using empirical data as a result of interviews and documentation studies.

3. Result and Discussion

Statistical data consist of data score from questionnaires were given to 14 teachers and 112 students as respondents. NPK and grain score from each indicator on questionnaires is calculated. The percentage of conformity and score from each indicator of the aspect evaluated was known from that calculated. Based on an analysis data of questionnaire to teachers and student respondent, the results of the analysis of quantitative data on aspects of context are listed in Table 1.

Table 1. Evaluation and context aspect

Respondent	Total Score	NPK	Percentage (%)
Teacher	657	46.93	78.21
Student	720	6.43	80.36

The level of conformity of the learning activities in vocational subject at SMK with Industrial Electronics Engineering expertise program with SKKNI industrial automation field, based on the result of the analysis of statistical data of questionnaire to teachers and student respondent on aspects of context was categorized very appropriate.

The result of statistical data from the analysis of the value of each grain on the evaluation aspects of context with the teacher respondents, shows that the orientation of RPP's form used in learning activities does not load the competence that related to the function of create a mechanical element for automated system in industry and contains the competence that related to function of operate automated system in industry. Units competency from the function of create a mechanical element for automated system in industry consist of operating the conventional tools of machine and CNC machine, as well as creating the JIG or penepat mekanik. In addition, based on statistical data of the analysis of NPK from each grain on the evaluation aspect of context with student respondents, it is known that the purpose of the learning activities appropriate with the purpose of SKKNI Number 631 Year 2016 industrial automation field. The purpose was to increase the efficiency and productivity of the production system in industry.

According to empirical data documentation study results about RPP and syllabus used in Industrial Electronics Engineering expertise program of each school, shows that the competence with regard to the function of create a mechanical element for automated system in industry overall is not contained in the RPP or syllabus. It is supported with the results of interviews with Heads of Departments of each school. The result of interviews indicate that the competency unit like an CNC machines more leads in the field of machining expertise or industrial automation, but the units of competence related to conventional machine tools listed in the RPP with subjects Workshop Work of Engineering.

Based on an analysis data of questionnaire to teachers and students respondent, the results of the analysis of quantitative data on aspects of input are listed in Table 2.

Table 2. Evaluation of input aspect

Respondent	Total Score	NPK	Percentage (%)
Guru	1787	127.64	72.52
Siswa	10486	93.63	70.93

The level of conformity of the learning activities in vocational subject at SMK with Industrial Electronics Engineering expertise program with SKKNI industrial automation field, based on the result of the analysis of statistical data of questionnaire to teachers and student respondent on aspects of input was categorized appropriate.

The result of statistical data from the analysis of the value of each grain on the evaluation aspects of input with the teacher and student respondents, shows a grain of the completeness of the equipment practice to support the learning activities of hydraulic's competency has the lowest value. Based on the highest value, known that SMK Muhammadiyah Prambanan, SMK Negeri 2 Pengasih, SMK Negeri 4 Semarang, and SMK Negeri 7 Semarang have lab practices that support the learning activities of

pneumatic's competency, as well as various procedures K3 industry and emergency conditions in learning practices space nor class of theory.

According to empirical data result from interview with the Head of Department of Industrial Electronics Engineering experties program from each school related to evaluation of input aspect, known that there are no facilities and infrastructure which support the learning activities of hydraulic's competency. However, Industrial Electronics Engineering experties program in SMK Negeri 2 Pengasih and SMK Negeri 4 Semarang teaches hydraulic field. But, it have to joining that competency with pneumatic's competency and the result was not good enough. In addition, the results of the interviews also show that competency related to the function of the mechanical elements making automation system in the industry more lead in the field of industry automation. However, for units of competency related to operate conventional machine tools can be taught in students of Industrial Electronics Engineering experties program, because the facilities and infrastructure that is used with regard to subjects Workshop Work of Engineering. Meanwhile, based on the results of the documentation study against aspects of the input in the form of data/document relating to the background of teachers, it is known that the majority of productive teachers in vocational subjects at SMK Industrial Electronics Engineering experties program has only a certificate of competence related to the fields of electricity, electronics, PLC, and robotic system.

Based on an analysis data of questionnaire to teachers and students respondent, the results of the analysis of quantitative data on aspects of process are listed in Table 3.\

Table 3. Evaluation of process aspect

Respondent	Total Score	NPK	Percentage (%)
Teacher	1098	78.43	75.41
Student	5908	52.75	69.41

The level of conformity of the learning activities in vocational subject at SMK with Industrial Electronics Engineering experties program with SKKNI industrial automation field, based on the result of the analysis of statistical data of questionnaire to teacher respondent on aspects of process was categorized very appropriate, meanwhile the result of the analysis of statistical data of questionnaire to student respondent on aspects of process was categorized appropriate

The result of statistical data from the analysis of the value of each grain on the evaluation aspects of process with the teacher and student respondents from the lowest value of the grain, shows that the method that applied in learning activities not yet support the competence of hydraulic and the function that related to competency of CNC machine. Based on the highest value, known that there was method applied in learning activities support the competence of pneumatic and system operating on PLC, as well as equipment that used in learning activities has been supporting the competence of electrical fields.

Based on empirical data result from interview with the Head of Department of Industrial Electronics Engineering experties program from each school related to evaluation of process aspect, known that

the method of teaching applied in the learning activities determined in the RPP. RPP use syllabus as a guidelines, but the syllabus refers to a curriculum that is applied to SMK. In addition, the unit of competency related to hydraulic fields cannot be taught with maximal, because there are no facilities and infrastructure to support learning and practice. Meanwhile, the results of the documentation studies against the syllabus and RPP, shows that the structure of the curriculum has no competence that relate to the mechanical field or CNC machines and the syllabus and RPP dont have no competencies related to that field.

Based on an analysis data of questionnaire to teachers and student respondent, the results of the analysis of quantitative data on aspects of product are listed in Table 4.

Table 4. Evaluation of process aspect

Respondent	Total Score	NPK	Percentage (%)
Guru	1787	127.64	72.52
Siswa	10486	93.63	70.93

The level of conformity of the learning activities in vocational subject at SMK with Industrial Electronics Engineering experties program with SKKNI industrial automation field, based on the result of the analysis of statistical data of questionnaire to teachers and student respondent on aspects of product was categorized appropriate.

The result of statistical data from the analysis of the value of each grain on the evaluation of aspect product with the teacher and student respondents from the lowest value of the grain, shows that the level of mastery by the students against the competencies with the function of create a mechanical element for automated system in industry tend to be low. Based on the most high-value grains, it is known that the rate of graduation in UKK tends to be high. According to empirical data results interview with the Head of the Department of Electronics Engineering experties program of each school related tp aspects of the product, known that competency units listed in the function of create an mechanical element for automated system in industry more leads to industrial automation of engineering or machine, so it is not taught to the students of SMK Industrial Electronics Engineering experties program and the students tend not to master the competencies related to that functions. In addition, the level of mastery of students against the competencies of hydraulic and SCADA tend to be low, because there are no facilities and infrastructure to support learning and practice that competencies. Meanwhile, units of the competence to be tested in the UKK for the last two years with regard to mikrokontroller, with a passing rate of 100%.

The results of the documentation study gainst the syllabus and RPP indicates that the associated competency units operate conventional tooling which is included in the function of create an mechanical element for automated system in industry, where it is listed in the syllabus of the subjects Workshop Work of Engineering is taught to the students of SMK Industrial Electronics Engineering experties program. In addition, there are several related documents certificate of competence by the students. Based on the latest documents related the certificate, it is known that the majority of students have mastered the competencies related mikrokontroller as well as various other competencies are tested.

Meanwhile, the results of the evaluation can be known that several factors causing the mismatch of learning in vocational subjects at SMK Industrial Electronics Engineering experties program against SKKNI Number 631 Year 2016 industry automation field. These factors are the curriculum applied to vocational high school, facilities and infrastructure, and the ability of productive teachers in vocational subject at Industrial Electronics Engineering experties program.

Table 5. Evaluation of Learning Activities Reviewed with SKKNI Industrial Automation Field

Aspect			
<i>Context</i>	<i>Input</i>	<i>Process</i>	<i>Product</i>
The orientation of <i>RPP</i> 's form does not load the competence that related to CNC machine	Lab practice support the learning of pneumatic and electronics circuit competency	There is teaching method that supports the learning of pneumatic and PLC fields	The rate of graduation in <i>UKK</i> are high.
The orientation of <i>RPP</i> 's form contains the competence that related to the function of operate automated system in industry	Productive teachers has certificate of competence that related to the fields of electricity, electronics, PLC, and robotic system.	There is no teaching method that supports the learning of CNC machine	The student's mastery against the competencies in the field of hydraulic and SCADA tend to be low
The purpose of leaning and <i>SKKNI</i> industrial automation field was categorized appropriate	There are no facilities and infrastructure that support the learning of hydraulic fields	There is no teaching method that supports the learning of hydraulic fields	The student's mastery against competencies with the function of create an mechanical element for automated system in industry tend to be low

4. Conclusion

The level of conformity of the learning activities in vocational subject at SMK Industrial Electronics Engineering experties program with SKKNI Number 631 Year 2016 industrial automation field from aspects of the context, input, process, and product are categorized as appropriate to very appropriate. The empirical data show that the student of Industrial Electronics Engineering experties program at SMK Muhammadiyah Prambanan, SMK Negeri 2 Pengasih, SMK Negeri 4 Semarang, and SMK Negeri 7 Semarang do not get learning related to SCADA competencies, because the facilities and infrastructure are not adequate, although the competencies listed in the syllabus. The student do not get learning related to CNC machine competencies, because CNC machine competencies more leads in field of industrial automation engineering or machine. However, the student of Industrial Electronics Engineering experties program at SMK Muhammadiyah Prambanan and SMK Negeri 7 Semarang do not get learning related to hydraulic competencies, because the facilities and infrastructure are not adequate. The student of Industrial Electronics Engineering experties program at SMK Negeri 2 Pengasih and SMK Negeri 4 Semarang get learning related to hydraulic competencies in pneumatic's subject, but it make the learning activities insufficient. Overall, can be known that several factors causing the mismatch of learning in vocational subjects at SMK Industrial Electronics Engineering experties program against SKKNI Number 631 Year 2016 industry automation field. These factors are the orientation of syllabus and *RPP* preparation, facilities and infrastructure, and the

ability of productive teachers in vocational subject at SMK Industrial Electronics Engineering expertise program to support the learning of hydraulic and SCADA field competencies.

Some advice to make the research goes well that can be given is to coordinate with the Head of the Department of Electronics Engineering expertise program. In addition, there was need to review of related curriculum that applied in SMK Industrial Electronics Engineering expertise program and doing the addition of the facilities and infrastructure that support the learning of hydraulic and SCADA field competencies. SMK Industrial Electronics Engineering expertise program can provide the introduction and training that related to CNC machine competencies for the productive teacher. The student can get the introduction of CNC machine competencies from the productive teacher in additional learning activities or related competencies.

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