Incorporating Employer's Requirement in Curriculum Design to Improve the Graduate's Technical Competence using Quality Function Deployment

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ABSTRACT

The graduates of vocational pre-service teacher education are expected to possess appropriate pedagogical, theoretical and practical skills. As part of the academic curriculum, all students should do two kind of apprenticeship programs: an industrial training and a teaching practicum at school. These programs providing students with the exposure to a real working environment in the industry and vocational schools. Thorough this program, the industry and the school could assess the student teachers' competences in their subject-related skills. Therefore, this study aims to identify feedback from the employers during the apprenticeship in order to determine their expectations toward the practical skills of vocational student teachers using Quality Function Deployment (QFD) approach. The employer' feedbacks are then translated into technical requirements which specifying the actions required in teaching and learning process. The QFD help the education institution to identify the gaps in the curriculum based on the requirements from the school and industry.

Keywords: quality function deployment; employers; curriculum design

INTRODUCTION

The pre-service teacher education institutions prepare prospective graduates to be a teacher which possess capability in the specific skills. Pre-service teachers in vocational engineering are expected to master the engineering related skills to be able to deliver they teaching subject. Therefore, it is important that the higher education institutions to evaluate the expectations of the industry toward their graduates. The evaluation aims to provide education services which provide students with acceptable competences (Devrim & Eryilmaz, 2011).

According to Soota et al., (Mukaddes, Bagum, Islam, & Khan, 2012) the success of manufacturing and service industries are located in understanding the requirements and expectations of customers and to anticipate the changes that are needed by consumers. Therefor to understand customer expectations required an analysis method, one of them is the Quality Function Deployment (QFD) which is a structured approach to defining customer needs and translate it into a plan specifically to meet those needs (Mukaddes et al., 2012). Through QFD method done step analysis perspectives from the world of work to determine the request as well as the expectations of consumers who will then be processed to take action to perform the repair learning program and activities with the aim of improving the competence of college students so when pass can become a qualified graduate from the workforce.

In the implementation of teaching and learning activities, the industrial and educational internship are intended to provide benefits for students with how to do the real work experience approach.

LITERATURE REVIEW

QFD is a device or method used to meet the expectations of the consumer (Jnanesh & Hebbar, 2008). Expectations as the basis for creating an improvement as well as the foundation of a new product with the purpose to achieve the gratifications of the consumer. According to Aytac & Deniz (2005:508) QFD is a management technique that is used to adjust the "voice of the consumer" and change requests into the character of the appropriate quality. While according to Akao (Taylor, Chan, & Wu, 2007) QFD is a method to develop a quality design that aims to satisfy customers and then to translate customer requirements into design goals and quality assurance became the primary focus should be used in every stage of the production process. Outline the use of QFD methods focused on consumer demand towards products that have previously been created. A request which is also often referred to as "the voice of the consumer" serve as feedback for the producers to do the analysis of the production process as well as results that have been achieved. Further analysis is used to perform the repair process so that products produced in accordance with consumer demand and customer satisfaction can be achieved to the maximum.

QFD method in the world of work were introduced around the year 1970 's in Japan (Mazur, 1993; Taylor et al., 2007). At that time, QFD is used as a quality system that focuses in providing satisfactory products and services for customers. So the necessary input from consumers to improve the quality of the production

process to produce appropriate and satisfying for consumers. Precisely in the year 1972 by Mitsubishi Heavy Industries QFD was first applied in Kobe Shipyards. Then beginning in the 1980-90s QFD start was brought in to the area United as one of the methods to develop the industry in the area (Hwarng & Teo, 2001). Akao (Mazur, 1993), also mentions the early application of QFD in a service provider organization conducted by Ohfuji, stains, and superior Ogino of the year 1981 on a souvenir shopping, sports complex and a variety of retail store.

In education, Devrim & Eryilmaz (2011) has used the QFD method to find out about work world expectations in order to get the right learning method for a university. The study found that the most effective learning method according to the employer for a university is lecture, case study and project work. While research is currently underway, the QFD method is used to get an assessment of the working world of the technical capabilities of students who have undertaken internships. With the assessment of the internship activities will be used to determine the priority level of consumer needs and then used to determine the effective learning design to improve student competence in terms of technical ability.

METHODOLOGY

In its application, according to Cohen (Mukaddes et al., 2012) analysis with the method of QFD have several steps as follows:

a. Determine the Voice of Customers (VOC)

VOC is a term used in business to describe the process of capturing customer demand (Gaskin, Griffin, & John, 2010). Consumer demand is an important part in the initial steps to do QFD method. In this study used questionnaire and interview method to obtain VOC. In making questionnaires and interview questions, researchers refer to Indonesian national competence standards. This is done because the standard is already national scale and there are competence standards from various fields of work, including the field of machining and automotive according to the focus studied in this research. After the questionnaire has been completed, the next step is to determine the respondent and give the questionnaire. Respondents selected in this study are vocational teachers who have become guide of students where they do educational apprenticeship activities. The selection of teacher guide is due to these teachers who have been guiding students during internship activities, so it is expected to provide an objective assessment for data collection research that is currently being done. In addition to the questionnaires, interviews were also conducted in this study. Interviews were conducted on respondents who also filled out questionnaires. This interview was conducted to get the voice of consumers who have not obtained from the filling questionnaire that has been done before.

b. Determine the structure of priority customer needs and prepare a competitive evaluation of customer needs

After the data is obtained, then do the determination of priority needs of consumers from existing data and renders from the most important to that is not important. In determining the priority level of consumer needs, we collect all the data that has been obtained. Then we accumulate the number of assessments of all respondents who have provided answers to each attribute of the question in the given questionnaire. If the attribute has the highest value, then it is certain that the attribute is a requirement of consumers who have the highest priority. So next until the last attribute that has the lowest value means it is a consumer need that is not very important or has the last priority level.

c. Develop Customer section on QFD matrix to a matrix of QFD there are several sections, one of which is a horizontal section

After determining the importance of the needs of consumers are done, put in a QFD matrix where the consumer needs in this section were written down and followed by the order of their importance.

d. Develop a matrix of QFD techniques on the section

At this stage of discussion with relevant parties in college to determine a design engineering or instructional design. Based on existing data, design techniques will be created or determined by the goal of keeping the needs of consumers who had obtained at the future, soon to be fulfilled.

Analyze QFD matrix on the final stage was conducted analysis thoroughly from several stages which have been carried out with the aim to be able to meet the needs as well as customer demand to the maximum.

HOUSE OF QUALITY

A product or service can be received either by the users of the planning process. The planning process of the manufacture of a new product, the consummation service, as well as product innovation which is based with the fulfillment of the needs of the consumer. One of the management methods that can be used to conduct the evaluation in a product or service provider is the QFD. QFD using matrix to capture a number of issues which are very important to the planning process. Basically HOQ is a tool that is important in QFD method to perform process analysis because HOQ helps to translate the VOC a requirement that design meets certain target values and matched against how the Organization will meet the These requirements (Mukaddes et al., 2012).
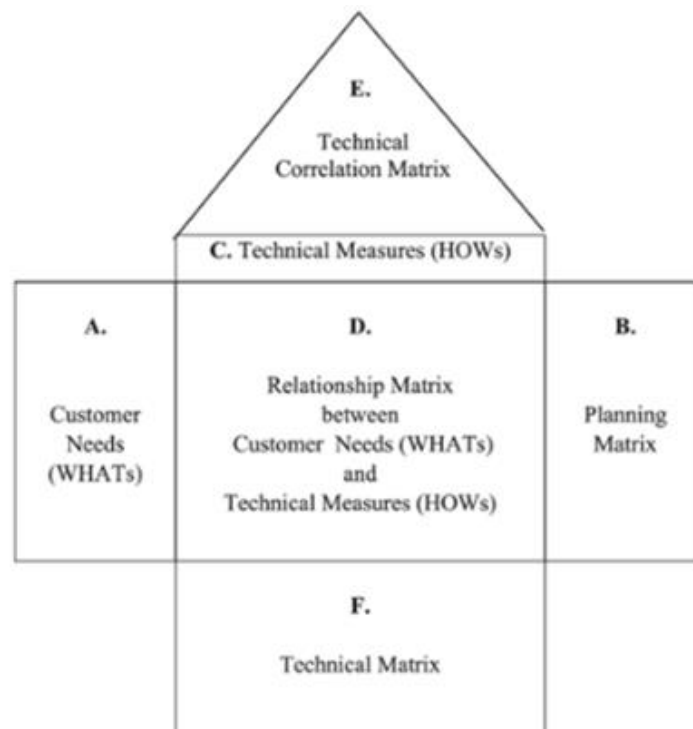
Fig 1. House of Quality in QFD Process

According to Tapke, Muller, Johnson, & Sieck, n.d. HOQ has at least some parts and subtitled as follows:

   a. Customer Needs (WHATs)

QFD begins with the customer and the initial steps in the manufacture of HOQ is identifying customer demand as the initial data which will be processed into the next stage.

   b. Planning Matrix

According to Cohen (Taylor et al., 2007) on the steps before talking about qualitative customer needs, while Planning Matrix is for quantitative data is essential to the requirement. At this stage is done compares the process of how good the team meet the needs of customers compared to its competitors.

   c. Technical Measures (HOWs)

This section contains a list of structures and technical measures identified by the product development team about what must be accomplished to meet the wishes of the customer.

   d. Relationship Matrix Between WHATs and HOWs

This is one container systematically to identify the relationship between the level of customer demand with the technical measures that have been identified by the development team product.

   e. Technical Correlation Matrix

This section is an assessment conducted by a team of developers towards the HOWs are interlinked and how these forces can be obtained with technical analysis.

e. Technical Matrix using the specified item to record priority assigned to in the technical requirements. It also provides performance achievement of competitive products and the level of difficulty in developing their respective needs.

RESULT AND DISCUSSION

The Engineering Competence of Students Majoring in Automotive

Data retrieval is done by the method of interview and questionnaire containing 30-questions about the competence of automotive field techniques and performed in four vocational high school with a total of seven speakers. From the data obtained, the respondents most important capabilities provide value in terms of safety and occupational health. Then followed by ability in handling the vehicle parts related to the safety of users such as braking system, steering system, system of wheels and also electrical and ignition system which is one of the important sources in order for a machine can work. Such matters are considered important by the respondents so that students can learn it better. The next important competencies a must-have is the ability to keep the components and diagnose vehicles such as electrical systems, hydraulic system, clutch, fuel system, steering system, cooling system, transmission, engine, axle the driving wheels, exhaust gas, and the working of the body.

In the search results data is done, it can be said that for automotive students have the ability to understand those parts that relate to the safety of the riders were very important. In addition to understand system-related electric vehicle also is important because it relates to the ability of a great power but not viewable i.e. electricity. It was only the other capabilities to follow such an understanding of the safety and health of work, contributions in group work, as well as an understanding of the engine, transmission and vehicle propulsion system, as well as the body of the vehicle.

Basically almost all of this is important for the students of teacher training automotive, but based on valuations provided by respondents appear a priority level that will be used as a reference for students in developing competencies.
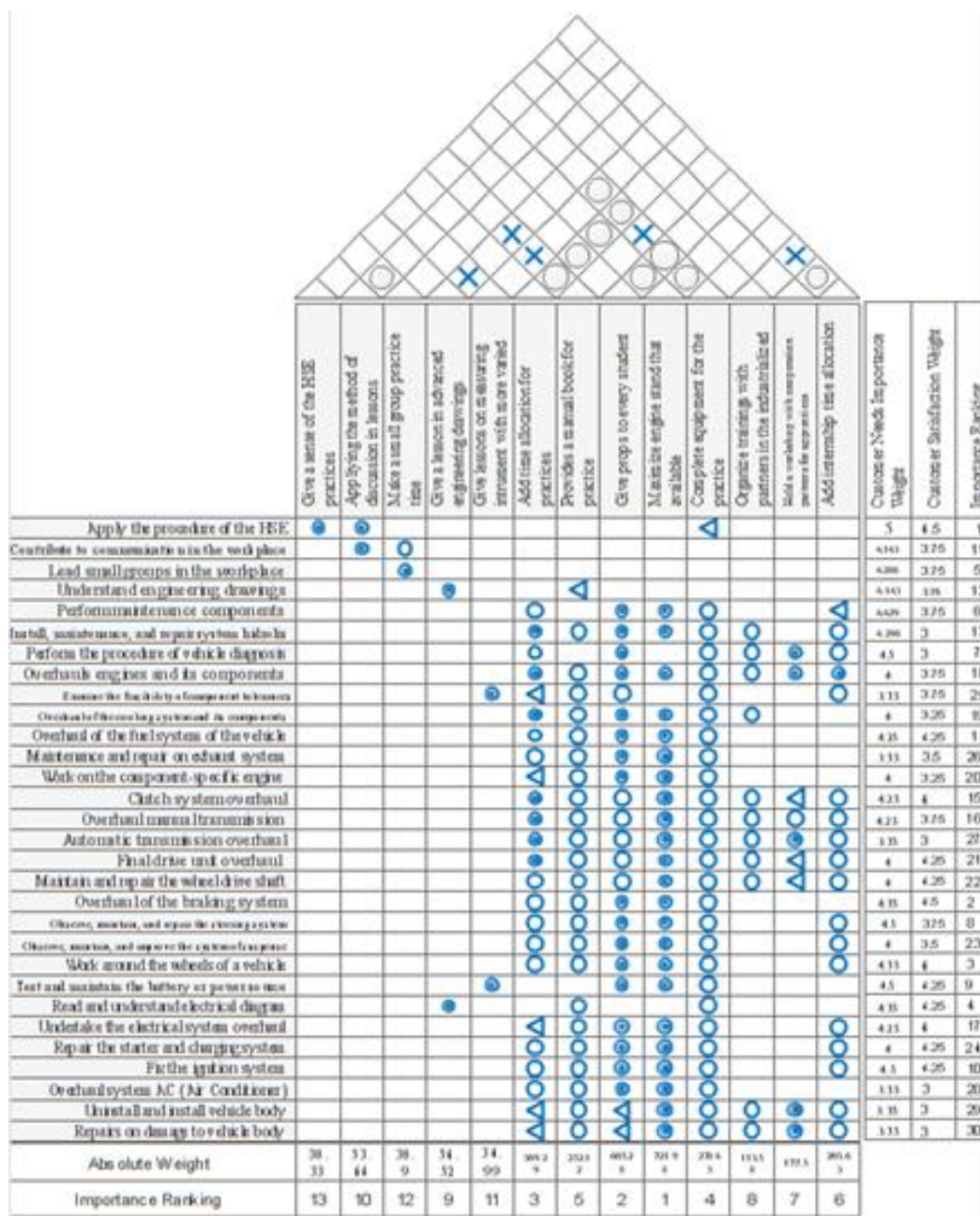
Fig 2. The result of the analysis of the customer satisfaction towards competence skills of engineering students majoring in automotive described House of Quality

Based on the implementation of the educational internship followed by students in related institutions, according to data obtained from some of the respondents rate the ability of students' satisfaction towards the automotive field can be said to be quite good. Nevertheless, there are some competence who must be increased again by the student automotive fields in order to achieve a level of expectation from his consumers. Some of the competencies that should be enhanced in a more pleasant is the ability of the students in understanding the system of air conditioning and body of the vehicle, on the competence of these students rated lacking sufficient capabilities by respondents. In addition, also the ability in

hydraulic system and automatic transmission. That's what competencies need to be improved for the automotive field so that students can at least have a pretty good when the competency will be logged in as a teacher at a vocational high school.

Based on the data that has been retrieved with the speaker's seven teacher vocational automotive majors where students do an internship, then data analysis was undertaken with QFD method along with the head of the Program of study in college students and produce some recommendations perimeter technique that can be done to try to improve students ' competence in order to be in compliance with the expectations of consumers. The perimeter of this technique are as follows:

a. Maximize engine stand that available
b. Give props to any student
c. Increase the allocation of practice time
d. Complete equipment practice
e. Provides manual book when practice
f. Add internship time allocation
g. Held a workshop in collaboration with partners for apprentices
h. Conduct training with a partner
i. Give the matter further in engineering drawings
j. Applied the method discussion in learning activities
k. Provide material measuring instrument with more varied
l. Make smaller groups when a practice
m. Provide any implementation of HSE

The Engineering Competence of Students Majoring in Machining

Data retrieval is done in the same place with the same method, but as speaker was the teachers of machining majors. In the field of machining this questionnaire containing 25 grains of a statement that the results were analysis by using QFD method and generate data such as in the following:

Competence	Customer Needs	Customer Satisfaction	Importance Ranking
Apply the procedure of the HSE (health and	4.5	3.5	4
Perform first aid in emergency situations	4.3	3.5	12
Contribute to communication in the workplace	4.6	3.5	3
Work in a group	4.5	3.5	5
Assist in the development and implementation of	4.3	3.5	13
Draw and interpreting sketches	4.4	3.75	7
Understand engineering drawings	4.7	4	2
Draw 2D or 3D by software, e.g. autoCAD	4.4	3.5	9
Use the tools properly and correct measure	4.8	4.25	1
Perform the calibration of the measuring	4.4	3.25	8
Give a sign of limits on the working of the	4.2	3.5	14
Perform basic calculations as well as further	4.5	4	6
Do the routine use of welding arc welding manual	3.9	3	23
Perform manual welding	4	3.25	21
Perform gas welding	3.7	3	24
Do the settings on the machine that is used	4.4	4.5	10
Use tools utensils the hands	4	4	22
Operate the lathe machine	4.3	4.5	11
Undertake the process of work with the milling machine	4.2	3.25	15
So the grinding process on the workpiece	4.1	3	16
Undertake the process of machining the workpiece	4	3	18
Set the machine and program CNC machines	4	3.5	19
Undertake the examination and care of the	4	4	20
Undertake the complete overhaul of the engine	3.6	3.5	25
Undertake the examination of products	4.1	4	17

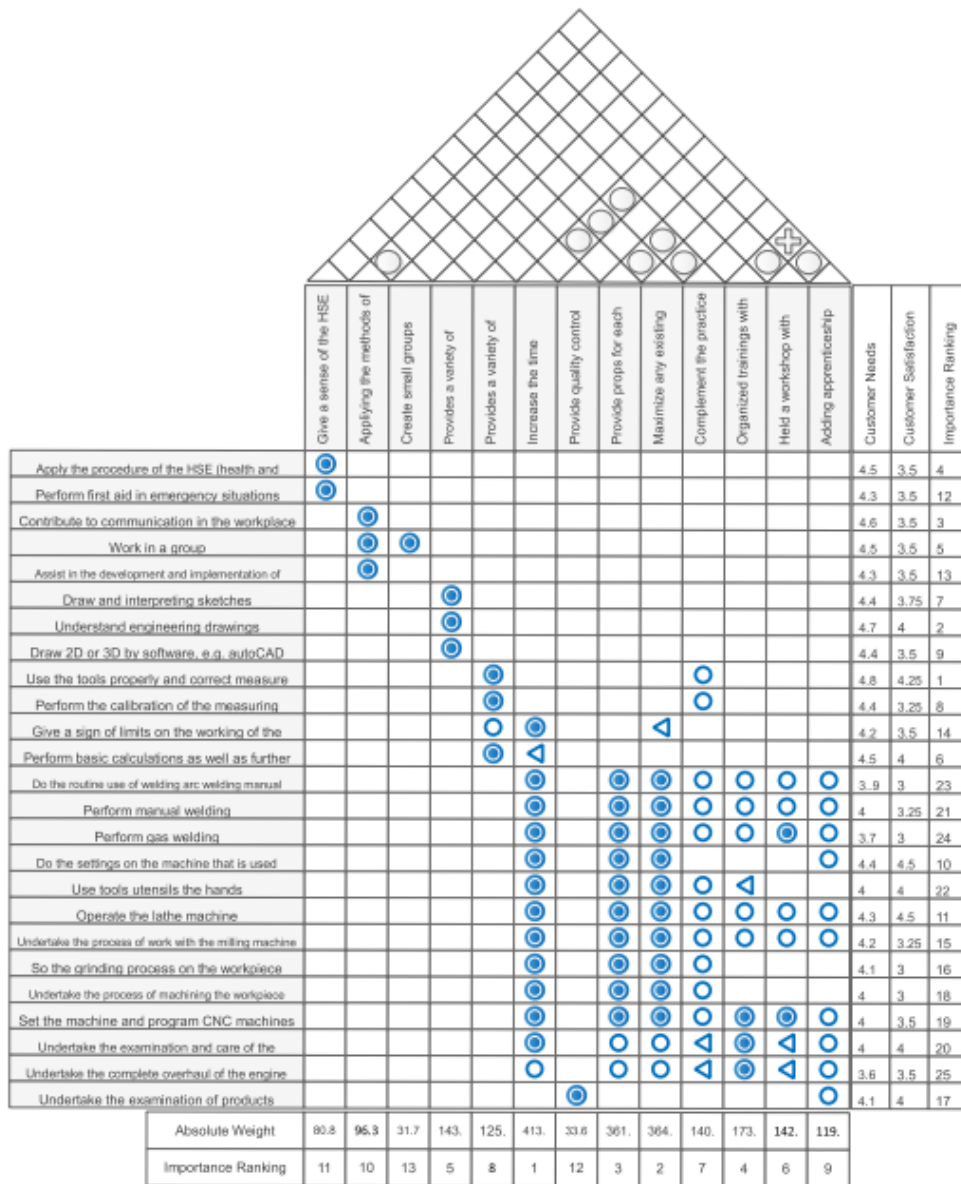|	Give a sense of the HSE	Applying the methods of	Create small groups	Provides a variety of	Provides a variety of	Increase the time	Provide quality control	Provide props for each	Maximize any existing	Complement the practice	Organized trainings with	Held a workshop with	Adding apprenticeship
Absolute Weight	80.8	96.3	31.7	143.	125.	413.	33.6	361.	364.	140.	173.	142.	119.
Importance Ranking	11	10	13	5	8	1	12	3	2	7	4	6	9

Fig 3. The result of the analysis of the customer satisfaction towards competence skills of engineering students majoring in machining described House of Quality

Just as the automotive majors, majors of machining also give a fairly high assessment to the importance of a student's competence through the now given. Based on the data obtained, generally the most important ability that should be owned by the student teacher concentration machining is the ability to draw and read engineering drawings as well as the use of measuring tools. By the respondents is considered the most important because it is the basic capabilities

which must be controlled when going in to become a teacher of teachers. Next is the ability to apply health and safety procedures as well as give the contributions and communication when working in groups. Then an understanding of the use of software engineering drawings such as auto CAD, inventor, etc. After that he went into the ability of practice such as the use of a lathe, milling machine, welding machine and process. The last must-have is the ability to understand the machine that is used so that when a problem occurs can do the checking process to service.

As for the level of satisfaction can be said the respondents were satisfied with the capabilities that have been owned by the student when doing educational internship activities. From the use of a lathe with tooling and calculation in the process works, the use of measuring and understanding the image engineering students can do well. Next in terms of health and safety as well as the contribution of the communication in the working group is pretty good. This was followed also for the ability of the students in using the milling machine, grinding, CNC, welding and felt by respondents to the student has a pretty good skill level.

The same is done by the majors of machining after acquiring "voice of customer" via questionnaire and interview. The discussion was conducted to create a design study that will be applied to college students majoring in machining on the level of interest and satisfaction that have been obtained. The instructional design of which is as follows:

a. Add the implementation time allocation practices
b. Maximizing every engine stand that available
c. Give props for each students
d. Conduct training with partner
e. Give variations of software to engineering drawings
f. Held a workshop in collaboration with partners for the implementation of the internship
g. Completes the equipment practice
h. Provide material measuring instrument that varied
i. Extend internship for student
j. Applied the method of discussion in learning
k. Provide material HSE each practice
l. Gives the sense of quality control in each practice
m. Making small group when practice

CONCLUSION

College Students is the major service provider for education students, one of them as teachers or lecturers. In conducting the program of study of at least the College Students must also accommodate and adapt their program design as used or expected by the consumers for example vocational high school. Where college graduate student had at least one level of practice skills on top of secondary vocational school students. QFD method is done with the analysis of consumer

demand and expectations towards the implementation of the learning activities by College Students and the results is used as the basis for making an instructional design are expected to be improve the competence of the candidate's practice skills of college graduates.

The results of the analysis bring out the instructional design for the automotive majors and machining majors that generally can be said to be similar to where the most influential design that can be done is to add implementation time allocation practices, provide props or machine for every student and supporting equipment and complete one is manual book. Then next is the application of design collaboration with workshop or our business partners to conduct training and to maximize the implementation of your internship. Next up is a learning design such practices when granting material measuring instrument, the use of variation of software to engineering drawings, material quality control, material HSE when practice, and instructional design such as discussions or small groups.

From that have been produced through the use of QFD method was expected to be used for College Students to improve the competence of its student so when the graduating students can meet the priority needs of consumers as a vocational high schools, especially in terms of competence skills practice.

ACKNOWLEDGMENTS

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