Innovation of Vocational Technology Education

Available online at http://ejournal.upi.edu/index.php/invotec

PATTERN OF INDUSTRY PRACTICES IN EFFORTS TO PREPARE VOCATIONAL TEACHERS COMPETENCES IN ELECTRICAL SKILLS

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ARTICLE INFO

Article history:
Received 2 July 2018
Received in revised form 2 August 2018
Accepted 20 Auguts 2017
Available online 31 August 2018

Keywords:
industry practice pattern,
partnership
electrical skills

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ABSTRACT

This research is based on by issues developing, that graduates of vocational teacher education have not yet had adequate vocational competence according to demand the world of work, primarily as vocational teachers in the field of electrical practices. Industry practice constitutes vehicle for students in order to have vocational competence according to the need the world of industry. This research using qualitative approach, in which data is collected from some industries in Bandung. It is found that patterns of industry practices done in the world of education have not yet run properly according to demand as vocational teacher even the world of work. Therefore through this research is drawn up the design of an patterns of industry practices that can maximize the activities of student for doing industry practice especially for electrical field. Conclusions, where pattern of industry practices using approaches the partnership cooperation with involving government, the world of industry, and university, can run properly and students have good skills and competence according to their field of electrical skills.

1. Introduction

Educational Institute for Teachers that produces graduates to teach in vocational schools has a central role in providing input and help develop vocational education. According to the result of RCP (regional cooperation platform) report (2013, p.9) that with the higher demands of college graduates to produce skilled workforces and ready to work, the learning pattern needs to be related to the existing activities in the world of industry in the sense that students carry out industrial practice activities according to their field and duration enough time to acquire skills. As known, almost all the world of education can be said that they do not have the means of practice as in the industry. Of course this is not possible, for that the world of education, especially technology and vocational education should raise cooperation with the world of industry so that students can practice and apply knowledge that has been obtained in college.

The demands of teachers as mandated by teacher and lecturer laws, where teachers have pedagogical, professional, social and personality competencies are a must. Vocational teachers in addition having those competencies, they are also required to have insight in the world of work, especially in the field of industry. Noticing the high demands that must be met as prospective teachers, especially prospective teachers of TVET, it seems that graduates (fresh graduates of teachers) of Faculty of Vocational and Technology Education not yet have the competence of knowledge and ability expected so that when they teach in vocational school not ready to teach

productive subjects, especially in practices. The same thing was also expressed at the National Workshop of Professional Competency Enhancement for the Candidate of Technology and Vocational Educator at FGD FPTK Universitas Pendidikan Indonesia on November 9, 2016.

Improving students' competence in skills and insight into the world of work can only be done through direct experience working in the world of work / business or industry. The problems faced by the students are still difficult to get the opportunity of industrial practice / internship in accordance with their field of expertise, besides that, it is not equal to the number of industries with the number of students who will carry out practical work in the industry. Students undertaking internships in industry are generally less than two months old. Ideally students carry out industry practice (internship) at least 2 months to be able to understand the work systems, industrial atmosphere, skills and insights that students need to know. This situation is still considered one of the obstacles so that industry insights and student skills are still lacking.

Improving the practice and industry insight of work of FPTK's students is a demand that must be done to meet the needs of professional teachers in vocational field. Vocational teachers should have good practice skills to be transmitted to students in vocational schools. It is difficult to improve the skills and creativities of vocational students if the teacher does not have good practice skills. In this regard, it is very urgent for FPTK's graduates have good practice skills and supported with a strong knowledge/technology base through work experience in the industry.

Teachers are a very important and decisive component in the success of vocational education. The quality of the educator is determined by the extent to which the values, professional knowledge, experiences and factors of human relationships a teacher must have in learning activities especially in vocational education (Miller, 1985). The role of teachers in vocational education can be seen from the progress made by teachers in developing the vocational education.

According to Snedden, quoted by Miler (1985, pp. 81), that in a vocational education a teacher must master vocational pedagogy, which is different from general pedagogy carried out in public education. Vocational pedagogy in his studies include vocational education and training (Sannerud, 2014). In the application of vocational pedagogy includes learning activities undertaken in schools and in the workplace, curriculum development related to vocational training, research and development in vocational education and training.

From the view above, that the concept of vocational pedagogy emphasizes the learning process that related to the work or work productivity. A teacher should give encouragement to the students in the mastery of learning materials related to the mastery of technology, process and high work productivity so that vocational education graduates are able and ready to work. The qualifications of the vocational teacher should have sufficient experience in the industry, and he must have good teaching skills as well. According to Allen (Mille, 1985, p.81), a vocational educator must have four main points: (1). The teacher must be competent in the specialty that is to be taught; (2) the teacher must know how to teach; (3) the teacher must deal with a group of problems that involve knowing children and be able to deal sympathetically and intelligently with adolescent and adult; and (4) the teacher must have abroad viewpoint of the position.

In relation to the competencies that a vocational educator must have, he must have sufficient competence in his field. Teachers not only have high skill ability, besides that he is also able to teach to convey or transfer his ability owned to students. However, there is still an impression that the educational institute of educational personnel (LPTK) that conducts vocational teacher education still has not seen the essential skills that a vocational educator must have. The condition can be seen that the courses related to the practice, as well as industrial practice in the world of work the number of credits is relatively little compared to the teacher practice carried out in schools.

Noticing the Law of the Republic of Indonesia, in 2005, on teachers and lecturers, the competencies that must be possessed as educators are: (1) competent in educating (pedagogic); (2) have a good personality, (3) have high social awareness, and have professional capability in their field. From the four competencies, each other has a high linkage into one in the sense of educational competence. As a vocational educator where he has a great responsibility to educate students into skilled workers in their field. Therefore, the vocational educator (teacher) must master adequate science and also must have good skills to become instructor (laboratory in laboratory/laboratory), (Miller, 1985, p. 81).

The learning and teaching process, a teacher must have the ability that is not owned by people who are not teachers. Therefore, teachers are referred to as professional manpower. Related to that, a vocational teacher has more professional ability than the general teacher. Vocational teachers

should have the attributes of high quality standard duties on vocations. Professional vocational teachers, where teachers should have the insight and capability of eight professional tasks thoroughly and in synergy with each other, as well as he must have adequate knowledge in his area of expertise.

Preparing vocational teachers to be able to teach in SMK (secondary vocational school) is not easy. Most of the developing countries are experiencing significant difficulties and obstacles in the provision of teachers for vocational education (TVET) (Georg, 2009). So far in vocational education there is still the impression that such skills can only be obtained through people who have skills and are directly taught traditionally rather than through formal education. This is the same way that seniors teach juniors without professional steps. Therefore, teacher training should be based on training standards appropriate to the need to produce professional teachers.

Reviewing variety of vocational education theories, where vocational education students are familiar with the notion of vocational pedagogy. Speaking of vocational pedagogy from the summary of discussion forums (UNESCO-UNEVOC e-Forum), vocational pedagogy has scope vocational education and training (Sannerud, 2014). In this context includes training in schools and the world of work (industry, companies, etc.), curriculum development on vocational education, research and development (R & D) in vocational education and training. And underlined also by Georg, that there is a difference pedagogy in general education with pedagogy in vocational education. Pedagogy in general education is child-oriented while pedagogy in vocational education is oriented toward adult learning principles.

The pattern of preparation of industrial practice programs related to preparing vocational educators, need to consider aspects that can provide knowledge and skills to the students. Noticing the provisions of research conducted in Turkey in terms of the duration of the internship activities in the industry is at least 30 work days (340 hours) or preferably effective 60 work days (480 hours) (Emir, 2013).

In an internship activity required intensive mentoring (mentoring) to the students, especially by their existing instructors in the industry. Understanding mentoring according to Orland-Barak in (Helgevold, et. al., 2015), Mentoring is described as ‘the mediation of professional learning’, where mentors constantly engage in mediation between persons and content in value-laden contexts of practice. From this understanding it can be understood that in the mentoring process a counselor must really guide students in practical activities in industry in order to become skilled.

Implementation of apprenticeship in Switzerland there is already a good rule or provision between the corporate education institution through signing the contract to ensure the amount and quality of training provided by the company (Muehlemann, et. al., 2009). In Switzerland, the implementation pattern of apprenticeship where at the end of the activities is carried out the final examination intensively involving the industry / company, supervisor at higher education. After being stated pass the apprentices are entitled to get national certificate (National Certificate). The existence of the certificate will prove that they have the qualification of expertise in accordance with their field of work. (Muehlemann, et. al., 2009).

Industries, places of students applying internships should have instructors who understand the training procedures so that apprenticeship implementation takes place in accordance with the provisions (Muehlemann, et. al., 2009). Talking about the implementation of apprenticeship system, Switzerland has proven to have experience in this activity. From the OECD report, Switzerland has the lowest rank that has the number of unemployed, this is because the country has a good system of internship pattern. The pattern of apprenticeship implementation in Switzerland is similar to that implemented in Germany, Austria, Denmark and the Netherlands (Muehlemann, et. al., 2009).

Apparently, according to experts of cognitive theory, apprenticeship can overcome the problems associated with coaching students in learning specific tasks. Where students learn something through active participation in the concrete task (authentic) in job. Experts or mentors or technicians who teach, guide, provide expertise and advice-advice to students. The apprenticeship learning process is demonstrated by increasing control / supervision and ownership by learners. (Murray, et. al, 2003).

In apprenticeship activities students should be involved 50% of activities in production and 50% in observation. Units where apprentices should be coordinated between university and industry (Polat, et. al., 2010). The interdisciplinary cooperation in the field of technology undertakes large and complex projects in industry using engineering system methods. On this occasion students

apprenticeship participants also take part and give their contribution. Thus the students gain valuable experience in apprenticeship (Rahnamai and Gray, 2015).

Learning by doing a direct activity of something learned will provide far greater benefits than just looking or listening. According to Kolb, 1984, (Rus, et. al., 2015). Experiential learning or learning by doing something to get experience is based on the notion that individuals have not the understanding of the elements of thought that remain otherwise unchanged but is instead formed and re-formed through experience. In this context can be understood that learning activities based on experience will certainly provide thoughts and ideas that make up a person has a much better competence than just seeing or listening. For that experience directly to the field or in the workplace for vocational workers will certainly give a positive result.

Colleges have the opportunity to cooperate with the industry, in addition to facilitate the marketing of college graduates to work in the world of industry. With an internship activity allows students to do activities outside the campus and visit industry in accordance with their fields. From the research seen the existence of internship activities done by students can be expressed through correlation between apprenticeship where students do work in accordance with the field of expertise can improve their career. Collaboration between Industrial and Academic, both very useful. The cooperation of both institutions can be profitable on both sides such as in research and development, cooperation in sponsorship assistance, student internships. Figure 1 shows a model of mutually beneficial cooperation between the two institutions (Sivananda, et. al., 2009).

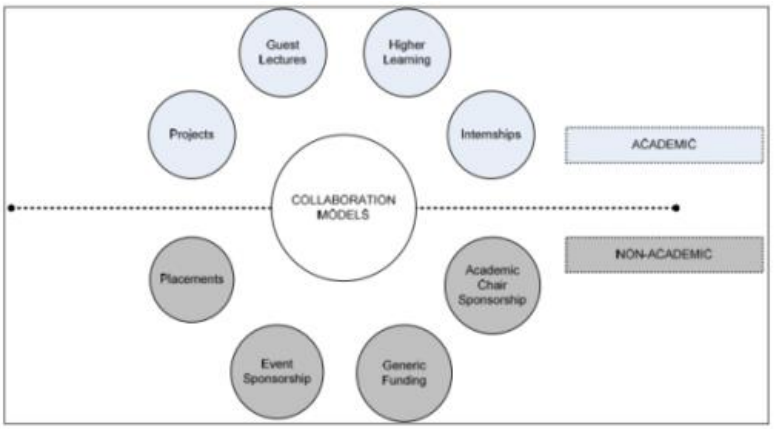

Figure 1. Model of Industrial Cooperation-Academic (Industry-Academia Collaborative Models). (Source: Sivananda et. al., 2009)

Implied that through apprenticeship proven to be a very effective model in recruiting workforce for students have ever undergone doing apprenticeship activities, their expertise. The industrial environment forces one to think concretely to get a practical solution through his system of thinking (Trotskovsky and Sabag, 2010). Students understand how the design of projects (jobs) that exist in the industrial environment to contribute to the development of engineering thinking.

In principle, a person's work performance should have employability skills, technical or dicipline specific skills, and core skills (LLN: language, literacy and numeracy), including: reading and counting in terms of understanding the meaning of the manual and determining the accuracy of work (Kemmis and Charles, 2014). Associated with preparing skillful vocational teachers in the field of engineering in accordance with the discipline that he must have like skills, ability to teach and transfer and develop skills for students.

2. Method

This research uses qualitative approach, where data are profoundly gathered through interview, observation, and documentation in some industries in Bandung, West Java. Data gathered through Delphi method is done using Group Communication Techniques namely through conference telephone call, commitee meeting, formal conference or seminar, conventional Delphi, dan real-time Delphi, Group Communication Techniques, (Linstone & Turoff, 2002).

To explain the pattern that needs to be implemented for improving industry practices of students in order they have good competences in electrical skills encompasses four variables: the

data of lab facilities, students' practices in lab, the activity of the students' industry practices, competences of electrical skills students that is achieved. The fourth of variables namely: program, facilities, activities, and competences. Related to those variables, where those are addressed to students, lecturers, and technicians encompass the data of documentations, interviews, and observations. After all data gathered, afterward analyzed as figure 2. In verifying data that has been gathered through documentations, interviews and observations which are done using focus group discussion (FGD) to representatives from industries, experts, lecturers conducted by faculty of vocational and technology education UPI in 2014, and coincidentally in the event, researcher involved on the FGD.

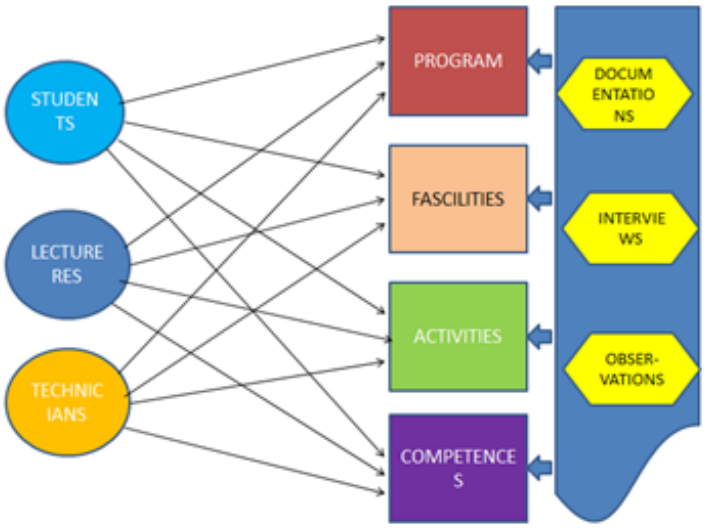

Figure 2. Mapping analyze data

3. Result and Discussion

From this research findings obtained that DPTE students, faculty of vocational and technology education, UPI, have yet to have good preparation to attend industry practices (IP) according to the job, specifically on electrical skills. Various factors cause students have weaknesses in doing practices' activities caused by minimum existing equipments for in lab/ workshop, thereby they have minimum skills as well. When they come to industry for doing IP, they felt not ready. IP activities done by Department of Electrical Engineering Program have yet to run properly as expected in accordance with curriculum. Electrical engineering graduates are prepared as educators for SMK should have sufficient vocational competence, especially in the field of electrical skills. But the fact that there are still many students do not have enough vocational competence to work both as educators and technician in industry.

In general, industries' communities accept students' attendance for doing industry practices after they undergo preconditions stipulated by industry. Student activities should refer to the agreed programs between educational institutions and the world of industries with abide the existing provisions and agreed by both parties. In the activities of students' IP, DPTE should establish cooperation in the form of MoU ties and partnerships with related industries thereby the process and implementation of IP can run as planned and not experience the significant obstacles. From the research findings, that to improve the students' vocational competence, it is necessary to revise the pattern of existing industrial practice programs in the DPTE.

The preparation of industry practical program (IPP) takes into consideration various aspects related to student Industry practical activities. INAP Commission Architecture Apprenticeship (2012) clearly illustrates that the target dimensions achieved in professional work tasks are through the process. In this context, students undertake training activities or seek experience in the world of work/industry. Student industry practical activities should be designed / arranged in accordance with the pattern of industry practices through an organized work system so that the implementation of industry practices achieves a maximum result.

Keep in mind that to form a person becomes expert should through rigorous process. According to Dreyfus and Dreyfus, (Rus, et. al., 2015), that the process of forming one's skills is essentially through five stages: novice, mature, competent, proficient), to experts. Looking at this process, to achieve a success requiring a work hard and spirit. Students doing industry practices should follow the regulations in industry, and be able to adapt with technicians and workers in industri. All activities of students in industry have to be recorded and create reports periodically, daily, weekly and monthly. In doing the industry practical activities, students should do the activities according to their field, and in this context the electrical installation.

In order the activities of industry practices can be done in routinely, required cooperation pattern done with two parties (the world of educations and the world of industries) in form of MoU. Related to the MoU, in which the implementation of apprenticeship in Switzerland there are provisions that should be met by the educational institution with the world of industry is to sign the cooperation to ensure the amount and quality of training provided by the company (Muehlemann, at. al., 2009) . Thus, it is clear that the certainty of the students to get a place in conducting industry practices, research and so on, in this respect, it must be done sign a memorandum of understanding with the industry. So far DPTE has not yet made a MoU with industry, therefore students have difficulty if they want to do industry practices or apprenticeship according to student study field. Besides that, students should queue up with other students from other education institutions in conducting industry practices. The number of students accepted by industry within limited numbers as well.

Completeness of facilities and infrastructure for practices in the lab / workshop needs to be considered. It is impossible to produce high-skilled students without being supported by equipments of adequate lab. Seen out of the context to the industry practices done by mahasiswa, in which students should do apprenticeship in industry that has enough equipments to be learned. On that basis, the following, a study published by the Standards Council training standardization body, traditional apprenticeship is an internship in which a person learns a particular skill in a person skilled in his field (Report, at. al., 2000). In the course of apprenticeship activities, apprentice participants (students) using adequate equipment thereby they completely feel the real conditions as worker.

In the course of student activities in industry need to get guidance, mentoring and monitoring continuously both by mentors in the industry and supervisors from university. Explicitly stated by Orlan-Barak (Helgevold, et. a., 2015), there needs to be mentoring of students, especially by instructors in the industry. Also said in the mentoring process there is a mediation of professional learning where the supervisor will continuously monitor and direct the intern trainees in training activities (internship). That the industry where the students perform the internship should have instructors who understand about the training so that the internship runs well (Muehlemann, et. al., 2009). Paying attention to the above statements, that supervisors (lecturers) should conduct regularly monitoring on students, what students conduct, any constrains students have. If there is any problem faced by students during apprenticeship activities in industry, immediately can be well addressed together with students, technicians and supervisors from university.

End of the process is through an evaluation move, in order to know the competence of students in the course of industry practical activities should be assessed according to the rules. In assessing student's competence must be: fairness-assessments, flexibility-assessments and reliability-assessments, and to meet the overall assessment criteria by applying the valuation model holistic assessment model, which includes knowledge, understanding, problem solving, technical skills, attitudes and ethics. The evaluation process after one has completed apprenticeship is necessary, and in the evaluation process must involve mentors (instructors) in the industry and lecturers (Muehlemann, et. al., 2009). After being declared pass, students deserve to get certificate. The certificate that students have, proving the relevant qualifications of expertise in accordance with their field of work.

Variety of inputs out of Instructors and guides, and students in the course of the industry practical activity constitute important inputs that need to be paid attention in order the conducting of industry practices can run well. Actually, through industry practical (IP) activities many things students obtain. The most important thing need to be understood by students are the situation and work culture in industry. Keep in mind that through the IP activities student mindset will be broad. To carry out IP pattern required agreement in form of memorandum of understanding (MoU) signed by two parties, industry and university. The existence of MoU means can simplify students want to

access student practical activities in industry and Management in industry can allocate the number of students who would do industry practices.

With refer to the PPP (Public-Private and Partnership) approach for vocational education, the three main components, i.e., University (higher education), industry (workplace) and Government with MoU ties and partnerships are expected to deliver positive results for the IP program in DPTE. As can be seen in Figure 3.

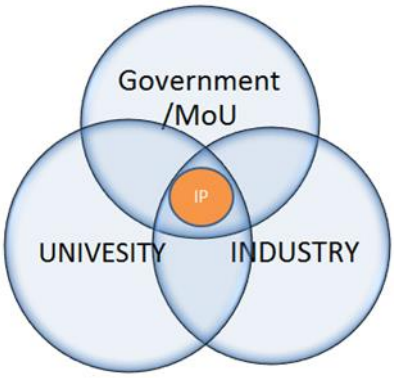

Figure 3: The Three Major Components of an IP Program

Cooperation within partnership between education and private sectors (the world of venture and industry) has actually been applied in many countries, such as in Germany, China, Korea, Thailand etc., known as PPP (public-private partnership) program. The PPP program pattern is implemented in RMUTL (Rajamandala University of Technology Lanna - Thailand). PPP program is a program involving universities, industry and government in partnership form (Songthanapitak and Lanna, 2015). The program has an important impact to improve students' competence in skills and employability. The cooperation pattern between universities and industry (private) parties which refers to government guidance through the provisions of the labor law, through a memorandum of understanding (MoU).

Considering the model of cooperation between the world of industry and academic (industry-academia collaborative models), (Sivananda, et. al., 2009), which clearly illustrates that the cooperation is advantageous on both sides. Educational institutions can place students to do industy practical activities, funding assistance, and other sponsors or assistances that can be utilized by educational institutions. Likewise for the industry, can utilize the existing experts in educational institutions, utilizing students apprentices to assist in the production process, improve the quality of human resources in the industry to a higher level, and cooperation in the field of research to improve productivity in the industry.

Student attendance to industry will get many benefits. That someone in the industrial environment will make him think concretely in solving the problem practically (Trotskovsky and Sabag, 2010). That one's skilled work there are three work skills (employability skills), discipline (specific skills and core language) and ability to solve problems or analyze (Kemmis and Charles, 2014). So through the practice of industry, where a person (student) directly dealing with the real world of work, then he will have many problems faced to be solved on the basis of knowledge he has.

4. Conclusion

The available facilities in lab are not enough to provide students with skills. Equipments available in the industry can be utilized by students in IP activities as long as the student's IP activities are guided by instructors not only experienced but also experts in their fields. Industrial Practice Pattern hasn’t yet been compiled by involving the industry communities where the students in general carry out IP activities. Out of the research found that generally industries provide opportunity for students to carry out IP activities, and do the research collaboration with involve students, lecturers and technicians in industry. Industrial practice activities should refers to the concepts of

PPP (public and private partnership), namely the existence of good collaboration between the academic, company/industry, and government (government) through memorandum of understanding (MoU). The existence of MoU in the form of partnership should be followed up with a form of mutual cooperation. In the activity of industry practices should refer to the learning process and RPL (recognition prior learning) approach in order to provide benefits to students for improving knowledge and insight about the world of industry, work skills, culture and work experience as well as fostering creative and innovative students.

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