PROCEEDINGS
3rd INTERNATIONAL CONFERENCE ON VOCATIONAL EDUCATION AND TRAINING (ICVET)
May 14th,2014

"EMPOWERING VOCATIONAL EDUCATION AND TRAINING TO ELEVATE NATIONAL ECONOMIC GROWTH"

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Editors:
Muslikhin
Muh. Izzudin M.
Surono

Layout:
Nur Hasanah
Muslikhin

Cover Designer:
Athika Dwi Wiji Utami

Penerbit:
UNY Press
Kompleks Fak.Teknik UNY, Kampus Karangmalang
Yogyakarta 55281 Phone: (0274) 589346
E-mail: unypress.yogyakarta@gmail.com

Empowering Vocational Education and Training to Elevate National Economic Growth

Welcome to the 3rd annual INTERNATIONAL CONFERENCE ON VOCATIONAL EDUCATION AND TRAINING (ICVET2014).

Educational practices today encounter the challenge of skills gap as the demand for diversity of skills qualification both in business and industry have not been fulfilled by the qualified workforce, particularly in the fields of technical and specialized skills. The unsuccessful attempt to meet this demand has resulted the high unemployment rate and sluggish economic growth. Vocational Education and Training (VET) has the potential to take responsibility in developing opportunities to address these challenges through closing skills gaps, reducing unemployment, and accelerating economic growth as well as to play a crucial role in a social and economy development of a nation.

Addition to having the opportunity in contributing completed above problems, another fact encountered VET in the presence of unfavorable situation, especially in its ability to meet the demands of VET qualification and fulfill meet of learning out comes. In the new economic environment, VET is more expected to produce an educated, skilled, and motivated work force. In this condition, the current issue is not so much about the value and importance of VET but how to ensure its relevance, responsiveness and added value in an increasingly national economy growth.

This conference provides the opportunity for teachers/lecturers, educational practitioners, and 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 the national economic development and employment demands.

Dear friends and colleagues,
distinguished speakers: Prof. Dr. Thomas Kohler (TU Dresden Germany), Dr. Margarita Pavlova (Griffith University Australia), Dr. Lomovtseva Natalya (The Russian State Vocational Pedagogical University), Dr. Numyoot Songthanapitak (RMULT Thailand) distinguished guests & participants, ladies & gentlemen

Good morning, May peace and God's blessing be upon you all.
In this precious occation, let me extend to you all my warmest greetings and welcome to Yogyakarta, especially to our invited speakers who have come a long way to Jogjakarta. We indeed feel honoured to have the opportunity to host this conference, the 3rd International Conference on Vocational Education & Training, attended by academicians & educational practitioners who have deep concerns for Vocational Education & Training (VET).

I am particularly happy with the theme of this conference "Empowering Vocational Education & Training to Elevate National Economic Growth" for some reasons. First, I believe vocational education is facing various problems that we have to solve immediately. The qualified workforce has to be improved to fulfill the demand in business & industry. Then, VET has the potential to take the responsibility in accelerating economic growth as well as to play crucial role in the social & economic development of a nation, and developing opportunities to address these challenges by removing skills gaps & reducing unemployment.

In addition, gender equality is a challenge to increase the quality of VET. The other challenge of VET is to produce an educated, skilled, & motivated workforce that is suitable with the industrial needs. The implementation of VET policy-making in order to strengthen the national economic development & employment demands is the key issue of this conference. In this regard, we can certainly share our experience and best practices in this conference.

Finally, I would like to thank you all for participating in the conference. May we have fruitful discussions today.

Chairperson,

Dr. Putu Sudira

EXPERIENCING TOOLS PROJECT THROUGH PBE (PRODUCTION BASED EDUCATION) SYSTEMIN VOCATIONAL INSTITUTION

Gamawan Ananto[1], Yoseph Andriyanto[2], Edi Suherdi[3]
[1,2,3]Bandung State Polytechnic for Manufacturing
[1]gamawan@polman-bandung.ac.id, [2]yoseph@polman-bandung.ac.id,
[3]edis@polman-bandung.ac.id

Abstract

Bandung State Polytechnic for Manufacturing (POLMAN), as a high education institution in vocational, implements up to approximately 60% practical program in order to build the students skill for manufacturing process. For those, product media are created from structured exercises that referred to students competency levels needed and also initiated from external inquiries through collaboration with industrial parties, in a system called Production Based Education (PBE). With industrial product handling setup in organization, the QCD necessity for the customers are embedded in the system. Since job shop is a kind of product that met with the facility design in Polman, special tools is the suitable product media for this kind of education.Supported with necessary theory session either in operation management and technical matters during the learning process, students will experience the comprehensive tools project. They learn not only processing skill but also introduced to other related production issuessuch as material and component preparation,operation planning, scheduling, managing and control the project, etc.This model might be implemented and developed to the other high education vocationaland VET institutions with certain condition, in order to make the students be more professional and responsible workforce in the future.

Keywords: PBE, production based education, toolsproject

1. Introduction

Bandung State Polytechnic for Manufacturing (POLMAN), as a high education institution in vocational, had the concept to implement up to approximately 60% practical program in order to build the students skill for manufacturing process. For its practical product media,the institution might create a structured exercise that referred to students competency levels neededand also initiate from external inquiry through collaborating with industrial parties. This collaboration concept between academia and industry called Production Based Education (PBE), as amodel of education program that aimed to provide workforces with new competencies andqualifications that suit for the new manufacturing generation [1].

Providing exact learning media helps university or polytechnic to achieve student competencies always relevant to what the industriesasked and validate the education process, since its products/ services are always pushed to meet the industrial need[2].Moreover, educational activity collaboration with industrial demand for the students kept an adequate loading works, and from other side industrial customers could utilize the educational institution capacity and capability as one of their vendors role to produce or develop product for supporting their needs [3].

With industrial style of order handling setup in the organization, all customers'inquiry that agreed to be produced will be followed up in proper and professional way, therefore the QCD (quality-cost-delivery) necessity for the customersare embedded in the system. In manufacturing field, 'job shop' is the common type of product for students practical media due to its wider challenges and flexibility for variety requirements, therefore the facility design ofworkshop/ laboratory in Polman is made to this type of product. As categorized in job shop, special tools like stamping dies, injection moulding or fixture is the suitable product media for vocational education in Polman.There are more things could be learned in tools

project besides machining or fabrication process skill only.

2. Methodology

Analogized with IPO (input-process-output) concept, learning process of Tools Project had common '5M' for input and support or adder. Except product, there are also skills, competencies and experiences - either for students and lecturers- as its output, as shown on "Fig. 1".

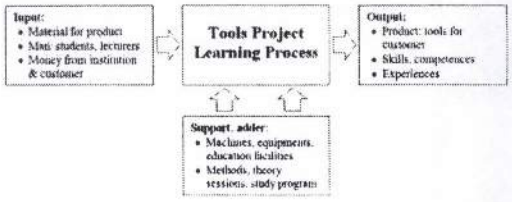

Figure 1. IPO Concept in Tools Learning

In Diploma-3 (D3) program that had 6 semes-ters period, this Tools Project is scheduled on semester 4 and 5 where '321' program concept is adopted. This 321 program idea stated that students will get the first 3 semesters for basic matters needed, the next 2 semesters in integrated project program continually and the last 1 semester for finalization and the additional enrichment items [4]. Basically, instead of doing machining or other learning process respectively, on this semester 4 & 5 of '321' a few subprograms are defined with no interrupting with any theory week nor surrounding from one kind of machine program to another.

3. Discussion

3.1 Production Based Education system

Through PBE Polman acts as an industry partner for components, tools and machine making. Since in general basic concept these activities are created to follow the present and update technological needs of industries. Generally, "Fig. 2" shows the flow of order handling in organization scope.The inquiry from customer should be followed up with calculation and other related necessary tasks by institution board or managementby considering its feasibility and organization policy interconnectedness. As soon as the proposal or quotation is agreed, the order should be planned for scheduling and controlled in executing.

On planning stage, referred to the common production planning and control procedure, there are few issues that have to be done such as exploring the product technical specifications in more detail, operation and process plan, scheduling and other.The related department then execute the order appropriate withtheir duty, following the planning made before. Design and technical drawing are initiated with approval from user or customer before continuing to the material/ component preparation and shop process like machining, fabrication and assembly.

Like in the real industry, the necessity of QCD (quality-cost-delivery) control is the important things to be paid attention. Therefore product quality check for its dimensions, tolerances and functional check is a compulsory thing before delivery to the customer. After submitting the goods to the customer it is following with necessary things related to management business between both parties such as invoicing, payment initiation, contract closing administrative etc. For those, all procedures and work instructions are bonded in an organization Quality System that each document described general steps in production activity.All parties that involved in production process refer to such procedure and work instruction, since it is made and documented in order to ensure that all steps are on the right way or method.

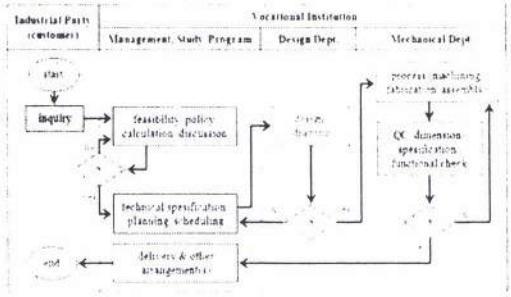

Figure 2. Order Handing setup

All these product data have to be well recorded in proper documents as a part of mentioned procedure in a Quality System frame because necessary action afterwards, in case something is not correct, has to be referred to these traceable product

documents. In principle, manufacturing organization are required to ensure that their processes are continuously monitored and products quality are improved in order to survive and be able to provide customers with good products [5]. As well known, quality can be defined as fulfilling specification or customers requirement without any defect.

3.2 IPO components in Tools Project learning

As described, in Polman Diploma-3 (D3) program that has 6 semesters of period adopted '321' concept, where on semesters 1,2,3 -as the first 3- and semester 6 -the last 1 semester- the program schedule is arranged respectively with 2 weeks for practical and 1 week theory session by turns. Semester 4 and 5 are defined for integrated project program continually, no interrupting with any theory week. Since special tools like stamping dies, injection moulding or fixture are categorized in job shop that met with the policy and facility design in Polman, this kind of product is used for learning education process on semester 4 and 5.Analogizing IPO (input-process-output) concept, learning process of Tools Project had common '5M' for input and support or adder whereas product, competencies and experiences -either for students and lecturers- as its output.

It is no doubt that material as the first 'M' is needed for making the tools in the project, not only the active parts like punch, dies or cavity but all standard components like screw, spring, base plate, guiding element etc are included in this category of material. The second 'M', man, are the parties that involved in the project; either related lecturers who have to make plan, control and supervising all production processes and students as direct executors in fabrication or supporting the lecturers in supervising and other managerial tasks. Money as the next 'M' could be got from the institution as planned capital, or form the customer as a normal certainty in 'business-like' activity.

Instead of described as input, the other 2 'M' had more support or adder function for the Tools Project learning process. Machines, equipments and other education facilities are used for realizing the agreed quotation or inquiry from the customer. Starting with planning and arranging on management level, designing and technical drawing in related Department, following with machining, fabrication and assembly on the shop floor, the office and machine resources are used for these value adding process for the inputs. The last 'M' are method that prepared for planning process and study program that assigning who will be involved on which project field related to the competency needed. Another method is theory sessions for endorsing the students knowledge; either technolo-gical matters for tooling, basic of management for production/operation and project management introducing that useful in tools project handling comprehensively.

The product of special tools is the one of this Tools Project Learning Process output that should be submitted to the customer. Except this product, there are also skills, competencies and experiences, for all involved parties. Students will obtain skills due to their assignment in machining or other process according to planned competencies they should get. This meant they will experiencing everything about the tools they involved. The lecturers will also get more and more experiences, insight and perspective since the special tool, from job shop characteristic point of view, is always 'new product' due to it is not repetitive product categorized.

"Fig. 3" is a simplified example program sche-dule in semester 5 [4]. One of shown subprogram is a 'tools project' for each subgroup (A, B, C and D) that composed -in this case- for 6 students, since 1 group consists of 24 students. 'Tools Project' sub program consists of design, material preparation and floor shop executing such as machining and assembly. In 'material preparation' case students play the role as the assistance of their lecturer in PPC (production planning and control) tasks, such as ordering standard part and material to the warehouse, controlling the coming material either in quantity or technical specification, checking the actual machining schedule, etc.

With this model of education, students learn not only processing skills but also introduced to other related production and project management issues. This model

might be implemented and developed to the other high education vocational and VET institutions with certain conditionsuch as potential market around the place, product relevancy with the institution strategy etc, in order to make the students be more professional and responsible workforce in the future.

3.3 Further discussion

As mentioned, Polman's Diploma-3 (D3) education program developed based on three phases arrangement that described by "Fig. 4". 'Problem-Based' on semester 1 to 3 is started using standard product as a structured job to train the student in basic competencies fit to the standard with low-mid speed and ordered job in deepening a competences for more speed in delivering a product to the industry as a customer [2]. 'Industrial Practice' as second phase on semester 4 and 5 is operated as the real industry where students are working full time for 1 year or 2 semesters, as mentioned previously, according to daily industrial problem where the Tools Project is in. Last semester is usedfor finalization/ strengthening remain planned matters, additional enrichment items and D3 final exam preparation.

As the competition on global workforce is getting higher and higher, the Diploma-4 (D4) is developed as well in order to preparingthe next generation human resources for manufacturing. Education program should fulfill the new requirement of knowledge-based manufacturing, promote innovation and entrepreneurship, and focus on teamwork, leadership and integrity, global awareness and multi-cultural spirit [1]. Additional semester 7 and 8 on this D4 program described for broaden analyzing capability and engineering, completing the process skills, knowledge and what the students got on previous semester.

	Month-1				Month-2				Month-3				Month-4				Month-5				Month-6			
Group A	BV	BV	JS1	JS2	JS2	D	D	D	M	P	P	P	P	P	P	P	P	A	A	PR	PR	PR	PR	E
Group B	JS2	JS2	BV	BV	PR	PR	PR	PR	D	D	D	M	P	P	P	P	P	P	P	P	A	A	JS1	E
Group C	D	D	D	M	P	P	P	P	P	P	P	P	A	A	PR	PR	PR	PR	JS1	JS2	JS2	BV	BV	E
Group D	PR	PR	PR	D	D	D	M	P	P	P	P	P	P	P	P	A	A	JS1	PR	BV	BV	JS2	JS2	E

Notes:

- BV = bench vice product, in Batch lab
- JS1 = Jobshop Lab, external customer's job
- JS2 = Jobshop Lab, external customer's job
- PR = Research Project Lab, internal customer's job
- D = design, drawing (Tools Project, TP)
- M = component & material preparation (TP)
- P = machining process (TP)
- A = assembly (TP)

Figure 3. Example of Practical Work Schedule For Semester 5 [4]

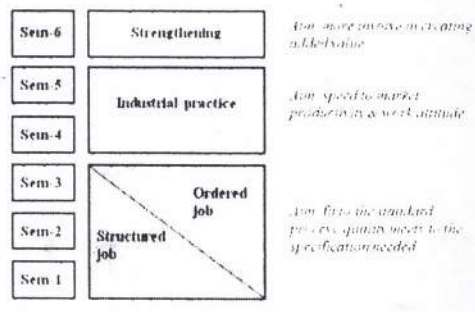

Figure 4. Program phases in education process

Moreover, the program on this period is run in learning or teaching factory where students are tasked to solve industrial demand/ order on their own project work in small groups (2-3 students) assisted by lecturer and supported by several operator who had been prepared. On this last semester, students could prepare their own business as a starting point on opening own venture based on their competencies in technology [2].

4. Conclusion

Bandung State Polytechnic for Manufacturing (POLMAN), as a high education institution in vocational, implements certain portion of practical program in order to build the students skills for manufacturing process in Diploma-3

(D3) program that had 6 semesters or 3 years period. Product media are created from structured exercises that referred to students competency levels needed and also initiated from external inquiries through collaboration with industrial parties, in Production Based Education (PBE) system. With industrial product handling setup in organization, the QCD necessity for the customers are embedded in such system. Special tools is the suitable product media for this kind of education, supported with necessary theory session in operation/ production, basic of project management and technical matter during the learning process where students experiencing the comprehensive tools project.

Diploma-4 (D4) program is also developed where on this additional semester 7 and 8 students are pushed to broaden analyzing capability and engineering, completing the process skills, knowledge and what the students got on previous semester.

With this model of education, students learn not only processing skills but also introduced to other related production and project management issues such as material and component preparation, operation planning, scheduling, managing and control the project, etc. This model might be considered to implement and developed to the other high education vocational and VET institutions with certain conditionsuch as potential market around the location, product relevancy with the institution strategy etc, in order to make the students be more professional and responsible workforce in the future

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