

ISSN: 2301-7147



ICVET
4th International Conference
on Vocational Education and Training

PROCEEDINGS

4th International Conference
on Vocational Education and Training 2016



**“Strengthening TVET in
ASEAN Economic Community”**

Yogyakarta State University, Indonesia
September 15, 2016



THIESS



RCP
Regional Cooperation Platform



**PROCEEDINGS
4th INTERNATIONAL CONFERENCE ON
VOCATIONAL EDUCATION AND TRAINING (ICVET)**

**GRADUATE PROGRAM COLABORATION WITH
ENGINEERING FACULTY, YOGYAKARTA STATE UNIVERSITY
September 15, 2016**

STRENGTHENING TVET IN ASEAN ECONOMIC COMUNITY

ISSN: 2301-7147

I. Article

II. Title

III. Achmad Arifin, et.al.

Copyright Act protected photocopied or reproduced by
any means, whole or in part without permission of the
publisher of this book is immoral and against the law

Title:

STRENGTHENING TVET IN ASEAN ECONOMIC COMUNITY

Editors:

Achmad Arifin
Surono

Layout:

Achmad Arifin

Cover Designer:

Muslikhin

Strengthening Technical Vocational Education and Training (TVET) in ASEAN Economic Community (AEC)

Welcome to the 4th annual INTERNATIONAL CONFERENCE ON VOCATIONAL EDUCATION AND TRAINING (ICVET 2016)

This proceeding compiles all abstracts and fullpapers from the invited speakers and participants presenter in the 4th International Conference on Vocational Education and Training (ICVET) held by the Graduate School and Faculty of Engineering Yogyakarta State University on 15 September 2016 at Sheraton Mustika Hotel Yogyakarta.

ASEAN Economic Community (AEC) has prevailed at the end of 2015. Regarding this issue, it has some consequences. One of them is the open flow of products, services, and human resources across ASEAN countries. In addition, ASEAN members can freely sell their industrial products. In other words, this policy can increase the degree of products competition among those countries. The main theme of this conference is “Strengthening Technical Vocational Education and Training (TVET) in ASEAN Economic Community (AEC)”. Four sub themes are covered in this conference: 1) Establishing the policy of Quality Assurance in TVET to prepare Regional Qualification Framework, 2) The Role of TVET to Fulfill National Economic Growth and Workforce in AEC Era 3) Contribution of Informal Sectors and Skills Village in AEC, 4) Empowering Vocational Teacher Education Institution in AEC.

This conference provides the opportunity for teachers/lecturers, educational practitioners, industrial practitioners, and the others stakeholders as well to share knowledge, experiences, and research findings relevant in contributing ideas and considerations for the implementation of VET policy-making in order to strengthen Technical Vocational Education and Training (TVET) in ASEAN Economic Community.

The committee would like to thank to those who have provided assistance without which it is impossible to finish this proceeding. Further comments and suggestions on the improvement of this proceeding would be highly appreciated.

CHAIRPERSON SPEECH

Rector of Yogyakarta State University,
Prof. Dr. Pascal Marquet, University of Strasbourg, France
Tony Borkett, Theiss, Australia
Dr. Michael Grosch, Karlsruhe Institute of Technology, Germany
Prof. Soenarto, Ph.D., Yogyakarta State University, Indonesia

Distinguished guests, Participants, Ladies and Gentlements,

It gives me great pleasure to extend to you all a very warm welcome to the 4th International Conference on Vocational Education and Training (ICVET) with the theme “Strengthening Technical Vocational Education and Training (TVET) in ASEAN Economic Community (AEC)” held in Sheraton Mustika Hotel today.

Consequences of the implementation of ASEAN Economic Community which came into force in late 2015 are the open flow of products, services, and human resources across the ASEAN countries. Another consequence is there are many employment opportunities among ASEAN countries, however, when one side can enlarge employment opportunities, it can threaten less skilled human resources’ position in a particular country.

The successful fulfillment of skilled human resources is highly dependent on vocational education. Reputable vocational education certainly is supported by professional teachers. Based on this fact, the strengthening of vocational teacher education institutions is considered urgent since at this time vocational teacher education institutions have not set up teachers according to expertise program in vocational education. This conference offers an opportunity for participants to share best practices, concepts, and experiences in Strengthening TVET in AEC.

Our technical program is rich and varied with 1 keynote speaker and 4 invited speakers. 170 participants in this conference that involving 4 groups: Graduate School Students, College/University Teachers, Secondary School Teachers, Vocational High School Teachers. A total of thirty papers will be presented during the parallel session.

As a conference chair of the 4th ICVET 2016, I know that the success of the conference ultimately depends on the many people who have worked with us in planning and organizing both the technical program and supporting social arrangements. Recognition should go to the organizing committee members who have all worked extremely hard for the conference programs.

I hope that this conference will give benefit to the students, academic staffs and vocational teachers.

Thank you for your attention. I wish you a very fruitful conference.

Dr. Widarto
Chairperson of 4th ICVET 2016
Dean of Engineering Faculty
Yogyakarta State University

RECTOR YOGYAKARTA STATE UNIVERSITY WELCOME SPEECH

Prof. Dr. Intan Achmad, Directorate General of Learning and Student Affairs, Minister of Research, Technology and Higher Education, Indonesia

Prof. Dr. Pascal Marquet, University of Strasbourg, France

Tony Borkett, Theiss, Australia

Dr. Michael Grosch, Karlsruhe Institute of Technology, Germany

Prof. Soenarto, Ph.D., Yogyakarta State University, Indonesia

Distinguished guests, Participants, Ladies and Gentlemen's,

I would like to say welcome you warmly to the 4th International Conference on Vocational Education and Training (ICVET) with the theme of "Strengthening Technical Vocational Education and Training (TVET) in ASEAN Economic Community (AEC)" held in Sheraton Mustika Hotel today.

ASEAN Economic Community (AEC) has prevailed at the end of 2015. Regarding this issue, it has some consequences. One of them is the open flow of products, services, and human resources across ASEAN countries. In addition, ASEAN members can freely sell their industrial products. In other words, this policy can increase the degree of products competition among those countries. Service industry will take part in all ASEAN countries without boundaries. Others consequences are several employment opportunities among ASEAN countries. However, when one side can enlarge employment, opportunities, it can threaten less skilled human resources position in a particular country.

To confront the invasion of foreign labor from several countries, it is necessary to put up candidates who have qualified manpower that can be accepted in other countries. In that case, it is necessary for educational institutions at national, regional, and international level to have assured quality. Also, based on the demands of the regional labor qualification, it is expected that vocational education graduates can implement quality assurance in accordance with the framework of regional labor qualification.

Vocational education aims to produce skilled human resources to meet the demands. One of the criteria of successful fulfillment of skilled human resources is depended on vocational education. Vocational education certainly is supported by professional teachers. Based on this fact, the strengthening of vocational teacher education institutions is considered urgent since at this time vocational teacher education institutions have not set up teachers according to expertise program in vocational education.

We know that the success of the conference ultimately depends on the people who have worked with us in planning and organizing both the technical program and supporting social arrangements. Recognition should go to the organizing committee members who have all worked extremely hard for the conference programs. I hope that this conference will give benefits to the students, academic staffs, industrial practices and vocational teachers.

Thank you for your attention. I wish you a very fruitful conference.

Prof. Dr. Rochmat Wahab, M.A
Rector of Yogyakarta State University

CONTENTS

Title	i
Preface	iv
Chairperson Speech	v
Rector Welcome Speech	vi
Content	vii

Invited Speakers

DEVELOPING A COMPETENCY STANDARD FOR TVET TEACHER EDUCATION IN ASEAN COUNTRIES

Michael Grosch.....	1-1
---------------------	-----

THE ROLE OF THE PRIVATE SECTOR IN VOCATIONAL EDUCATION

Anthony Borkett.....	1-9
----------------------	-----

THE ROLE OF TVET FOR IMPROVING ECONOMIC GROWTH AND LABOR IN ASEAN ECONOMIC COMMUNITY ERA

Soenarto.....	1-14
---------------	------

DIGITAL MEDIA RESEARCH IN EDUCATION: THE USEFULNESS OF THE INSTRUMENTAL CONFLICTS THEORY

P. Marquet.....	1-28
-----------------	------

Paper Presenters

Theme 1: Establishing the policy of Quality Assurance in TVET to prepare Regional Qualification Framework

THE QUALITY OF STUDENTS' SOCIAL COMPETENCY OF EDUCATIONAL EXPERIENCE PROGRAM IN VOCATIONAL SECONDARY SCHOOLS

Suparman, Galeh NIPP, Dwi W	2-1
-----------------------------------	-----

CURRICULUM DEVELOPMENT OF VOCATIONAL EDUCATION FOR ELECTRICAL ENGINEERING REFERS TO THE NATIONAL QUALIFICATION FRAMEWORK FOR STANDARIZING STUDENT COMPETENCE'S

M. Khairudin, R. Asnawi, Herlambang S.P, Totok Heru TM, A. Candra, T. Sukisno.....	2-7
--	-----

EXPLORING THE MALAYSIAN QCLASSIC PRACTICALITY

Sohimi, N. E, Affandi, H.M, Fadzil, H., Mohd Sattar, R.....	2-16
---	------

VOCATIONAL SCHOOL QUALITY IMPROVEMENT BY STRATEGIC PARTNERSHIP WITH INDUSTRIAL SIDE

Zainal Arifin.....	2-24
--------------------	------

THE QUALITY OF ELECTRONIC APPLICATION COMPETITION IN VOCATIONAL HIGH SCHOOL BASED ON HIGHER ORDER THINKING SKILLS

Muslikhin, Muh. Munir, Poncowali Pranoto.....	2-30
---	------

Theme 2: The Role TVET to fulfill National Economic Growth and Workforce in AEC Era

LABOR PRODUCTIVITY UP WITH DEBURRING TOOL IN GEAR PROCESSING, A CASE OF STUDENT INDUSTRIAL INTERNSHIP PROGRAM

Gamawan Ananto, Aji Yudistira 3-1

DEVELOPMENT OF CONTEXTUAL LEARNING TO INCREASE THE STUDENT KNOWLEDGE OF PILES IN FOUNDATION ENGINEERING

Nurlita Pertiwi 3-6

MOBILE LEARNING TRENDS AND CHALLENGES FOR VOCATIONAL EDUCATION IN INDONESIA

Ridwan Daud Mahande, Herman Dwi Surjono 3-12

THE EMPOWERMENT OF VOCATIONAL EDUCATION AND IT'S CONTRIBUTION TO NATIONAL ECONOMIC GROWTH

Sutarto Hp 3-20

STRENGTHENING COMMUNITY COLLEGE TO IMPROVE GROSS ENROLMENT RATIO (GER) OF HIGHER EDUCATION

Sunaryo Soenarto 3-28

DESIGN EXPERIENTIAL LEARNING ON COMPETENCE BASED TRAINING COMPUTER ENGINEERING AND NETWORKS IN VOCATIONAL HIGH SCHOOL

Riana T. Mangesa, Dyah D. Andayani 3-34

MADRASAH ALIYAH ANALYSIS FOR THE IMPROVEMENT OF VOCATIONAL GRADUATES' COMPETITIVENESS TO FACE GLOBAL WORKFORCE

Adhan Efendi, Jeng Iswari 3-40

VOCATIONAL STUDENTS' SELF-AWARENESS AND LEARNING NEEDS TO SURVIVE AND THRIVE IN THEIR JOB-LIFE

Adi Suryani, Usman Arief, Tri Widyastuti 3-47

THE FACTORS THAT AFFECTS THE SUCCESS OF ENTREPRENEURSHIP OF FASHION PROGRAM AT YOGYAKARTA

Ma'rifatun Nashikhah, Moch. Bruri Triyono 3-57

IMPROVING THE COMPETENCE OF VOCATIONAL HIGH SCHOOL GRADUATES BY TEACHING FACTORY AND TECHNOPARK

Sanatang 3-64

Theme 3: Informal Sectors and Skills Village as Drives in AEC

VOCATIONAL STUDENT'S SKILLS ENHANCEMENT THROUGH EMPOWERING LOCAL EXCELLENCE IN DEALING ASEAN ECONOMIC COMMUNITY (AEC)

Hendra Jaya, Yasser A. Djawad, Ilham Thaief 4-1

BIG BANG MODEL STRATEGY FOR ACCELERATION OF LOCAL GOVERNMENT READINESS FINANCIAL ACCOUNTING SYSTEM BASED ACCRUAL IN THE DISTRICT KARANGANYAR

Siti Nurlaela, Sri Hartono, Istiqomah 4-9

VOCATIONAL VILLAGE INITIATIVES FOR COMMUNITY SKILL DEVELOPMENT BASED ON LOCAL RESOURCES IN AEC

Suhendar, Siswo Wardoyo, Syadeli Hanafi..... 4-21

STRUGGLING CREATIVE HOME INDUSTRY ON IMPLEMENTATION OF MODIFIED BEAN BREAKER TOOLS-MULTICULTURAL CHARACTER BUILDING BASES OF MERAPI VOLCANIC DISASTER

Zainur Rofiq, RA. Rahmi Dipayanti Andayani, Das Salirawati..... 4-28

THE WORKERS COMPETITIVENES OF SMALL BUSINESS ENTERPRISE TO FACE ASEAN ECONOMIC COMUNITY AGREEMENT

Yasrizal..... 4-33

Theme 4: Empowering Vocational Teacher Education Institution in AEC

VOCATIONAL TEACHER ROLE IN PREPARING STUDENTS IN THE ASEAN ECONOMIC COMMUNITY ERA

Hasanah, Muhammad Yahya, Muhammad Nasir Malik..... 5-1

TEACHERS QUALIFICATION FOR VOCATIONAL EDUCATION AND TRAINING PROGRAM IN HEAVY EQUIPMENT SECTORS

Moch. Bruri Triyono, Achmad Arifin, Nur Hasanah..... 5-8

INFORMATION SYSTEM MODEL OF SELF-EVALUATION EFFORTS TOWARDS WORLD CLASS TEACHERS' INSTITUTION OF VOCATIONAL EDUCATION AND TRAINING

Edy Supriyadi 5-15

EMPOWERING INDONESIA's TVET TEACHER EDUCATION IN ASEAN ECONOMIC COMMUNITY ERA

Lutfiyah Hidayati..... 5-22

THE CHALLENGES OF MUSIC TEACHER COMPETENCIES FOR VOCATIONAL SCHOOLS TO FULFILL CREATIVE ECONOMY INDUSTRY DEMANDS

Ayu Niza Machfauzia 5-27

INDONESIAN VOCATIONAL TEACHERS EDUCATION DEVELOPMENT

Putu Sudira..... 5-36

TEACHERS QUALIFICATION FOR VOCATIONAL EDUCATION AND TRAINING PROGRAM IN HEAVY EQUIPMENT SECTORS

Moch. Bruri Triyono, Achmad Arifin, Nur Hasanah

Faculty of Engineering, Yogyakarta State University
bruritriyono@uny.ac.id

ABSTRACT

This paper aims to describe the qualification of teachers or trainers in the Vocational Education and Training Program in Heavy Equipment Sectors. Data were collected through interviews and direct observation to vocational and heavy equipment industries in the island of Java and Kalimantan. Data analysis used is descriptive qualitative approach. The result showed that: (1) in formal education (SMK), educators must have the academic qualification of at least S1 fields of automotive or machinery, capability of heavy equipment including the basic technical training / basic mechanic, engine intermediate, electrical training, hydraulic system and powertrain. Technical training in heavy equipment or work experience in the industry is a plus, (2) in non-formal education (training center industry), trainers must master the material and basic competencies for heavy equipment mechanics, which is similar to the certificate III for mechanical, electrical and fabrication technicians and also has the ability to teach and completed the training program for trainers or certificate IV for training and assessment, (3) there is a need to develop qualifications and competencies for heavy equipment educators, which involves SMK, industry, university and the government to acquire the competence of vocational graduates that are relatively the same as the graduates of mechanics training organized by industry.

Keywords: teachers qualification, education and vocational training, heavy equipment technical training, heavy equipment mechanics.

I. INTRODUCTION

Heavy equipment utilization is increasing in the mining and construction industry. This situation leads to the needs of the Human Resources (HR) with the competence of maintenance and repair of heavy equipment has increased in terms of both quantity and quality. Heavy equipment in question is a large-sized machine designed to perform functions such as earth working and moving building materials. Heavy equipment generally consists of five components, namely implements, traction, structure, power source and its transmission (power train), and the control system (<https://id.wikipedia.org>). Heavy equipment holds a significant factor in projects, especially those dealing with construction, mining and other large scale activities. Rostiyanti (2008: 1) explains that the purpose of heavy equipment utilization is to enable people to have the works done, so that the expected results can be achieved more easily with a relatively shorter time. Heavy equipment that is commonly used in

construction projects, among others: (1) dozer, (2) excavator such as backhoes, front shovels, clamshell, (3) a conveyance such as loader, truck and conveyor belt, (4) roller ground such as roller and compactor.

Efforts to support the fulfillment of human resources in question need to be done in various ways, namely non-formal education undertaken by an industry in the form of a training center or formal education such as vocational schools (SMK), Polytechnic, and University. HR needs in heavy equipment areas such as mechanics and operators continue to increase every year. It is as presented by Assistant Director of Academic UT School Bustamamsyah Djalal that HR need is in correlation with the increasing heavy equipment sales in every year. However, the number of workers in heavy equipment business is quite limited compared to the existing needs. (<http://www.medanbisnisdaily.com>)

One of the obstacles encountered in preparing the human resources, especially heavy equipment mechanics and operators is

the availability of professional educators whose qualifications and competence can be accepted by the industry as the employer and administratively recognized by the government in accordance with the applicable legislation. Jalal and Mustafa (2001) describes the results of studies that teacher is the main factor that can determine the success of the educational process in which it can be seen from the students' learning achievement. Eligible teachers provide a significant contribution in improving the quality of the educational process such as curriculum reform, development of instructional media and application of learning methods.

Regulation of the Minister of National Education No 16 in 2007 states that a teacher shall have academic qualifications and competence which includes pedagogical competence, personal competence, social competence, and professional competence acquired through professional education and integrated in teacher performance. Ananda et al (2010: 65) mention that teachers hold a strategic role in education. Their study to SMK teachers with a field of industrial technology in all areas of Malang city shows that the majority of teachers (78.77%) with certified educators have a good pedagogical competence, 78.38% have a good personal competence, 77.42% have a good social competence, and 76.95% have a good professional competence.

Arif Rahman (2009: 14) in his study explains that the problem of improving eligible teachers cannot be resolved simply by providing sufficient salary and welfare, but it is also necessary to enhance and improve the teachers' competence. This is crucial because science and technology is always changing and evolving rapidly, so it is necessary for teachers to continue to improve their professionalism hence they are updated or even create a new engineered technology for the benefit of wider communities.

This paper is going to analyze the qualification of teachers/instructors in vocational education and training programs in the field of heavy equipment both organized by SMK and industry. The results of this analysis are expected to gain a complete picture about the profile and competence of vocational educators in heavy equipment field. These results are beneficial as an input for the improvement of curriculum development in universities and training institutes to prepare educator/instructor candidates in engineering machine.

II. METHOD

Data analysis employs qualitative descriptive approach to the measures as proposed by Burhan Bungin (2003: 70), as follows: (1) data collection, which is carried out by observation or direct observation, interviews and document analysis, (2) data reduction, namely electoral process focusing on simplification and transformation of data from data collection, (3) data presentation, a description of a set of data which gives the possibility of drawing conclusions and taking action, (4) verification and conclusion assertion namely the interpretation of data to find the meaning of the presented data.

The population sample is parties involved and interested in the implementation of education programs and vocational training field of heavy equipment, namely: SMK as education institutions producing middle-level workers, a company engaged in heavy equipment field, and college that becomes a place to educate SMK teachers. The location of this sample group spread across several cities in Java and Kalimantan.

III. RESULT AND DISCUSSION

Based on the results of direct observation and interviews and after performing data reduction, the obtained data is presented in Table 1.

Table 1 Observation data after data reduction

NO	Institution	Learning Activities	Teachers' Qualification
1.	SMK N 1 Singosari Malang	Learning activities are done by using a block system. Compulsory learning resources are modules from industry and combined from common text books.	Teachers with a bachelor degree in mechanical,automotive engineering that have received training in heavy equipment in PT Trakindo Utama

NO	Institution	Learning Activities	Teachers' Qualification
2.	SMK BAKTI BANGSA Banjarbaru Kalimantan Selatan	Learning theory is done in schools, while practical lessons in schools and Banjarmasin UT Training Center. The material is developed based on the results of teacher training at TC UT Banjarmasin.	Teachers have a diploma degree from formal education and work experience in an industry or a bachelor degree; a certificate of competency of heavy equipment from an industry.
3.	SMK PGRI Banjarbaru Kalimantan Selatan	Learning theory is done in schools and sometimes by inviting guest teachers from the industry. Practice learning is held in school workshops and industrial workshops.	Teachers have Diploma from formal education and a training certificate of a company, work experience in an industry and integrity.
4.	SMK N 5 Banjarmasin Kalimantan Selatan	The learning process is done in schools (both theoretical and practical). Instructional materials refer to materials from industry which is obtained by teachers who join industry's training.	Teachers have a bachelor degree from formal education or a competency from heavy equipment training in an industry.
5.	SMK N 1 Balikpapan Kalimantan Timur	Theory and practice is done in an integrated way and later validated by teachers as a requirement to join industry work practice.	Teachers with a bachelor degree in mechanical / automotive engineering and teachers in a combined class have received training in Trakindo.
6.	Training Center PT United Tractors Cabang Banjarmasin	Training for all new mechanics is held for 1 year (4 months of theory and practice at UT School, 8 months internship in a project site). The development (advanced training) is given in each competency according to the interests and talents of each mechanic	Instructors shall master the material and basic competence of mechanics and receive training for trainers and other supporting training to improve their teaching abilities.
7.	Traning Center PT Thiess Contractors Indonesia	Apprentice program is held for 8 blocks @ 6 months. Material: Basic mechanic awareness, mandatory material from Thiess, trade stream, and specialist units.	Instructor qualification criteria are established in accordance with CQ University, Cert IV for training and assessment.

Table 1 shows that learning activities in the field of heavy equipment engineering are conducted in two lines of education namely, formal education from vocational schools (SMK) and non-formal education from training center in the industry. SMK organizes heavy equipment education programs and the industry also conducts training in the field of heavy equipment to prepare mechanics and operators personnel. Chairman of Heavy Equipment Engineering Program in SMK Negeri 1 Singosari Malang mentions the heavy equipment learning process is carried out using a block system. Compulsory learning resources shall employ modules from industry and learning resources from common text books. Students' evaluation is carried out by assessors from schools and an industry. However in some vocational respondents/other observation objects,

there is a small difference in the learning process which is carrying out theory and practice in an integrated in schools by teachers. During the education program students are required to join industry work practice for varying periods of about 2 to 6 months.

The data observation also shows that training programs in industries are more intensive and specific. Paimin (Training Center United Tractors) states that to become a new mechanic in PT UT, vocational graduates shall join an intensive training for 1 year (4 months of theory and practice in the UT School workshop, 8 months of internship in a project site). Furthermore, Alusiyansyah explains that the training program for aspiring mechanic in PT Thiess Indonesia is in the form of an Apprentice program conducted for 8 blocks @ 6 months

in workshops training center and PT Thiess project site.

One significant component which supports the heavy equipment engineering learning process is educators both teachers in vocational schools and instructors in industry training center. Qualifications of educators and instructors shall be relevant and aligned with the competencies of graduates defined. Regulation of the Minister of National Education of the Republic of Indonesia No. 16 of 2007 on standard of academic qualifications and teachers' competence explains that any teachers or educators shall have academic qualifications and competency standards that apply nationally. Teacher competency standards are developed from the four core competencies, namely pedagogy, personality, social, and professional. This paper discusses only in terms of academic qualifications, pedagogical competence and professional competence. Firstly, academic qualification is education requirement that shall be met by an educator as evidenced by diplomas and/or certificates of relevant expertise. Secondly, pedagogic competence is the ability of teachers/educators in managing the learning process, recognizing the learners' characteristics, mastering learning theory and principles of learning, and be able to develop curriculum and instructional media. Lastly, professional competence is the ability of teachers or educators in participating in the development of science in accordance with the areas of expertise that is always dynamic, developing with learning and reflective action in mastering the learning material broadly and deeply.

Paimin of Training Center United Tractors explains that an instructor shall master the material and basic competence of mechanic by joining the Training for Trainers and other supporting training to improve the teaching abilities. In addition, Darmawan, an instructor coordinator in PT Thiess training center elucidates that an instructor shall have skills in heavy equipment engineering that are relevant to a certificate III for mechanical, electrical and fabrication engineering, and qualify for a certificate IV for training and assessment issued by CQ University Australia. Both only

describe the requirements of the pedagogic and professional competence, but they do not describe the academic qualifications required to become an instructor. Other data reveals that the majority of industrial instructors have a bachelor degree but some of them also have the educational background of high school / vocational school with work experiences.

In general vocational teachers' qualification in heavy equipment engineering fulfills government requirement which is a bachelor degree in automotive engineering or mechanical engineering. It is in line with the explanation given by the Chairman of the Heavy Equipment Engineering Program SMK Negeri 1 Singosari and the explanation of the Chairman Heavy Equipment Engineering Program SMK Negeri Banjarmasin. Teachers also shall have skills in heavy equipment engineering including basic technical training/basic mechanic, engine intermediate, hydraulic system and powertrain, electrical training, and experience of industrial training or work experience. Teachers who teach industrial cooperation classes are required to have a certificate of training in heavy equipment engineering from industry partner as explained by the Head of SMK Negeri 1 Balikpapan.

Table 2 presents a comparison of the qualifications and competency of vocational teachers and training instructors in an industry seen from the academic qualification factors, pedagogical competence and professional competence. Table 2 defines that heavy equipment engineering educator qualifications of vocational teachers and instructors have in common, but there are differences in quality standards in terms of academic, pedagogy and professional. Pedagogical competence of vocational teachers is not identified definitively from the observation, but it can be assumed that the pedagogical competence is attached to their bachelor degree. This is because the provision of qualifications and competence of vocational teachers shall be based entirely on the rules and regulations set by the government, while the instructor qualification prefers achievement of graduates' competencies.

Table 2. Comparison of the qualifications and competence of vocational teachers and instructors of heavy equipment training

No	Qualifications/ Competencies	Vocational Teachers	Instructors in Industry
1.	Academic	A bachelor degree in Automotive Engineering or Mechanical Engineering	There is no absolute requirement. (A bachelor degree or graduated from vocational school with considerable field experience)
2.	Pedagogy	Unidentified	<ul style="list-style-type: none"> • Training for Trainers • Certificate IV (training & assessment)
3.	Professional	<ul style="list-style-type: none"> • basic technical training /basic mechanic • intermediate engine system, • intermediate hydraulic system, • intermediate powertrain, • electrical & electronic system, engine rebuild. 	<ul style="list-style-type: none"> • Safety • Product Knowledge • Tools • Basic Machine Element • Basic Driving • Diesel Engine • Hydraulic System • Electrical System • Direct Drive System • Torqflow Drive System • Steering & Brake System • Final Drive & Undercarriage • Axle, Wheel & Suspension • Basic Remove & Install • Basic Maintenance • Basic Trouble Shooting • Part Book Reading

The relationship between the two, where there are similarities and differences, in order to facilitate further understanding can be described as in Figure 1 below.



Figure 1. Chart of qualifications and competence of vocational teachers and instructors.

Optimal alignment between the educator qualification for vocational teachers and instructors can be achieved by enlarging or expanding sections intersecting in Figure 1 above. Vocational school party

and industry facilitated by the government and supported by the college on the basis of mutually beneficial cooperation can make a mutual agreement related to the competency expanding. If the section is increasingly broad, the qualification and competence of vocational teachers and instructor are relatively equal so that the graduates from both vocational and industrial training center have the equal competency standards.

Thus vocational graduates who will work in the industry only require a shorter training to become a heavy equipment mechanic as required by the industry. The industry will be more efficient in setting up new mechanics recruitment from vocational fresh graduates. Universities and colleges are expected to actively participate in positive contribution to generate prospective professional vocational teachers in heavy equipment field. They shall be proactive to improve and restructure the curriculum to be able to produce more candidates who are ready to become a vocational teacher or an instructor in the industry’s training center.

This line of thought to programs of qualification and competence development of heavy equipment engineering educators as the description above is shown in Figure 2 below.

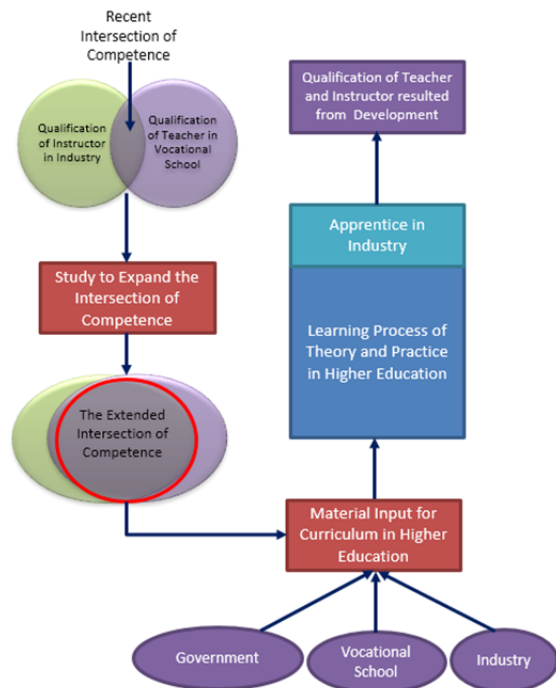


Figure 2. The pattern of development of qualifications and competence of heavy equipment engineering educators

Figure 2 illustrates that to gain the educator qualification of heavy equipment engineering as vocational teachers and instructors in the industry requires a proactive and contributive cooperation of each stakeholder. Particularly universities shall open opportunities in accepting input related to the improvement of the curriculum and the learning process in order to adjust vocational and industrial needs. Curriculum improvements include the adjustment of professional scientific competence that is relevant to heavy equipment technology developments. Universities shall provide sufficient time for internships or industry practice for students of heavy equipment engineering education program.

Vocational teachers qualification in heavy equipment is developed based on the pattern as Figure 2 above and is expected to obtain outcomes as follows: (a) having a bachelor degree in heavy equipment

engineering, mechanical engineering or automotive engineering, (b) having internship experience or industry practices or field experience in heavy equipment, (c) having more pedagogical expertise with a certificate of training and assessment, (d) mastering the ability and professional competence of heavy equipment, as listed in Table 11 above.

IV. CONCLUSION

Based on the result and discussion regarding the educator qualification in heavy equipment engineering can be summarized as follows: (1) in formal education (SMK), educators shall have the academic qualification of at least S1 fields of automotive or machinery, capability of heavy equipment Including the basic technical training/basic mechanic, engine intermediate, electrical training, hydraulic system and powertrain. Technical training in heavy equipment or work experience in the industry is a plus, (2) in non-formal education (training center industry), trainers must master the material and basic competencies for heavy equipment mechanics, which is similar to the certificate III for mechanical, electrical and fabrication technicians and also has the ability to teach and completed the training program for trainers or certificate IV for training and assessment, (3) it is necessary to develop educators' qualifications and competencies by involving parties from SMK, industry, universities and the government to acquire vocational graduates' competence that is equal to industry training graduates.

REFERENCES

- B. Bungin. (2003). *Analisa Data Penelitian Kualitatif: Pemahaman Filosofis dan Metodologis ke Arah Penguasaan Model Aplikasi*. Jakarta: Raja Grafindo Persada.
- F. Arif, A. Ananda, A. Mukhadis. (2010) *Kinerja Guru Kejuruan Bersertifikat Pendidik Ditinjau dari Standar Kompetensi Guru Profesional Sesuai Undang – Undang Nomor 14 Tahun 2005*. Jurnal Teknologi dan Kejuruan, Vol. 33, No. 1, pp. 65-80.

- J. Fasli. and M. Bahrudin (2001). *Education Reform, in the Context of Regional Autonomy: The Case of Indonesia*. Jakarta: Ministry of National Education.
- Republic of Indonesia. (2007). *Peraturan Menteri Pendidikan Nasional No 16 tahun 2007*. Jakarta.
- S. Rostiyanti. (2008). *Alat Berat untuk Proyek Konstruksi*. Jakarta: Rineka Cipta.
- Thompson, John F. (1973). *Foundations of vocational education: Social and philosophical concept*. New Jersey: Prentice-Hall, Inc.
- Wikipedia. *Alat Berat*. https://id.wikipedia.org/wiki/Alat_berat was accessed on 1 August 2016
- (<http://www.medanbisnisdaily.com>). was accessed on 1 August 2016

**4th International Conference
on Vocational Education and Training 2016**

Yogyakarta State University, Indonesia
www.icvet.uny.ac.id

