The relevance of industrial practice activities to the competency field of industrial practice in Faculty of Engineering YSU

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Abstract: *This study is aimed at finding out the comparasion between students' activities in industrial practice and the curriculum of industrial practice. The study was a survey. The population consisted of students of the Engineering Faculty taking industrial practice in 2011. A sample of 268 students was used. The results of the study show that all the activities of industrial practice of all study programs have suitable correspondence with the curriculum of industrial practice. On assistancy side, industry used discussion, supervision, and giving material as the methods of assistancy. The majority of the industries made use of the discussions that went on when students put up questions to supervisors.*

Keywords: *industrial practice's activity, competency, assistancy method*

1. Introduction

The gaps between competencies of alumnae and competency that are needed in industry are a significant issue in education. The competency of graduates in accordance with the required jobs is highly expected by educational institutions. However, due to the changing needs of the labor that goes by very quickly, its expectation is difficult to achieve. This is because of the diversity of competencies required by industry, while educational institutions can only hold a few. To address its gaps, educational institutions come out with industrial practices (Hargiyarto, 2009).

In addition, as a curriculum, industrial practice also has several strategic roles for the Faculty of Engineering. The first role is as a quality control carrying the following questions: Have the students of the Faculty of Engineering YSU (Yogyakarta State University) met the required competencies in industry?; Have the students complied with industry demands? The second role is to carry out functions of public relations for institutions. The students will give positive images if they have high competencies and good attitudes, and vice versa.

Industrial practice is the hallmark of the Faculty of Engineering that the implementation continues to be refined. With 3 credit hours, this activity is a curricular program that must be taken by students. The implementation of industrial practice is at least 256 hours or approximately 7-8 weeks. Industrial practice students are placed in industries that are eligible and relevant to the study programs in the Faculty of Engineering.

The aims of the industrial practice are that the students can add insights of science and technology through hands-on experience in the industry that house them. The students can also learn the entrepreneurial aspects related to the industry. In detail, the aims of industrial practice are: (1) to explain industrial management and labor competencies that are required by industry, (2) to help carry out the

tasks and activities of the production/operation process in the industry, and (3) to find a case in accomplishing the industrial practice and analyze in depth as in the report of industrial practice.

The industrial practice competency skills from various study programs in the Faculty of Engineering are as follows. (a) Department of Electronic Engineering: The competency skills are analogue system; digital system; instrumentation and control system; telecommunication system; microcomputer; microprocessor; microcontroller; programmable logic controller (PLC); and hardware programmable devices. (b) Department of Electrical Engineering: The competency skills consist of two fields: installation of industrial electricity field that covers electricity installation; electricity generator; electricity transmission and distribution; electricity transformation and motor; household appliances; SCADA system; and maintenance of electricity power. Second, industrial control system field that covers electrical control system; electronic control system; computerize control system; distribution control system; pneumatic and hydraulic control system; and programmable logic controller (PLC) control system. (c). Department of Informatics Engineering: (d) The competency skills are analogue system; digital system; instrumentation and control system; telecommunication system; information services and support; network systems; programming and software development; and interactive media.(e) Department of Mechatronics Engineering: The competency skills are digital system; microprocessor; programmable logic controller (PLC); mechatronics system; robotic system; automation system; flexible manufacturing system (FMS); pneumatic and hydraulic control system; and CAD/CAM. (f) Department of Mechanical Engineering: (g) The competency skills consist of three fields. First, production machine field that covers lathe, scrap, milling, grinding, and drilling machine; CAD/CAM; CNC; and also maintenance and repair. Second, fabrication field that covers oxy acetylene welding; MIG and TIG welding; assembling; and also maintenance and repair. The last field is design of machine that covers machine construction design; machine element design; and fluid mechanical. (h) Department of Automotive Engineering: The competency skills are maintenance and repair of machine (gasoline and diesel); maintenance and repair of electricity system; maintenance and repair of chassis; maintenance and repair of body system; and also maintenance and repair of motocycle. (i) Department of Civil Engineering: The competency skills are design and analysis of construction; furniture design; and CAD. (j) Department of Food Engineering: The competency skills are food and beverage in hotel; restaurant; catering; and bakery and pastry (k) Department of Fashion Engineering: The competency skills are design, flat pattern, cutting, and sewing; garment production system; boutique; batik; embroidery; textile handmade; and fashion accessories. (l) Department of Make-up and Beauty: The competency skills are make-up fantasy; make-up character; bridal; and spa.

One of the goals of the industrial practice is carrying out the tasks and activities of the production/operation process in the industry. But because many industry partners and their products have quite a lot of variation, it is necessary to know deeply about wich content of production process that can meet requirement of alumnae competency, and to know the pattern of assistancy by industry.

Some problems in industrial practice are: (a) Scale of industry partners is very diverse, so that the variety of competency is also very high, (b) The use of technology in industry partners have a large range of variation, so that it requires different readiness among students, (c) An assistency service by industry relies heavily on the competence of mentors, density of production schedules, and (d) Students' ability to settle in to the industrial activities, communication skills, personal competency, and competency of science and technology.

Based on the above problems, this research will compare between students' activity

of production/operation process in industry and competency standards of industrial practice. Further, this study also tried to determine the effectiveness of assistency by industry in achieving competency skills of industrial practice. It is important to be studied for various purposes such as the evaluation of implementation, decision and policy making on industrial practice, and mapping industry partner.

2. Method

This study was a survey. Quantitative description analysis was used in this research. The research population consisted of students of the Engineering Faculty taking the industrial practice class in 2011. A sample of 268 students was taken from the number of population of 1,166 students using the *purposive proposionate sampling* technique.

3. Findings and Discussion

Education of Electronic Engineering Department

This study shows that all competencies set out in the Industrial Practice curriculum are done by students of Education of Electrical Engineering Department. Most students selected assembly and repair jobs (94.44%) while supporting component jobs is the least (16.67%). Students give a good perception about the activity of Industrial Practice with a mean of 2.67 (scale of 3).

Education of Electrical Engineering Department

Not all fields of competencies required by the curriculum of Industrial Practice are implemented by students of Education of Electrical Engineering (S1) and Electrical Engineering (D3).

Field of competency that are not chosen by Education of Electrical Engineering's stu dents are SCADA system and household appliances jobs. Meanwhile, no student of Electrical Engineering chose home appliance

Table 1.
Field of Competency of Education of Electronic Engineering Department

No.	Field of Competency	(%)	Result
1	Assembly jobs	94.44	2.65
2	Supporting component jobs	16.67	3
3	Planning jobs	44.44	2.75
4	Instalation jobs	88.89	2.875
5	Repair jobs	94.44	2.59
6	Analysis jobs	61.11	2.64
7	Research and development on ICT	33.33	2.17

jobs. The interesting finding is that some students of Education of Electrical Engineering learned mechatronics field even though it is not field of competency for them.

The most popular field of competency for Education of Electrical Engineering's students is electricity installation, 75% of students take this competency. Meanwhile the least competency is distribution control system, 12.5% of students take this competency. Students give a good perception about the activity of Industrial Practice with a mean of 2.5.

On the other hand, Electrical Engineering's students are most likely to chose maintenance of electricity power system (66,67%), while the least competency are electrical control system, electronic control system, and computerize control system(16,67%). Students give a good perception about the activity of Industrial Practice with a mean of 3.

Education of Mechatronics Engineering Department

All fields of competencies required by the curriculum of Industrial Practice are implemented by students of Education of Mechatronics Engineering. All students chosen otomation control system, Flexible Manufacturing System (FMS), and also pneumatic and hydraulic control system. Students give a good

Table 2.
Field of Competency of Education of Electrical Engineering (EE) and Electrical Engineering (EE) Department

No	Field of Competency	Education of EE (%)	Education of EE Result	EE (%)	EE Result
Competency of Industrial Electricity Instalation					
1	Electricity Instalation	75	3	50	3
2	Electricity generator	25	2.5	33.33	3
3	Electricity transmission and distribution	62.5	3	33.33	3
4	Electricity transformation and motor	37.5	3	33.33	3
5	Household appliances				
6	SCADA system			33.33	3
7	Maintenance of electricity power	50	3	66.67	3
Competency of Industrial Control System					
1.	Electrical control system	62.5	2.8	16.67	3
2.	Electronic control system	50	2.25	16.67	3
3.	Computerize control system	25	1.5	16.67	3
4.	Distribution control system	12.5	1		
5.	Pneumatic and hydraulic control system	25	3		
6.	Programmable Logic Controller (PLC) system	25	3		
Competency of Mechatronics Engineering		25	2		

Table 3.
Field of Competency of Education of Mechatronics Engineering Department

No.	Field of Competency	(%)	Result
1.	Mechatronic system	50	3
2.	Robotic system	25	3
3.	Otomation control system	100	3
4.	Flexible Manufacturing System (FMS)	100	2.75
5.	Programmable Logic Controller (PLC) system	100	3

perception about the activity of Industrial Practice with a mean of 2,95.

Education of Mechanical Engineering Department

All fields of competencies required by the curriculum of Industrial Practice implemented by students of Education of Mechanical Engineering (S1) and only one competency was not taken by students of Mechanical Engineering (D3), that is work with slot machines.

Students of Education of Mechanical Engineering (S1) did most activities of machinery maintenance (82.35%) and product inspection (80.95%) for students of Mechanical Engineering (D3). The interesting finding is that some students learned steam turbine, boiler machine, and also observation to small medium enterprise to looking for a problem and helping made a tool even though it is not field of competency for them. Students' perception about industrial practice is in good category with a mean of 2,64 (Education of Mechanical Engineering/S1) and 2,78 (Mechanical Engineering/D3).

Table 4.
Field of Competency of Education of Mechanical Engineering (EME) and Mechanical Engineering (ME) Department

No	Field of Competency	Education of ME (%)	Education of ME Result	ME (%)	ME Result
Competancy of Machinery Maintenance					
1	Learn materials	76.47	2.7	66.67	2.93
2	Learn working drawing	58.82	2.7	61.90	2.69
3	Works with lathe machine	58.82	2.6	52.38	2.55
4	Works with scrap machine	11.76	2.5	19.05	2.5
5	Works with milling machine	47.06	2.75	23.81	2.8
6	Works with grinding machine	29.41	2.8	42.86	2.78
7	Works with drilling machine	58.82	2.5	47.62	2.7
8	Works with slot machine	11.76	2.5		
9	Assembling	47.06	2.63	47.62	2.6
10	Knife sharpening	11.76	2.5	19.05	3
11	Product inspection	58.82	2.3	57.14	2.83
12	Machine maintenance	82.35	2.79	42.86	2.67
13	CAD/CAM, CNC	29.41	2.6	23.81	3
	Work with steam turbine	5.88	3		
Competency of Fabrication					
1	Learn materials	41.18	2.43	66.67	2.93
2	Learn working drawing	52.94	2.67	76.19	2.63
3	Works with plate	23.53	3	42.86	2.78
4	Works with Oxy acetylene welding	52.94	2.78	38.10	2.88
5	Works with electricity welding	64.71	2.55	57.14	2.83
6	Assembling	52.94	2.44	66.67	2.86
7	Painting	41.18	2.57	52.38	3
8	Knife sharpening	5.88	2	19.05	2.5
9	Product inspection	35.29	2.5	80.95	2.88
10	Welding product maintenance	17.65	3	42.86	2.67
11	Machine maintenance	64.71	2.91	38.10	2.63
12	Metal plating	5.88	3	33.33	3
13	Works with hydrolic	5.88	2		
Competency of Machine Design					
1	Design of working drawing	29.41	3	28.57	2.83
2	CAD/CAM	47.06	2.86	33.33	2.57
3	Process of working drawing	29.41	2.4	19.05	2.75
5	Working drawing archive	29.41	2.4	28.57	2.33
6	Measurement of working drawing	17.65	2.67	23.81	2.8

Education of Automotive Engineering Department

All competencies of Industrial Practice implemented by its departments' students except motocycle maintenance. Students' perception about industrial practice is on good category with a mean of 2,64.

Education of Civil Engineering Department

This department consists of Education of Civil Engineering and Civil Engineering Study Program. All competencies of Industrial Practice implemented by its departments' students. Implementation of building project was the highest option of competency that stu-

Table 5.
Field of Competency of Automotive of Mechanical Engineering (AME)

No	Field of Competency	(%)	Result
Competency of Machine Maintenance			
1	Maintenance and repair of gas machine	100	2.91
2	Maintenance and repair of diesel machine	72.73	2.88
Competency of Electricity System Maintenance			
3	Maintenance and repair of machine electrical system	90.91	2.80
4	Maintenance and repair of body electrical system	100	2.82
Competency of Chasys Maintenance			
5	Maintenance and repair of suspension and chassis	72.73	3.00
6	Maintenance and repair of power transfer system	100	2.91
7	Maintenance and repair of steering system	100	3.00
Competency of Body Repair and Painting			
8	Polishing paint	9.09	3.00
9	Replacementbody components	9.09	3.00
10	Repair ofbody	9.09	3.00
11	Painting preparation	9.09	3.00
12	Pinting process	9.09	3.00
Competency of Motocycle Maintenance		-	-

Table 6.
Field of Competency of Education of Civil Engineering (ECE) and Civil Engineering (CE) Department

		Education of CE		CE	
No	Field of Competency	(%)	Result	(%)	Result
1.	Planning of building project	14.29	2.00	63.64	2.43
2.	Implementation of building project	100.00	2.29	100.00	2.55
3.	Project Management	85.71	2.17	63.64	2.86
4.	Furniture Industry	42.86	2.67	45.45	2.80
5.	Construction Component Industry	71.43	2.60	54.55	2.83

dent's chosen. Students' perception about industrial practice is on good enough category with a mean of 2,34 (Education of Civil Engineering/S1) and 2,69 (Civil Engineering/ D3).

Education of Fashion Engineering Department

Some competencies didn't chosen by its students. The most popular competency for students of Education of Fashion Engineering Department was boutique. It shown by 66,67% students learned boutique in industrial practice. Students' perception about industrial practice is on good category with a mean of 2,88 (Education of Fasion Engineering/S1) and 3 (Fashion Engineering/D3).

Education of Food Engineering Department

Not all field of competencies required by the curriculum of Industrial Practice implemented by students of Education of Food Engineering (S1) and Food Engineering (D3). The most popular competency for students of Education of Food Engineering Department was hotel while for students of Food Engineer-

Table 7.
Field of Competency of Education of Fashion Engineering (EFE) and Fashion Engineering (FE) Department

No	Field of Competency	Education of FE (%)	Education of FE Result	FE (%)	FE Result
1	Garment Manufacturing	5.56	3.00	25.00	3.00
2	Garment Home industry	11.11	3.00	12.50	3.00
3	Boutique	66.67	2.67	50.00	3.00
4	Batik	16.67	3.00	12.50	3.00
5	Embroidery	5.56	3.00	-	-
6	Fashion Craft and Accesories	16.67	3.00	-	-
7	Textile Industry	-	-	-	-
8	Workshop of Fashion	-	-	-	-
9	Training center of modelling and design	11.11	2.50	12.50	3.00

Table 8.
Field of Competency of Education of Food Engineering (S1) and Food Engineering (D3) Department

No	Field of Competency	Edu. of Food Eng. (%)	Edu. of Food Eng. Result	Food Eng. (%)	Food Eng. Result
1	Hotel	37.50	2.00	42.86	3.00
2	Restaurant	25.00	2.00	57.14	3.00
3	Catering	25.00	2.50	-	-
4	Bakery and Pastry	-	-	-	-
5	Hospital	12.50	2.00	14.29	3.00
6	Dormitory	-	-	-	-

ing Department was restaurant. Industrial Practice activity is good enough for students of Education of Food Engineering with a mean of 2,13 and on good category for students of Food Engineering Department with a mean of 3.

Make-up and Beauty Department

Some competencies didn't chosen by students of make-up and beauty department. Implementation of spa and beauty salon was the highest option of competency that

Table 9.
Field of Competency of Make-up and Beauty Department

No	Field of Competency	(%)	Result
1	Make-up for wedding	16.67	1.00
2	Television	33.33	3.00
3	Production House	-	-
4	Spa and Beauty Salon	66.67	3.00
5	Photo Studio and event organizer	-	-

student's chosen. Students' perception about industrial practice is good enough with a mean of 2,33.

Appropriateness between Activity and Curriculum of Industrial Practice

In principe, activity of industrial practice on 2011 has appropriate with curriculum of its industrial practice. Moreover, some students get additional competancy on production management, marketing, and human resource management. With this appropriateness, the goal of industrial practice has been reached.

Pattern of Assistancy by Industry

This research will consider two aspects to know how the pattern of assistancy by industry's supervisor, ie: assistancy method, and students' response of its assistancy.

Assistancy method. In general, supervisor gave orientation in the beginning of industrial practice. Unfortunately, industry did not give a schedule and material of assistancy during the industrial practice. So that, if students did not active to ask, they will not have much knowledge about its industry. Most of industry used discussion, supervision, and giving material as the method of assistancy. But the biggest was discussion that happened when students put a question to supervisor.

Response of assistancy. Almost all students were give good response of assistancy. Only a few students of Education of Food Engineering and Fashion Engineering who said that assistancy were on enough category.

4. Conclusion

The study has shown that all activities of industrial practices of all study programs have suitable matches with the curriculum of industrial practice. Assistancy methods that were used consisted, among others, of discussion, supervision, and giving material. Because most of the industryies did not give a schedule and material of assistancy, the Faculty of Engineering must ask the industryies to give them out, and on the same time also encourage the students to be more active in the industrial practice activities. It is important because such schedule can make students more active, and more motivated. Consequently, students can optimally reach the competencies of industrial practice.

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