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The Level of School-Industry Partnerships of Building Engineering Program of Vocational Secondary Schools in Bali

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Abstract

Collaboration/partnership between vocational education (as educational for work) and the business world is believed to be a key mechanism to face of the complexity of the challenges arising from rapid changes in the world of work. Collaborative arrangements tend to be dynamic and constantly evolving, so it is mentioned that the partnership/collaboration as a journey and not as an end. Therefore, many experts introduced a series of stages towards partnership/collaboration called collaboration/partnering continuum, such as communication, coordination, cooperation and collaboration. This study was conducted to determine the level of vocational education cooperation with the business community that took place in Indonesia (especially vocational secondary schools in Bali). The strategy used in this research is a case study, with a multiple-case holistic design. Three schools were observed, namely SMK Negeri 1 Susut (Bangli), SMK Negeri 3 Tabanan and SMK Negeri 3 Singaraja (Buleleng) and data were collected through interviews, observations and documentations. Data were analyzed using interpretational techniques. The cooperation that takes place between the school and the industry are limited to the implementation prakerin for grade XI and assessment of the practices competency test for final degree students'. There are three variations of the pattern of engagement of vocational schools with the industry, the school established an agreement with the company directly, the school made a Memorandum of Understanding with the association of the company, or a combination of both. However, cooperation is still in stages communication which little leads to levels of coordination, and has not yet reached the stage of cooperation/partnership.

Keywords : coordination, cooperation, collaboration/partnership, partnering continuum, vocational education

I. Introduction

Educational institutions have difficulty in anticipating the rapid of technological developments that occur in the working world because of its ability to make changes tend to be slow [1]. This leads to technological mastery and competence of graduates be left far from the competencies expected by employers. In fact, vocational education is expected to meet labor market needs (demand driven), in terms of both quantity and quality [3]. Therefore, vocational education as education for work, as stated by Strom, need to adopt or develop the principles that will guide, support, or create instructional practices in anticipation of changes in the world of work [13]. School system (education) and economic systems (world of work) is actually dependent on each other [1]. School expects its graduates can be accepted in the world of work, while employers desperately need labor generated by the educational institution or training. The relationship of interdependence is a good condition to be mutually beneficial to both parties, by creating institutional networking between vocational schools and enterprises. Therefore, vocational education should be organized with the basic principles of link and match [3]. Link regarding to the linkage between employers and education providers should be mutually interactive. Interactive processes are shown by the collaboration between the world of vocational education with the world of work in the planning,
developing and evaluating of the educational programs. While the match shows the results should be appropriate or commensurate with the needs, the conformity between the abilities/skills of vocational education graduates (employee) in the hope of the employers.

To obtain a broader cooperation, both sides need to base the process of collaboration with the republican principle of civilian (civic republicanism), which emphasizes a commitment to the fulfillment of common interests [15]. If all stakeholders, such as government, business, civil society as well as education and training institutions are willing and able to build a systematic and continuous collaboration, then innovation will be stimulated and eventually have a positive impact for all parties [14]. The partnership approach was developed based on theoretical roots associated with the theory of collaboration/game theory, economic/transaction costs, organizational theory/interdependence of resources, and the theory of governance/networking [18]. Partnership models were developed to overcome the disadvantages of the traditional model of command-control by improving communication, cooperation, negotiation and collaboration between groups. The increased interaction between entities inevitably raises costs, but concerns over the transaction costs can encourage each parties to work together to minimize their costs. In addition, organizations collaborate with each other because they are lack of critical competency, and unable to or takes a long time to develop it themselves; facing uncertain environmental conditions, scarcity of resources; or any organization has the inherent tendency to try to resolve the uncertainty. The breadth of the scope of the interaction between any sectors allows an organization in the sector to adopt or learn and borrow from expertise in other sectors. Therefore, governance processes developed new emphasis on management through a network structure to produce good governance, demonstrate transparency, accountability and integrity in the cooperation and partnership with critical stakeholders. In this process, there has been a paradigm shift from the traditional bureaucratic models to the new governance model.

Differences in the type of partnership that is applied will involve different levels of collaboration, depending on the desired objectives and readiness of the partners to change the pattern of its business [16]. Collaborative arrangements is dynamic and growing, so it is mentioned that the partnership/collaboration as a journey, not as an end [5];[6]. Therefore, many experts introduced a series of unity towards partnership/collaboration (collaboration/partnering continuum). The basis used to establish the continuum is a shift in activity that occurs gradually on the nature and intensity of the relationship [6] or the level of integration and its formalization [4]. The term used to describe each phase in a series of partnerships/partnering continuum also diverse. Most can be grouped into partnering continuum models comprising several stages of the seven stages according to Frey, et al, i.e. coexistence, communication, cooperation, coordination, coalition, collaboration and coadunation [4]. While others use terms of eight levels in involving stakeholders in the business sector by Accountability, the United Nations Environment Programme, and Stakeholder Research Associates [9], as follows remain passive, monitor, inform, transact, consult, involve, collaborate and empower.

One model of collaboration in the education sector to accommodate the concept of partnering continuum is the model proposed by Montiel-Overall [11];[12]. She proposed four models of cooperation between teachers and school library media specialists (SLMSs) [11];[12], namely models A: coordination, model B: cooperation, models C: integrated learning and D models: the integrated curriculum. Differences among the four models are based on (i) the intensity of cooperation or reason to work together; (ii) the intensity or level of involvement, commitment,
or participation among the participants; (iii) the interest to expand the student's academic achievement or effort focused on improving the results/outcomes of students. The four models certainly involve a number of business networking as an initial condition, as a way for someone to figure out each other and an important means to build trust. In addition, the proposed model involves some form of sharing of objectives that are part of the reason for them to work together.

Figure 1 Teacher-Librarian Collaboration Model [11]

Many people are already aware of the importance of the collaboration, but they were able to apply these principles are still limited. The fact is the world of education and the world of work still seem like worlds apart from each other [8]. They still hold on perspective and an operational basis respectively [8];[10]. On the one hand, education has the characteristics aimed at facilitating the learning environment for students, keep students in a learning environment that is protected in a classroom environment, and maintain the attention of students according to their needs as learners. And the other side, the world of work has characterized by production-oriented, efficiency and optimum benefit achievement. Thus, if both sides highlight the characteristics of each, then it will not be obtained any common ground to support the development of alliances/partnerships.

Dual System Education Policy (PSG) imposed on Indonesia was intended to strengthen vocational education partnership with the business world [3]. However, differences in the context of the education system also led a collaborative effort between the world of education with the world of work tend to be moving towards inertia [7]. Vocational and enterprise business/industry is still difficult to internalize the mutual advantage through collaboration/partnership. An interesting fact presented by the World Bank [2], in which the variables that influence the level of participation of employers in the program of PSG in vocational secondary education (SMK), in addition to financial limitations and the capacity for training, also manager of vocational assume that they do not need help of the industry in the delivery of education. In addition, inadequate regulation as a driver for the business world in favor of PSG program to make employers reluctant to assist the implementation of the education sector.

This study was conducted to determine the extent to which the level of vocational education cooperation with the business community that took place in Indonesia in terms of the intensity of collaboration between vocational high schools with the business world, especially in vocational schools in the province of Bali.

II. Research Design

The study was conducted with a qualitative approach using case study technique. This research can be classified into multiple-case holistic design [17] with three cases (three schools) and one unit of analysis (the partnership). Cases studied are the partnership between SMK of Building Engineering expertise program with the business world in the field of building construction. Observed school are SMK Negeri 1 Susut (Architecture Engineering), SMK Negeri 3 Tabanan (Architecture Engineering) and SMK Negeri 3 Singaraja (two of Skill Competencies: Architecture Engineering, Stone and Concrete Construction Engineering). Research sample is determined by purposive sampling that is equipped with a snowball technique to anticipate the respondents who actually has a
key role in the case of research but not included in the target of the planned research.

Data collected by using semi-structured in-depth interviews, and documentation, such as documents of MoU between SMK with the business world, the school curriculum, guidelines for the practice of industrial work and the assessment criteria, implementation guidelines for the competency test, and other relevant documents. Data were analyzed using interpretational techniques by comparing the real conditions to the characteristics of each model of partnership as shown in Table 1.

Table 1 Attributes of Successful Collaboration [11]

<table>
<thead>
<tr>
<th>Model A: Coordination</th>
<th>Model B: Cooperation</th>
<th>Model C: Integrative Learning</th>
<th>Model D: Integrative Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust is still shallow</td>
<td>Trust is quite shallow</td>
<td>Trust is depth</td>
<td>Trust is depth</td>
</tr>
<tr>
<td>Friendly</td>
<td>Friendly</td>
<td>Friendly</td>
<td>Friendly</td>
</tr>
<tr>
<td>Congenial</td>
<td>Congenial</td>
<td>Congenial</td>
<td>Congenial</td>
</tr>
<tr>
<td>Collegial</td>
<td>Collegial</td>
<td>Collegial</td>
<td>Collegial</td>
</tr>
<tr>
<td>Propensity to share</td>
<td>Propensity to share</td>
<td>Propensity to share</td>
<td>Propensity to share</td>
</tr>
<tr>
<td>Reciprocity</td>
<td>Reciprocity</td>
<td>Reciprocity</td>
<td>Reciprocity</td>
</tr>
<tr>
<td>Respect</td>
<td>Respect</td>
<td>Respect</td>
<td>Respect</td>
</tr>
<tr>
<td>Equality</td>
<td>Equality</td>
<td>Equality</td>
<td>Equality</td>
</tr>
<tr>
<td>Expertise recognized</td>
<td>Expertise recognized</td>
<td>Expertise recognized</td>
<td>Expertise recognized</td>
</tr>
<tr>
<td>Minimal/low communication</td>
<td>Moderate communicati on</td>
<td>Good communicati on Frequent dialogue</td>
<td>Excellent communicati on Frequent dialogue</td>
</tr>
</tbody>
</table>

III. Result

Based on interviews, it was found that the cooperation between vocational schools and the business that goes on until today still limited to the implementation of the industrial working practices (prakerin) for grade XI and assessment of skills competency test (UKK). As stated by Mr. I Ketut Muliana that the school in collaboration with business sector/industry for the purpose of teaching practice, the interests of graduate recruitment, and the recognition of the legality of the graduate’s competence.

The cooperation between school and industry is outlined in the form of Understanding (MoU) which was made by both parties. As Wayan Candra said, companies which accept students to do work practices are already have had a MoU with the school. The contents of the agreement are more mutual understanding (not mutually binding) and demonstrate openness among partners, as well as flexible cooperation item.

The procedure of placement of students in the company in the implementation of prakerin conducted by SMK 3 Singaraja and SMK 3 Tabanan is to provide flexibility for students to find their own place of work practices. School helps students to find a place of industrial work practices when students do not get it him/herself. The main reason is to reduce the cost of which is borne by the parents when students practice by providing the opportunities for students looking for a practice close to where he/she lived. This is because the real conditions in the field of construction project, where the project/job being taken are not always in the office, especially for contractors who can work on projects in the city/other districts outside the office operations.

Different conditions applied by SMK 1 Susut, where students who will participate in working practices, its placement is distributed by the employers’ association (in this case INKINDO Bali). The school has established cooperation with business associations in the practice of
placing students in companies that do have a project/job while students working practices, so that the students who take the practice more secure will gain direct work experience in projects in the industry.

Prakerin scheduled by the school and coordinated by the school management team. The timing of the prakerin also arranged so that not much interfere with effective student learning time in schools, around the months of January to April. However, the schedule of the prakerin on these period sometimes out of sync with the the company’s project. As Mr. Palguna (employer) said that most companies do not yet have a job on early year (January to February). He recommends that the implementation of student’s practical work should be started at the mid-year (between June to December).

For the implementation of the competency test for students’ final degree (UKK), the school manager also coordinate with the world of work by inviting external assessors from the industry. SMK 3 Tabanan invited a team of external assessors coming from the company one of the partners in prakerin. Meanwhile, SMK 3 Singaraja and SMK 1 Susut invited an external examiners through the employers’ association (INKINDO Bali) and professional associations (ATAKI Bali).

IV. Discussion

Based on the findings above, it can be stated that the cooperation forged by vocational schools and the business still involves minimal communication and with a low level of confidence. This is indicated by the lack of synchronization in the scheduling process of prakerin. The relationship between the world of vocational schools who work together have not fully act as a partner, but the impression of a particularly active and others are more passive. As stated by one respondent that the cooperation forged on the basis of interests, who are interested, they are more active in contacting other parties. When considered in the implementation of prakerin and UKK, the business sector appears to be merely as a supporter of vocational education program. When compared with the attributes of a partnership on the model proposed by Montiel-Overall, it can be concluded that the cooperation between the SMK-industry include in model A (coordination).

Coordination between the school and the business community in the activities prakerin and UKK has three patterns, namely (1) the school coordinate directly with the company, (2) schools in coordination with associations of the company, and (3) the school to communicate with the company for activities prakerin and schools with associations for UKK activities. The characteristics of each cooperative relationship are as follows. (1) School-company coordination

- Schools have had a communication network with many companies, and the number is still sufficient to accommodate the students to do work practices. In addition, the location of the school with the company closer to the school than the school association or lack of information on the whereabouts of association of the company. (Guidelines of the ministry also does not require schools to cooperate with trade associations and/or profession, because not all occupations have associations).

- Students are given the discretion to seek the company as a place to follow the work practices (with a letter of introduction from the school).

- The main consideration is to reduce the cost to be incurred by parents when students follow prakerin (students looking for a practice close to where they live, so that the cost of living and transportation be minimal).

- If students have relatives who have a construction company, they are more dominant selecting the company as a prakerin although the company does not currently have a job/project. This allows the students do not gain experience and
mastery of adequate competence, in accordance with the purpose of prakerin.

- External examiners which are invited from companies may not certified or qualified yet as assessors.

(2) School-association coordination

- Schools realize that association of companies play a role in fostering and establishing communication with its member companies, so the association is to know the condition of its member companies, including information on companies that are getting tender or have a job/project. Therefore, to ensure the attainment of the objectives of prakerin, the school coordinating with associations in distributing the students who will carry out prakerin.

- External examiners invited from associations of the companies because they are representatives of companies that will absorb graduates of vocational, so that UKK activity can be used as a medium for the promotion of competency mastery of prospective graduates who will enter the workforce later.

- Costs incurred by parents may be more when the placement of students in the activities of working practices is at a location away from their homes.

(3) The combination of school coordination with companies and schools with business associations

- Schools have had a communication network with many companies, and adequate to accommodate students' work practices.

- Prakerin process is the same as the first pattern of coordination, in which students are allowed to find a place prakerin alone, with consideration to reduce the cost incurred parents.

- Schools realize that in order to enhance the credibility of the UKK, a team of external examiners must have qualified as an assessor in the world of work. Labor assessors who served in LPJK are derived from professional associations and associations of companies.

- The possibility of the students do not gain experience and mastery of competencies adequate to the purpose prakerin if students are willing to be accepted by the company even though the company does not currently have a job/project.

V. Conclusion

Vocational education partnership with the business world is not a new thing in the system of vocational education. However, discussion of the results of this study found that vocational-industrial cooperation that took place on vocational courses of building engineering expertise in Bali is still included in the coordination model. There are three variations of the pattern of coordination of vocational schools with the industry, such as the school established an agreement with the company directly, the school made a Memorandum of Understanding with the association of the company, or a combination of both.

Therefore, more effort is needed to synchronize the expectation of vocational education with the hope of the world of work. SMK collaboration with business/industry needs to be addressed, especially with regard to the mechanism of communication, coordination, and collaboration among the various stakeholders to build connectivity between partners. In addition, it is also necessary to restructuring/revamping of the management structure of vocational education partnerships with the business world in order to improve the cooperation program between the school and the business world (companies and associated companies as well as professional associations). All partner institutions should consistently implement the
principle of management that takes place in a sustainable partnership program.

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CONTENT VALIDITY OF EDUCATIONAL OUTCOME EVALUATION INSTRUMENT IN VOCATIONAL TEACHER EDUCATION INSTITUTION

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ABSTRACT

This article discusses the analysis of content validity of outcomes evaluation instrument of education in vocational teacher education institution (Indonesian: LPTK). This instrument is intended to determine the performance of graduates who became teachers at vocational schools. The steps being taken in the analysis of the contents validity are: (1) instruments development; (2) assessing instrument by the experts; (3) the data tabulation; (4) data analysis; and (5) judgment. Assessing instrument carried out by the expert of educational evaluation and expert of vocational education, consist of 7 experts. Content validity index is calculated using the Aiken’s V formula. Based on the analysis, a number of 77 items from 78 items which analyzed qualify valid (V ≥ 0.75) while 1 item does not qualify valid (V < 0.75). Thus the 77 items can be used as a measurement instrument while one item should be dropped.

Keywords: Aiken’s V formula, outcome evaluation, content validity.

I. Introduction

The effectiveness of learning in vocational schools is largely determined by the quality of teachers. In the teaching learning process, the teacher is an instrumental input that has strategic position to develop all potential of the learners. To improve the effectiveness of teaching learning process in vocational schools, the teacher should be enhanced and educated specific. This is due to the characteristics of the teaching learning process in vocational schools and senior high school is different. Vocational teachers should be given the knowledge, skills and attitudes appropriate to the areas of expertise.

Teacher education institution (Indonesian: LPTK) as an institution which producing prospective teachers in Indonesia have a role in improving the quality of teachers. LPTK should oriented in improving teachers quality, thus LPTK role in education is becoming increasingly apparent. One effort that can be used to improve the quality of LPTK is evaluate the education that has been organized. With the evaluation, it can be seen the level of educational success, strengths, weakness, opportunities and threats in LPTK so that it will be used as a material consideration in decision making or educational policy.

The evaluation will be success if using an instruments which developed in accordance with the rules of the instrument development. One of the rules that must be fulfilled is the validity of the instrument including the content validity. Content validity describes as “a judgment of how adequately a test samples behavior representative of the universe of
behavior that the test was designed to sample” or in the other words an instrument should cover the content that supposed to be measured (Cohen & Swerdlik, 2005) [1]. This article will present evidence of the content validity instruments used to reveal the education outcomes of vocational LPTK. The aim is to describe the content validity evidence of the instruments. By reading this article, readers can understand how to analyze the validity based on content.

The instrument was developed to reveal the education outcomes of vocational LPTK. In this article will present evaluation instruments for: (1) the graduate of the LPTK, (2) the stakeholder (schools principal and student of vocational schools).

Validity

Validity evidence based on test content is one of the five “sources of evidence that might be used in evaluating a proposed interpretation of test scores for particular purposes” set out in the Standards for Educational and Psychological Testing (Miller, Linn & Groulund, 2009)[2]. Haynes et al. said that the meaning of content validity is “the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose” (Haynes, Richard, & Kubany, 1995)[3]. Content validity describes “a judgment of how adequately a test samples behavior representative of the universe of behavior that the test was designed to sample” or in the other words an instrument should cover the content that supposed to be measured (Cohen & Swerdlik, 2005)[1]. Adequate representation of the content measured is a fundamental requirement of a psychological and educational tests instrument. According to Syaifuddin Azwar (2012)[4], the representation of the content can be estimated by testing the feasibility or relevance of the tests content through rational analysis by a competent panel that commonly called expert judgment. Expert judgment is a formal process for eliciting judgments from experts of educational evaluation and vocational education about the value of a decision-relevant quantity.

Procedure

The instrument of education outcomes of the vocational LPTK consist of 78 items. Assessment content serve as the basis for the research data analysis and gathering validity evidence based on test content with the help of experts.

Data collection was performed using Likert scales validation sheet to measure the aspects of each item of the content domain the experts are being asked to consider. Each experts was given a booklet containing all of the 77 items to provided the data. To see the consistency between the validators, content validity index is calculated by using Aiken index [V](Aiken, 1985)[5,6]. Aiken index calculation based on the result of experts ratings as "n" people towards an item in terms of the extent to which the test measures the constructs it purports to measure. Aiken's V formula is defined as . The “s” value obtained from the rating given by Experts(r) subtract the integer assigned to the lowest validity category (lo).While “c“ is the integer assigned to the highest validity category. The range of both coefficients validity (V) is 0 to 1.

II. Data analysis

Lawshe (Andi Ulfa T.P., 2015) [7] said the most common method for collecting validity evidence based on test content requires experts to either: (a) rate the degree to which items are relevant to the domain tested (relevance), (b) rate the degree of the construction items, and
(c) rate the degree of the clarity of the items tested. The value of content validity calculated by using Aiken’s V formula with the $\geq 0.75$ criterion. When Aiken index value $\geq 0.75$ and statistically significant, there is agreement among the Experts that the item is relevant to the specific content area. When Aiken index value $<0.75$ and statistically significant, there is agreement among the experts that the item is not highly relevant to the specific content area. Moderate values of the Aiken index signify poor agreement among the experts about the relevance of the item to its prescribed content area.

Table 1. Example of Experts rating task assessing item construction

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>1 (poor)</th>
<th>2 (fair)</th>
<th>3 (average)</th>
<th>4 (good)</th>
<th>5 (Very Good)</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>C2 Teachers motivate students to reach learning achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

... Attention: Please read each item and its associated benchmark. Rate how well the item construction using the rating scale provided. Be sure to give a check list one rating for each item.

Using the rating scale approach we can get an idea of how well specific items, and the group of items measuring a specific objective, adequately measure the intended objective. An example of how the data summarized according to the criteria illustrated in Table3. Aiken index ranges from zero to one and essentially indicates the proportion of Experts who rate the item and it can also be evaluated for statistical significance (Sirecci, 1995[8]; Sirecci & Bond, 2014)[9]. An item content relevance analysis with 6 judges should yield a V coefficient equal to or above 0.75 to be statistically significant (Aiken, 1985)[6]. This value was taken from a right-tailed binomial probability table provided by Aiken. To improve the content validity measurement accuracy, Penfield and Giacobbi (2004)[10] established a confidence interval for item content-relevance ratings applied to Aiken index. Index values obtained from Aiken (V) may deviate substantially, and thus it is require to construct a confidence interval for the value of the confidence interval V. A confidence interval that is not constrained by large numbers of raters or Likert-scale categories. The Score interval outperforms the traditional Wald interval formula, especially when there are five or fewer categories and twenty or fewer raters (Penfield & Miller, 2004)[10]. Therefore, using Penfield score confidence interval is the solution of obtaining a more accurate estimate of content validity when the number of experts is small (i.e., less than 20) or the number of Likert-scale categories is small (i.e., less than 5).

Table 2. Outcomes Values of Aiken’s V, and 95% Score Confidence Interval for 78 Items
Table 2 shown the 77 item have value of validity coefficient (Aiken index) ≥ 0.75 while 1 item (A1) has value of validity coefficient (Aiken index) < 0.75. Based on the analysis, 77 item have good validity and can be use as effective tools in measuring.

III. Discussion

One characteristic of a good instrument is valid. It means the instruments that had been developed able to measure precisely the instruments that have to be measured. Content validity assessment done by asking experts opinion in the form of qualitative, containing advice and end with judgment feasible or unfeasible. In the other hand the measurement experts have developed a theory that can be used to quantitatively determine the validity of the content. Aiken (1985)[6] developed a formula that can be used to calculate the validity coefficient (index), while Penfield & Giacobbi (2004)[10] develops confidence interval score to set confidence interval of experts assessment score.

The instrument which has higher scale validity index indicates that the scale results can better present the actual characteristics the contents measured. Content validity evaluation requires reputable Experts to examine whether the test items assessing defined content (Lawshe, 1975)[11]. Content domain representation is critical for demonstrating the validity of inferences derived from test scores (Sireci, 1995)[8].

The steps being taken in the analysis of the contents validity are: (1) instruments development; (2) assessing instrument by the experts; (3) the data tabulation; (4) data analysis; and (5) judgment. Validity an item is determined by the values of the validity coefficient (Aiken's Value). In this test, the assessment of validity carried out by experts in the field of education evaluation and vocational education. The results of expert’s assessment are tabulated and analyzed. The values of the validity coefficient is determined by the table Aiken taking into account the number of experts who assess and significance level. In this case, the assessment carried out by 7 experts, while the significance level used was 95%, in order to obtain Aiken's index of 0.75. This means that an item is declared valid if it has an Aiken's index ≥ 0.75.

Table 2 displays the Aiken’s index of 7 experts with a score of 95% confidence intervals for item construction criteria. The typical length of the 95% score confidence interval for the data presented in Table 2 ≤ 0.16 although this value varies across the items depending on the specific value of V for the item. Using the typical length of the interval of precision of Vas an estimator, a researcher may make statements concerning the adequacy of the precision of V. For example, in this study a researcher may set a criterion level of typical length of a 95% confidence interval equal to 0.16 to ensure the accuracy of V. If the typical length of the score confidence interval exceeds this (as is the case with the example item A1 in Table 2), then the researcher may opt to examine the content of the items for potential lack of content-relevance, or increase the number of expert judges providing ratings for the items of the scale. Increasing the number of expert judges will act to increase the precision of V, and thus decrease the length of the confidence interval.

IV. Conclusion

The results of the analysis show that the content validity of 78 items, there are 77 items of evaluation instruments in vocational LPTK education outcomes that have values of the validity coefficients are adequate. Content validity is an important factor in identifying the concept of measurement and gave the evidence that the instrument can measure exactly to what should be measured.

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Model of Learning Social Cognitive in Vocational School

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Abstract
This paper aims to contribute to teachers in secondary vocational schools about social cognitive learning model. This learning model can help learners to develop their social skills so as to adapt to the work environment. Social cognitive learning model was first observed by Albert Bandura by giving attention to cognitive factors such as expectations and beliefs as well as the role of social influence. Teachers can be role models and help students to develop their learning capabilities for even the most difficult students. With this learning, students can improve self efficacy and learners can be an agent of lifelong learning independently and capable of adapting to changes.

Keyword : Cognitive Social, Vocational School

I. Introduction
Vocational school is a secondary education that prepares students primarily to work on a specific area (Undang-Undang RI Nomor 20 Tahun 2003). Vocational secondary education is one of the secondary education who have the orientation to prepare middle-aged children after graduates who have the competence to be able to work independently, working on other people, add education into specialist or continue to pursue vocational education (Direktorat Pembinaan SMK 2014, p. 1).

Thus, if the work is not expected to vocational school graduates continue their education to a higher level, in vocational education. Secondary level vocational education programs is expected to produce skilled graduates who are educated and in accordance with the expectations of the business world and the industrial world. In the end, students are required to undertake self-development of cognitive, affective and psychomotor.

Development of the students adapted to the demands of the real world that students should be provided with the appropriate learning to the 21st century.

Learn the necessary skills expressed by Ted Lai in (Rachmah, 2014, p. 245) as follows: “In a nutshell, these are the skills that will help people be globally competitive in the 21st Century. Especially with our students, these are skills that include not only the curricular standards but also a host of other essential skills like communication, collaboration, and creativity. Literacy doesn’t merely refer to the ability to read and write but also the ability to evaluate and synthesize information, media, and other technology. At the heart of 21st Century Learning, in my opinion, is the piece on creating authentic projects and constructing knowledge… essentially making connections between learning and the real world!” (Lai, 2008, p. 1).

The function of vocational education has actually led to the above concept. Directorate of Vocational in 1998 has been reformed by launching the concept of Skill Toward 2020. The main objective of the concept is to be based on demand driven vocational school (based on the needs of the working world with all its variety and the types) (Slamet PH, Februari 2013, p. 23).
Based on research conducted by Slamet PH (February 2013, p. 20) conditions vocational schooldate suggests that graduates of vocational immature human resources which is superior and has the properties of a creative, innovative (able to discover new things), flexible (not rigid and easy to adjust), technology-literate, skilled and has multiple intelligences. According to Trilling and Fadel education in the 21st century capable of producing innovative, inventive, self-motivated and self-directed, creative problem solvers to confront increasingly complex global problem.

Results of a study conducted by the Directorate of Vocational (2008) in Wijanarka(2012) there is still a gap between the competences of vocational curriculum to the needs of the industry the absence of entrepreneurial skills. These findings indicate that learning in vocational school has not touched the level of self-development and adaptability of students. However Man is a social being influencing the conduct of others and being influenced by their behavior, in his turn. Social relationships depend upon the mutual adjustment between such behaviors. Every society has some norms and standards regarding social development. A child who accepts and obeys the traditions, customs and adjusts with the social norms is said to be sociable (Rashid, June 2010, p. 69).

Social skills are defined as the set of skills people use to interact and communicate with one another. Social rules are created, communicated, and changed in verbal and nonverbal ways. Social thinking is a way to train your brain to help you figure out the people around you – what they maybe thinking, how that compares to what you’re thinking, and how to vary your actions based on what you and other people are thinking. Social Thinking is social cognition (Coppola, Haratine, Bethel, & Biling, 2011, p. 1). Need to be a social thinker to understand social skill because Social Thinking® is required prior to the development of social skills. Successful social thinkers consider the points of view, emotions, thoughts, beliefs, prior knowledge and intentions of others. Behavior contained in learners is not entirely inherited granted. When students think harder to solve the problem, ask better questions, explain the answer in a more logical or hear with more attention, means that learners are doing the learning process. The learning process involves the behavior of academic and non-academic and takes place at school or anywhere around the world learners. Santrock (2007, pp. 266-268) provides an overview of the approach in the learning process, namely:

1. Behavioral: emphasis on experience, especially reinforcement and punishment as a determinant of learning and behavior.
2. Social Cognitive: an emphasis on the interaction of behavioral factors, the environment and cognitive as a determinant of learning.
3. Information Processing: an emphasis on how students process information through attention, memory, reasoning and other cognitive processes.
5. Social Constructivist: emphasis on collaboration with others to generate knowledge and understanding.

Development of social competence can be done through social cognitive training provided to learners. In Bandura's social cognitive perspective, man as an individual is deemed to have ability to be proactive and organize themselves, and be able to behave reactive and controlled by environmental forces. Besides social cognitive theory rooted in the view that every human being has self-beliefs that allow them to train control over your thoughts, feelings and actions (Mukhid, 2004, pp. 107-108).

Based on the need for training of social cognitive and empirical evidence imbalance
between vocational graduates and the needs of the workforce, the theory of social cognitive as well as the results of previous studies, the authors will formulate the form of cognitive training social can be given to vocational students that are ready to enter the world of work and competence social required in the era of globalization.

II. DISCUSSION

Vocational School Curriculum

Education is a process and activities that will make a difference to each individual. Vocational school education is the equivalent of high school that promotes the development of skills of learners. Teachers are responsible for providing education and produce changes in behavior of learners. The process is not limited to the values of the cognitive but also teaches social skills and social values were integrated into the vocational curriculum.

Curriculum in 2013 for vocational schools to develop subjects were divided into 3 groups of subjects namely general subjects Group A, Group B common subjects and subjects of specialization in vocational subjects Group C. Group B aims to develop competencies attitude, knowledge and competence competences environment-related skills of students in the areas of social, cultural and arts (Permdendikbud RI No. 60 Tahun 2014, 2014). Reference content and general subjects Group B developed by the Government but can be enriched with local content by local governments and education units.

Local content is the study materials in schools that contain content and process of learning about the local potential and uniqueness so that students can understand the advantages and wisdom in his residence. The principle of the development of local content include conformity with the development of learners, competency and integrity of national importance and usefulness to face global challenges (Permdendikbud RI Nomor 79 Tahun 2014). Local potential can be used as a reference for social cognitive learning, in which environmental factors are among the factors that affect someone in applying social cognitive themself.

Social Cognitive Theory Social Cognitive is what is done when interacting with other people and think about how to interact socially with others. Moreover also in social thought, faced with how a person thinks about the people that influence behavior. Someone will respond by others in accordance with his behavior and ultimately will affect the person's emotions(http://www.socialthinking.com/what-is-socialthinking/introduction,2011).

The development of social cognitive theory originated from the social learning theory demonstrated by Albert Bandura in the early 1960s. This theory states that a person can learn by observing other people's actions and the consequences. This theory emphasizes the observation, modeling and vicarious reinforcement (Woolfolk, 2008). Social learning theory emphasizes learning through observation of others.

Over time, Bandura adds cognitive factors such as expectations and confidence in his theory. Social cognitive developed by Albert Bandura (1986) in (Tarsidi, undated, p. 1) which mentions the social cognitive theory is based on the proposition that the process of social and cognitive processes is central to an understanding of the motivations, emotions and human actions. According to Feist & Feist (2006) in (Mahabbati, November 2012, p. 3) Bandura concept combining the internal side of a person in the form of personality and behavior, with the external side of the child in the form of the environment as a model. According to Bandura learning principle sufficient
to explain and predict behavior change by considering that humans can think and adjust its behavior itself and the involvement of the interaction between the individual and other individuals (Alwisol, 2006). Social Cognitive Theory can be seen in the figure below:

![Social Cognitive Theory](http://ahmadasim.blogspot.com/p/constructive-perspectives.html)

Social cognitive needed before developing social skills. Social thinkers will succeed because look at the problem from different perspectives, emotions, thoughts, beliefs, prior knowledge and perspectives of others. Social Cognitive intelligence is one that integrates all the information from the environment such as social norms, access to get into the community and influence on others. Additional information was obtained from a person's cognitive factors such as knowledge, expectations and attitudes towards others. The latest information that affects a person's perspective is the personality factors such as skills, training and self-efficacy.

Everyone had been developed in his life, including cognitive development. The cognitive development is the development of the child's way of thinking that helps determine the response of a stimulus. So that, one can respond to something well then cognitive development must be directed and built. Piaget said that cognitive development is a continuous mental process as a result of biological maturation and experience of the environment. A child develops an understanding of the surrounding world based on knowledge acquisition, and if he found to not conformity between what they know with whom they meet, they will accommodate it into new-knowledge.

(http://www.simplypsychology.org/piaget.html).

Based on the opinion of Piaget, it will be important if the person's cognitive development getting new knowledge that is positive to help them understand the world and the surrounding environment. Application of Social Cognitive Theory in Vocational High School One important application is the social cognitive theory of self-efficacy is the belief of students about the competence or personal effectiveness in certain fields (Woolfolk, 2008, p.121). Based on the results of interviews to students in one of the Bandung Tourism Vocational High School in August 2015 regarding students' opinions on self-efficacy, basically the students still do not feel confident about its ability to complete its work by the time the industry practice or work. Their uncertainty arises because there are concerns the differences between learning in school with practice in the industry.

According Pajares (1997) in Woolfolk (2008, p. 121) self-efficacy future-oriented, a context-specific assessment of the competence to perform specific tasks. Self-efficacy is a person feels that he is able to handle certain tasks effectively without the need to compare the abilities of others. Beliefs that emerged from self-efficacy is a powerful predictor of behavior. Bandura in Woolfolk (Woolfolk, 2008, p. 122) identified four sources of self-efficacy expectations:

1. **Mastery Experience** is the direct experience of a person and the resources of the most powerful efficacy because the success or failure of a person will determine the level of self-efficacy. Success will improve the efficacy and failures
will reduce efficacy. Effective training to improve mastery experience is the program working practices in the industry that is now done in school.

2. Arousal namely physical and psychological reactions when people face a certain task. The higher the person's level of anxiety and concern that self-efficacy will go down. Students need to get reinforcement-reinforcement from teachers can foster confidence that they are able to complete a given task. Teachers can give a positive impetus as giving praise when the student is able to complete the task, giving a way out when the students are not able to complete the task and keep giving spirit when students are repeatedly unable to complete the task.

3. Vicarious Experiences achievement is modeled by others. Teachers can provide examples of resolution of a problem to the students because the closer the students identify the teacher as a model, the greater the impact on self-efficacy. When teachers work with both the efficacy of students will increase, but if the teachers work with the poor, the expectations of students decreased efficacy.

4. Social Persuasion can be feedback on student performance. Social persuasion can make students exert effort, seeking new strategies or try hard enough to achieve success. Social persuasion can minimize setback which causes a person to doubt himself. At the stage of improving self-efficacy, students are invited to assess her feelings towards a task. Students are asked to think about how good he was in completing the tasks requested by the teacher. For example, students are asked to practice the theory about making a layer cake. If students have a high confidence in making a layer cake, the failure will not make him stop to continue to make a layer cake the best ever. Students will motivate him to always practice and make a layer cake with the right composition according to the experiences gained. It could be the recipe will slightly deviate from cake recipes provided by the teacher, but this will only convince the student that he can finish the job.

Research conducted by Graham & Weiner (1996) in Woolfolk (2008, p. 129) shows if the performance in school increases the student selfefficacy will be improved if:

1. Having short term goals so that students more easily assess progress.

2. Master taught to use a more specific strategies

3. Receiving the reward on merit is not just involved only. Reward for the achievement signifies the increasing competence.

Another important element in the social cognitive theory is self-regulated learning. Zimmerman (2002) in Woolfolk (2008, p. 130) defines self-regulation as a process to activate and maintain thoughts, behaviors and emotions to achieve his goal. Self-regulation can function as a self-reactive capability where one can have the ability to regulate their own behavior (Tarsidi, undated, p. 14).

Learning objectives students should be able to make independent and free the need for teachers. Students can independently learn lifelong and has a combination of academic learning skills as well as self-control so that learning will be easier. In other words, students have the skill and the will to learn so that students can be self-regulated learner (Woolfolk, 2008, p. 131):

1. Knowledge of himself, hisjob, learning strategies to the learning context to be applied. If students know the learning styles of students can identify learning needs.
2. Motivation that arise when students have knowledge that helps him to overcome his difficulties. Motivation to learn will appear not to please the teacher, but the students are able to understand the need to learn. Students learn to know the reasons for the action and can be determined by their own choice without being controlled by others.

3. Volition or self-discipline needed to strengthen the knowledge and motivation. By volition, the students know when to learn and able to cope with learning difficulties. Students know what to do when tempted to stop learning.

Model of self-regulated learning one of which was developed by Phil Winne and Allynson Hadwin (1998) which is based on the idea that learning is the agent (Woolfolk, 2008, p. 132). Agency is the capacity to coordinate a variety of learning skills, motivation and emotion to achieve the goal. Self-regulating agency learners apply when they are involved in four (4) phases as can be seen in the following figure (Woolfolk, 2008, pp. 132-134):

1. Analyzing the Task
Learners examine any information deemed relevant to construct a sense of what kind of duties, what resources should be owned and how he feels about the task to be done.

2. Setting Goals and Devising Plans
Learning objectives set after getting information about conditions affecting the work. After knowing the conditions and objectives, the plan carried out by the students in order to achieve its objectives.

3. Enacting Tactics and Strategies
This stage is an important stage because every student should be able to monitor how well the plan goes as well as continue to monitor the results of its work.

4. Regulating Learning
Students take a decision on any changes to the three previous stages.

After the students can understand the stages to be agency, the teacher can help students to develop social cognitive skills so that they can continue to learn independently lifetime. Teachers can teach self-efficacy and self-regulated learning by involving students in setting the criteria for evaluating the process and products of learning, and give them the opportunity to assess their progress using these standards. After the students are directed to collaborate with friends and seek feedback from them. Teachers can teach students in the following way (Woolfolk, 2008, pp. 137-140):

1. Teachers can give a complex task that is not too make students overwhelmed in working. Complex here means include the proposed task more objective and involving students into a variety of critical social and cognitive processes. Complex tasks that can help students to cope with stressful
situations and adapt to their environment.

2. By involving students in making decisions, teachers also shared control by giving to them some options. Teachers take responsibility for learning to plan, set goals, monitor progress and evaluate results.

3. Teachers can encourage students to selfreflection by asking students to write down its contribution to the learning process and to describe what has been designed and implemented in learning.

4. Teachers encourage students to collaborate with peers. In addition, teachers can collaborate with students so that they can solve problems together.

III. CONCLUSION

1. Students of vocational school graduates are expected to have social competence can help students to adapt to their environment. Social competence can be given for students to learn at school through social cognitive theory.

2. The social cognitive theory gives a lesson to the students about self-efficacy and self-regulation. Self-efficacy is beneficial to provide the confidence and the confidence to learners when dealing with others in the work place. That belief will help students easily adapt wherever located. Self-regulation make students as agents that are able to adapt continuously and learn independently so be prepared with any changes.

3. Teachers can support learners by engaging students in meaningful tasks and complex, define the criteria for evaluating the learning process, provide an opportunity to evaluate themselves and to encourage students to collaborate with friends.

REFERENCES


DEVELOPING THE SOURCE OF SCHOOL FUNDS IN VOCATIONAL SECONDARY SCHOOLS

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ABSTRACT

This research aims to: (1) reveal the source of school fund model which has been applied; (2) reveal the development model of alternative source of school fund; and (3) test the internal effectiveness of development model of source of school fund in vocational secondary schools (SMK) which run the Study Program of Technology and Engineering Expertise.

This research employed the research and development method. This research was conducted at public and private vocational secondary schools in Yogyakarta. The research data were collected using in depth interview and observation.

The results of this research show that: (1) the source of the schools’ fund is the government and citizens; the alternative source of the schools’ fund which has been cultivated by SMK mainly comes from canteen lease, production units, and cooperatives; and the contribution of the alternative source of the schools’ fund to the schools’ operating budget is ≤ 0.39%. (2) The result of the development showed that the grand design model of alternative source of school fund which consist of source of funds management model and development of business units model. Furthermore, the result of internal effectiveness testing which involved the experts concluded that: (a) the components of the model are sufficient (84.5%); (b) the structure of the components of the model has been understood (86.3%); (c) the relationship between the components is clear (80.4%); (d) the model has good readability (80.4%); (e) the model is acceptable (88.1%); and (f) the model is effective if it is implemented (93.3%).

Keywords: source of fund, school business unit, alternative fund, SMK

I. Introduction

Human Resources (HR) is one of the indicators as a tool to measure the progress of a nation. Crucial problems faced by Indonesia are related to human resource development. Indonesian's human resources issues such as: interregional population distribution is uneven; the growth of the labor is higher than the availability of employment; incompatibility HR competencies with the competencies required in the workplace; and the high unemployment rate equals to poverty leads to the low quality of education, eventually leading to low quality of Indonesian human resources. The number of Indonesia's human resources which is the fourth largest in the world as if a blade, it is very advantageous if used properly, and very harmful if not fully utilized.

The publication of The Global Competitiveness Report which is released by the World Economic Forum can tell the level of competitiveness among countries around the world. According to 2013-2014 Growth Competitiveness Index Indonesia ranked at the 38th of 148 countries. It such an achievement because Indonesia only ranked at the 50th of 144 countries in the previous year. However, when it is compared to the ASEAN countries, Indonesia still relatively been underdeveloped. Singapore ranked as the highest competitive country followed by Malaysia (24), Brunei Darussalam (26), and Thailand (37). Indonesia was in the fifth place (38), while the
Philippines, Vietnam, Laos, Cambodia, Timor-Leste, and Myanmar are on the order of 6-11. Meanwhile, based on the indicators of the Higher Education and Training, among eleven ASEAN countries, Indonesia ranks at the 4th (64th of 148 countries) lags far by neighbour countries such as Singapore (2nd of 148 countries) and Malaysia (46th of 148 countries).

The efforts to improve the quality of human resources are carried out through various development sectors, among others: health, social welfare, population, and employment. One of the other important sector is education. Technological change promotes demand for education, and education promotes technological change. Technological change leads to economic competitiveness and economic growth. Therefore, education is associated with these factors (Marginson, 1993 in [14]). Education is closely related to technological change and economic growth of a country. Education is a form of long-term investment that contributes greatly to the economic development. Education investments provide a rate of return higher than any physical investment in other areas. A finding shown economic benefit of investment in education, the rate of return was higher than the other side of physical investments with an average ratio of 15.3% and 9.1%. This suggests that investment in education is very profitable, both socially and economically (Bappeda Jabar, 2002 in [3])

One type of education mentioned in Undang-Undang No. 20 Tahun 2003 on National Education System is vocational education. In clause 15 it is stated that vocational education is secondary education that prepares students primarily for working in a particular field. Vocational education considers efficient when they are able to ensure the supply of labour (output) adequately to the needs of the workforce. One basic principle of vocational education is that people are trained on the specific work needed by the community/labour market (demand) (Thompson, 1973). [2] stated that the purpose of SMK (vocational schools level in Indonesia) to prepare their graduates to be able to work both independently and fill the job demand according to their expertise. After several decades, SMK in Indonesia have been able to supply manpower needs. But now the problem is the amount of labors are more than the necessity. Thus it causes the unemployment rate of vocational graduates somewhat higher.

The Central Statistics Agency (BPS) recorded the number of unemployed in August 2013 were reached 7.4 million people with open unemployment rate (tingkat pengangguran terbuka/TPT) of 6.25%. TPT in August 2013 was compared to February 2013 which shown the result of increasing up to 5.92% and 6.14% compared to result in August 2012. When it traced by education background, TPT of vocational education graduates occupy the highest position which amount 11.19%. This number is increasing, compared to the 9.87% recorded in August 2012 [10]. There are Many factors that lead vocational school graduates to have not got a job, lack of competence, expertise program that is not up to date, and there is no existence of good cooperation between schools and DU/DI caused vocational learning is not getting along with the DU/DI needs. It becomes a challenge, especially vocational education in Indonesia and in the ASEAN region generally. As described by [16] The biggest challenge for TVET in the ASEAN region in 2015 lies in an active and sustained participation in TVET, not only of large companies and corporations, but also of the SME sector and the informal sector to achieve a demand-oriented qualification of well-skilled laborers and specialists at all levels. The Incompatibility of competencies required and the lack of support from the DU/DI are the reasons the quality of vocational schools become a doubtful program.

The quality of graduates always associate with the learning process and support facilities, the learning process and the facilities also relate to the financial support. Results of research which was conducted by [6] stated that money
is very influential in improving the quality of education in general. Thomas (1985) in [3] stated that Finance is necessary but not sufficient condition for educational excellence. It is recognized too that finance is one of several perspective that are essential in understanding and analysing education.

The problems faced by vocational education are related to lack of funding. This was confirmed by [4] that the main problem arises in some countries is the lack of funding due to limitations of vocational education budget from the state. Another challenge, especially in countries with limited educational resources is the need to use the funds in an efficient manner. In addition, the cost of vocational education is usually higher than any general education. According to [5] the average unit cost of vocational schools (SMK) 40% higher than common secondary school. Meanwhile, according to the average non-personnel operating costs between vocational schools (Department of Engineering Building expertise cluster) 49.10% higher than common secondary schools [11].

Review and analysis of investment in education in Indonesia at the Regency/City Governmental level was conducted by the World Bank (The World Bank, 2008) showed that funds of education for primary and secondary schools were calculated according to the unit cost per each student multiplied by the number of students who are active in the school. Method of allocating funds for education by the central Government, Provincial Government and Regency/City Government explicitly show that the amount is not calculated according to the unit cost of learning activities along with the type of education. It becomes a special problem due to the funding requirements of educational providing fund in vocational high school is different from the common high school, which of course the amount of unit cost in vocational is greater. [9] strengthen the statement by stating that the implementation of vocational education is generally assumed to require a greater cost than the other education.

Some statements above shown that the funding for vocational education program needs a great sum of money, and of course it is based on both theoretically and empirical study according to the facts in the field. The higher needs of fund in vocational education rather than common school due to the skill competencies development through much more practical learning rather than cognitive competencies through theory learning. Such learning processes need financial support for purchasing the practical tools and materials, maintaining the equipment, instructors wages, and purchasing the power source.

The expensive fee of vocational study in fact could not be met by the parents. Most parents who enrolled their children to the vocational school come from poor family. The research was conducted by [18] concluded that a significant difference between the welfare of families with junior high school students' interest in Bantul for continuing to study in vocational school. Parents who have a background as poor families could give positive attitude for their children to study in vocational school. The poor parents will encourage their children to choose vocational study over common high school in hoping that after their children graduate, they could get a job immediately. This condition does not only happen in Indonesia, [8] reported one study's finding that the implementation of the cooperative learning model of internship which was held by Technical and Further Education (TAFE) in Australia tend to be followed by community groups of lower economic. Thus the vocational education seems to be as less prestigious education according to society. [7] stated that “… We are still stuck and in a groove of thinking that the practical vocational courses are inferior to more academic studies”.

The government's commitment to improve the quality of education is embodied in the provision of school operational assistance. Since 2005 the government has implemented the School Operational Assistance (Bantuan Operasional Sekolah/BOS). BOS was
originally given to the elementary and junior secondary level, then since 2013 BOS is given also at the high school level, including vocational school. BOS for SMK is given in the form of direct funding to public and private vocational school to support school’s operating costs of non-personnel. The number of grants are received by schools calculated based on the number of students each school multiplied by the unit cost of assistance [1]. In addition BOS assistance provided by the central government, Provincial Government also provide assistance called the Regional School Operational Assistance (BOSDA).

BOS and BOSDA for SMK are intended for students whose study in public or private vocational school which have an operating permit. BOS funds for vocational school is set at BOS Vocational Technical Guidelines (2014) and refers to the Permendiknas No. 69 Tahun 2009 including: (1) Purchasing/copying text books for learning, (2) purchasing the stationery for studying activities, (3) copying the examination test question and the answer sheet for the gradual test and examination, (4) purchasing the education equipment, (5) purchasing the disposable practice materials, (6) maintenance and light improvement of school infrastructure, (7) school-based ICT service operations, (8) performing the competency test students’ activities, (9) performing the industrial internship (domestic), (10) subscribing and other services, (11) season of enrolment new students, (12) compiling and reporting, and (13) supporting the implementation of 2013 curriculum.

Despite the points were mentioned above, for the referential vocational school can use the BOS fund for the coordination that is related to the Planning/application of Referential Vocational School Development. Referential vocational school is the vocational school with excellent performance, accessible, and running the institutions effectively. According to PSMK director, Mustaghfirin Amin (2014), there are several requirements that must be fulfilled by the schools to be considered as the referential one, such as: (a) Have more than 1000 students, and good in characters; (b) productive teachers, (c) industry cooperation; (d) basic facilities are in a good condition; (e) the alumni have been graduated with good grades of national final exam; (f) located strategically [15].

The Regional School Operational Assistance (BOSDA) that been given by Government of Yogyakarta Special Region have an objective to asist Universal Secondary Education program and 15 years of Pioneering Compulsory Study has been launcher by the government in 2012 through Peraturan Menteri Pendidikan dan Kebudayaan nomor 80 Tahun 2013. In addition, Regional Government of Yogyakarta Special Region’s BOSDA is used to fulfil the shortage and/or complete the School Operational Assistance (BOS) from the central government. Based on the technical instruction of BOSDA Secondary Education Yogyakarta Special Region (2014) the amount of fund providing for vocational school is Rp510,000 each student. Local Government’s commitment to support the Universal Secondary Education and 12 years of compulsory education is also manifested in the form of Regional Education Assurance (Jaminan Pendidikan Daerah/JPD) provided by the Regional Government of Yogyakarta city for the people who hold the Towards Prosperity Card (KMS). Based on Lampiran Keputusan Walikota Yogyakarta Nomor 580/Kep/2011, the amount of fund that provided Rp3.000.000 for public and private vocational students of 10th grade and Rp2.550.000 for public and private vocational student of eleventh and twelfth.

Pre survey has been conducted in several vocational schools of Technology and Engineering Expertise in the city of Yogyakarta, it has been done in August 2014 showed that: first, the funds allocation for education providing in public SMK from the central government, Provincial Government, and the Government of Regency/City were not based on reality needs of implementation the education. Second, the source of funds was
certain (fix resources) and annually, they were insufficient for the learning process, maintenance the building infrastructure, maintenance the learning infrastructure, laboratory/workshop tools, as well as upgrading the equipment to follow the technology development in business and industry. Third, SMK have not been able to maximize its potential for managing the alternative sources of school funds. The last, the school administrators get difficulties in developing alternative sources of school funds that involve community participation and DU/DI.

The existence of the problems make vocational school of Technology and Engineering requires a development design of alternative sources of school funds. Development design is expected to create vocational school that maximize the potention of independent business school units and can be utilized by vocational school students as an entrepreneurship learning based.

II. Research Methods

The final results of this research is the discovery of the development funding source design in SMK. Therefore, this study is using Research and development method that developed by Borg and Gall (1989), but it is limited to three stages: preliminary studies, design development, and internal testing model.

Before the school funding source design in vocational school is developed, need assessment should be conducted as a study to determine the need or preliminary description about funding source in vocational school. The research is done using qualitative approach.

This study was done in November 2014 until February 2015. From November to December were used to analyze the needs, in December 2014 till Januari 2015 were developed the patterns of resources the school funding, while in Januari until February 2015 were get used for testing/validation of the model and test the internal effectiveness.

The research location chosen was six Group Technology and Engineering Vocational Schools in the Yogyakarta city. They were: SMK 2 Yogyakarta, SMK Muhammadiyah 3 Yogyakarta, SMK Negeri 3 Yogyakarta, SMK Perindustrian Yogyakarta, SMK PIRI 1 Yogyakarta, dan SMK Taman Siswa Jetis. The six vocational schools are the Cluster and Non-Cluster vocational schools in the Yogyakarta city.

The research respondents consist of the principal, public relation vice principal, infrastructure vice principal, school treasurer, UPS coordinator, and school cafetaria. The type of data that been select relating with the school funds source and operational unit for school business in term of management functions.

Research and development were carried out through three stages. First stage, was a research intended to obtain preliminary information about the source model of school funds. Second stage, was planning or designing the preliminary developed model of the school funds source. Third stage, was developing the model. In this stage, the model was get validate and efficiency internal test conducted. Validation model was performed by an education management, vocational education expert, and the bureaucrats education department of Yogyakarta City. While the internal effectiveness test conducted on each school administrators.

Data collection techniques used in this study are: (1) direct observation in the study site with the help of a tape recorder picture and sound, (2) in-depth interviews to all the respondents that have been chosen, and (3) study the documents at the schools including: school budget, business school unit that has been operated, school financial report, and other data required.

The data obtained were the result of interviews, observation, and analyzed and interpreted documents to fulfil the research purpose and other information. In order to present the more meaningful data and easier to
understand, then the steps of data analyze that have been used in this study with analysis of interactive model form Miles and Huberman [12] that split analytical activity into several parts, such as: collecting data, data reduction, data presentation, and conclusion.

III. Results and Discussion

Based on the interviews, observation, and documentation that ben done in six vocational school, it can be described the vocational public and private school's funds sources

![Figure 1. Source Funds model at Public SMK in Yogyakarta city](image1)

In figure 1, it can be explained that funds source in public vocational school in the city of Yogyakarta came from the government, both central, provincial, and regional. In addition, people also have a part in funding source through committee and investment money. Alternative funding source come from cooperation, cafetaria, and cooperation with DU/DI. From the three of these alternative source funds that provide the greatest contribution is the school cafetaria.

School Production Unit (Unit Produksi Sekolah/UPS) at Yogyakarta's public vocational school is not running. This is due to regulation constrained. Under UU No. 17 tahun 2003 on State Finance, which is currently applied on the on-budget management system, which essentially requires every revenue and expence state financial included in management budget system, in this case through APBN/APBD; so any use of the state assets that generate revenues must be deposited to the state before it can be used by working units in central or local government. The usage of the revenue that has been earned from activity from UPS, with local aset, directly by the school, it is contrry to UU No. 17 Tahun 2003.

The model of school funds source on private vocational school can be pictured like the following.

![Figure 2. The model of private school funds on private vocational school at Yogyakarta City](image2)

On Figure 2, it can be described that the funds source on private vocational school at Yogyakarta City come from the people in the form of study processes donation (Sumbangan Proses Pembelajaran/SPP) and investment money. Private vocational school is also received assistance from central government, provincial government, and regional government but the number is lower than public vocational schools. Alternative funds source come from UPS, cooperation, cafetaria, and another business. UPS in private vocational schools are still running but they don't give significant profit, as well as the school cooperation. Alternative funds source that give the biggest contribution come from renting the cafetaria. Business unit which is held in private vocational school including: laptop and motorcycle renting services, shops, photocopy centre, and teacher employee's dues.

Based on these descriptions, there are found some weaknesses in the management of the funding and development school business units, such as: (1) management and development school business doesn't run optimal. The vocational management, especially private vocational schools make school committee money and help from the
government as major funding sources; (2) There aren't well socialized regulation related to the implementation of Production Units (Unit Produksi/UP) especially in public vocational schools that in fact their assets belong to the state so the profits they earned must be deposited to the state treasury; (3) In the implementation, many students from private vocational schools who are in debt for committee school money so the management of vocational schools feel burdened with this position; (4) The organization of the business school units, like production units, school cooperation, etc are performed by the teachers who are not met with the competence and professionalism; (5) The implementation are less professional make the revenue generated is minimal; (6) Lack of monitoring and evaluation so that the school business units are like neither life nor death; (7) The principals leadership greatly affect school business in their ways looking for alternative source funds. Based on the interviews and observation in private vocational schools, the principal have not yet get an entrepreneurship spirit; (8) The school attempts are not yet integrated so they compete to run their own business at their own.

Based on some weaknesses above, next development models of schools sources funding at vocational schools consist of source funding management model and Business school unit development model. On The model was conducted of test phase 1. Futhermore, the result is came in form of operational models:

The pattern of school funds at vocational school

The pattern in figure 3 can be explained that for improving vocational funding, it can be developed through a model of resource funds management and developing School Business Unit. Funds resource model management carried out in four stages, they are: planning, organizing, implementing, and monitoring. While the development of School Business Funds (alternative funds resource) consist of: UPS, School Cooperation, Cafetaria, DU/DI cooperation, and rentals. The operations of the five business units are expected to bring in revenue/income.

The flow of School Fund Resources Management at vocational school.

According to [13] two of the four structural weaknesses in the system of education funding nowadays is inefficiency in budget allocation and implementation of educational institution. Therefore, for motivation the educational units
toward increasing efficiency, they can practice the saving within government budget system. Savins can be used to assist the funds flow.

The diagram can be explained that in the management of vocational funds source can be done in several stages, they are: (1) planning; (2) organizing; (3) implementation; (4) supervision; and (5) accountability. The things that get emphasized in this model is (1) medium-term budget planning for 3 years and based on school self-evaluation; (2) funding management that oriented on result and quality improvement; (3) implementatio/financing based on efficiency (4) supervision in form of financial administration and job result; and (5) flexible accounting system, it means that the rest of profit can be saved and used in next planning period.

Development Pattern of School Business Unit in vocational schools

Business Unit School was established to make income as alternative fund resource for vocational school. So that alternative fund source can be on targeted, the vocational managers need to do environment scanning so the efforts that have been doing can give benefits as expected.

The diagram above can be explained that the development vocational school business units can be done through stages: (1) Planning. The principal is required to become a visionary leader and entreprenuer oriented person, and get supported from the school's resources and human resources. (2) Organizing. The task cooperation among the human resource involved, show the participation aspect. (3) Implementation. School Business Units are implemented commercially but oriented to increase the education quality. (4) Supervision. The business units operational can receive supervision, whether for the product, marketing strategy, human performance, or financial reports.

Business School Units are run by schools including: (1) School Production Units; (2) School Cooperation; (3) Cafetaria; (4) Cooperation DU/DI; and (5) Rental Units. School business units run each production and operation as a part division. UPS marketing division and Rental Units are coordinating with School Cooperation marketing division. Financial management is performed centrally so the funds amount can be monitored well.

The Pattern of Management School Production Management Units at Vocational School

The diagram above explained that the management of School Production Units can be done by: (1) a well prepared business planning; (2) human resources involving are professional and proportional wage system; (3) developing Production Unit Department; (3) good marketing strategy and collaboration with cooperation marketing team; and (4) quality control, costs, and time.

Cooperation Management Pattern in Vocational School
The following pattern can be explained that the management of School Cooperation can be done by: (1) establishment of cooperation that legal and analyzing the needs; (2) clear capital fund and along with with cooperation principles; (3) human resources support and clear tasks division; (4) supervision can be done by Audit Board; and (5) marketing management activity participate to market the UPS's product and Rental Unit services.

Management patterns in Vocational School's canteens

The diagram in picture 8 can be explained that the school canteens management can be done by: (1) planning including: site selection, good building, and SOP; (2) Organizing such as coordination with WK Sarpras and unit dividing in managing the canteen; (3) implementation including: sales unit, site preparation and display, supplying and rent payment system; and (3) monitoring such as: environment cleanliness monitoring, food/beverages cleanliness, and financial administration.

Management pattern of Business and Industrial World (DU/DI) cooperation on Vocational School

Establishing cooperation between vocational school and DU/DI is not an easy thing because the cooperation/partnership model that desired is mutually beneficial cooperation. The thing to be note is the vocational manager require the ability to sell (marketing capability) so DU/DI get interested and be sure to give their education resources. Marketing capability can be done if the vocational school have resource that have advantage so in negotiating process, vocational school have good bargaining positions. Planning until implementation of cooperation can be done by: (1) human resource planning on working in group and various activities; (2) organizing work teams (BKK and PR vice-principal) and MoU preparation; and (3) cooperation mode that can be done. the DU/DI can provide: (1) Training programs and instructors; (2) supporting equipment; and (3) Prakerin place. While the vocational school can provide: (1) The graduates who ready to work; and (2) a competency test places.

Rental Business Unit Management Pattern at Vocational School
The picture can be explained that the Rental Business Unit can be done with: (1) Planning, including: goods inventory, SOP, and HR; (2) marketing such as, offline marketing, online marketing, and cooperation marketing team; and (3) implementation including customer searching, program implementation, maintenance items, and the administrative order. As part of the evaluation, it is conducted monitoring function.

IV. Conclusion

According to the model development research of fund sources in Vocational Schools, they can be concluded as following:

First, the sources of funds that have been applied in vocational school of Technology and Engineering Expertise can be seen that: (1) the sources of funds come mostly from the government, whether from central government, local government, or regional government and from the public; (2) alternative sources of funding are derived from leasing canteens, cooperation, and cooperation with DU/DI; and (3) The role of alternative sources of funding for school operational budget is generally as much as <= 0.15%. The details of each school, are: (a) the alternative funding sources at SMK 2 Yogyakarta contribute 0.07% of the total expenditure as much as Rp 26,997,627,173; (b) alternative sources of funding at SMK Negeri 3 Yogyakarta contribute 0.15% of the total expenditure as much as Rp 17,250,486,377.

Second, sources of funding that have been applied in the private vocational School of Technology and Engineering Expertise can be seen that: (1) the sources of funds come mostly from the public and government assistance; (2) alternative sources of funding are derived from leasing canteens, production units, cooperation; and other business units; (3) The role of alternative sources of funding for school operational budgets in general amount = 0.39%. The details of each school, they are: (a) the alternative funding sources at SMK Muhammadiyah 3 Yogyakarta contribute 0.36% of the total expenditure of Rp 11,258,728,500; (b) alternative sources of funding at SMK Perindustrian Yogyakarta contribute 0% of the total expenditure as much as Rp 803 918 500; (c) alternative sources of funding at SMK PIRI 1 Yogyakarta contribute 0.28% of the total expenditure of Rp1.568.006.000; and (d) alternative sources of funding at SMK Taman Siswa Jetis Yogyakarta contribute 0.39% of the total expenditure of Rp1.003.400.000.

Third, the grand design of the development model of the sources of funding on public vocational school is applying the management model of school funding sources.

Fourth, the grand design of the development model of private vocational school's funding sources consists of: (1) the management model of school funding sources; and (2) the development model of business units at vocational schools.

Fifth, management functions for sources of school funds management model consists of stages: planning, organizing, implementing, and monitoring. In the planning stage, vocational school does a self-evaluation, which evaluates the achievement of the program in the previous academic year. At the stage of organizing the distribution of tasks between the school management and group funding are based on budget lines. At this stage the role of principal to coordinate and justify for the purpose of budget efficiency could really do come true. At the stage of spending, it is implemented according to agreed procedures and controlled as well as monitored both internally and externally. Then at the stage of reporting, accountability made in the form of financial statements and
performance reports. The remaining funds from budget savings and profits from business units of schools can be saved in cash.

Sixth, the management function development model business units in vocational schools starting from the planning stage, the principals are required to have a vision and an entrepreneurial spirit to optimize school resources and human resources in it. At the stage of organizing the distribution of tasks between PR vice principal, facilities and infrastructure vice principal, treasurer, and a manager who is served as coordinator of school business unit. At the stage of implementation, the school business unit holds the principle of participation, transparency, and accountability. Commercial in nature but still support the teaching and learning process. Besides they clearly regulate the wages earned for the business unit manager. School business units is running production management/operation respectively. However, in the marketing department, cooperation school can be a coordinator for UPS and Rental Unit. In addition, financial management be centralized and unified.

Seventh, internal test results that can be concluded that the experts agree: (1) component of the model is complete (84.5%); (2) the structure of the component model have been clear (86.3%); (3) the relationship among the components of the model has been clearly (80.4%); (4) the model has good readability (82.2%); (5) the model has been feasible (88.1%); and (6) the model effective if it is implemented (93.3%).

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Effect of Campus Link and Match industry, Service Quality and Image toward their Decision in Choosing a Higher Education Vocational Institution.

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ABSTRACT

The objective of this research were to find out: the effect of campus link and match on applicants’ image of the campus and applicants’ decision in continuing their study at a campus. It is found that campus link and match influence applicants’s image about the campus. The link and match also effects applicants’ decision in choosing an educational vocation institution (campus). Furthermore, service quality also has consequence on both applicants’ image and decision. Finally, applicants’ image also has effect on their decision to continue their study at a campus. It means that campus link and match, service quality have crucial influence to satisfy applicants (candidate students) as campus customer. When they are comfortable with the link and match, service quality, they will have good image about the campus and choose it as their future educational vocation institution.

**Key word**: link and match vocation, service quality, image, and decision

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I. INTRODUCTION

This research is a qualitative category of the survey, conducted in Bandung during the college entrance examination, ie from June to July 2015, with a population of research on prospective students who will follow test entrance exam College in Bandung. Things become very interesting research, that future students more booming and enthusiastic about taking the college entrance exam that link and match with the industry. Sample of higher education that NHI Bandung D4, D4 STT Tekstil Bandung, Bandung STT Telkom, and D3 Polytechnic Bandung.

The average ratio between the number of students who sign up with students who enter placement test is 1:35. This means that a very small chance of being accepted. But students still follow the spirit of the entrance examination of the college. In fact, none of them have been registered in one of the state universities in Indonesia. The reason they are very simple: in order to quickly get a job after graduation, because, according to their observations lot of scholars who are unemployed. Therefore, although prospective students have been accepted in public universities, they retake the college entrance exam that link and match the industry with reason in order to quickly be able to work.

It becomes very attractive to researchers, so researchers conducted a survey observations, interviews, question and answer and provide an open questionnaire questionnaire as authentic evidence of research results. This study thus classified as a descriptive qualitative research.

II. Theorities

**Link and match Vocational**
Putz and Dybowski (2004) says that in order to achieve harmony and harmonious balance between stakeholders (management, teaching staff, learners, and industrial customers), required the design and implementation of education homprehensif, so that technical education vocational has a strong basis for facing demands and work requests changing dynamically.

Torraco (1999) states that the strength of vocational education in order to survive and maintain the continuity and relevance lies in the flexibility of vocational technical education institutions in the face of dynamic change.

Opinions Lynch (2000) stated that the reform of vocational education system of learning in relation to the three essential parts, namely contextual learning, work-based learning and authentic assessment, the three standards on constructivism.

Johnson et.al (1992) and Cash et.al (1997) that learning by using cognitive apprenticeship rules in konstruktivisme-based contextual learning that can provide a solid understanding, especially in the field of engineering. While Brown (1998) which states that perbagai learning strategies can be done to articulate a theory of constructivism in the vocational education system, such as: teaching to student-centered, problem-based learning, penbelajaran contextual, integrated curriculum, and authentic assessment.

According to Finch and Crunkilton (1999) there is a difference between curriculum development and learning. Curriculum development focusing on the content and region related to guidance and direction as well as the coverage has an impact on the learning program and learning experiences. While the development pembelajaran more narrow sense, namely the development of a curriculum that is done through the planning and provision of learning experiences that are specific to each material taught.

**Image**

Definition Image or Image, according to Levitt, (1983: 170) that the image is the key to the early success of the sentence marketers an institution service providers. The next image is the interpretation put forward anyway, and the reaction of the issuance of symbols, signs, physical condition, product reliability, reliability get organized, the attitude of trust and feelings of the strength of the institution. Citra is the impression, impressions, feelings or conception that of the public regarding the institution, objects, people associated therein.

Meanwhile, according to Phillip Kotler (2010: 57), the image is confidence, ideas and impressions somebody about something. Image is part of the trust, ideas and loyalty of people in an institution, through an assessment of the facility / physical evidence or development in total, at the institute.

According to Christina Martinez and Sharon Leslie (2004: 436) in the Journal of Consumer Marketing, Aaker cites the opinion that the definition of a person's image is the assessment of the symbol, logo, motto, trademarks, packaging design that identifies good service to competitors.

**Decision**

John Moven (1995: 5) in Consumer Behavior, stating that the Observers-nine is the final decision is taken / consumer decided after studying the parts in detail on the quality, the ideas offered, the contents of the product, kindness product.
Meanwhile, according to Philip Kotler and Gary Armstrong (2010: 177), Observerdécision-is the behavior or the behavior of consumers, through the stages of the process of recognition of needs, information search, evaluation of alternatives, make decisions and behavior after the decision.

Christopher Lovelock and Jochen Wirtz (2007: 59), stated that the decision-making process of consumers is a decision-making process of consumers towards the product or service which consists of three stages, namely: 1) the stage of the process prior to purchase (pre-purchase), 2) stage purchase (purchase), and 3) the stage of activity after the purchase (post purchase activity).

Furthermore, Lilian Kanuk and John Schiffman (2004: 555), states that at the stage prior to the purchase (pre-purchase), consumers would do things: a) the introduction into account the needs-god (problem recognition), b) information search (searching information) , c) evaluate other alternative (alternative evaluation). The introduction of requirements is essentially dependent on how much discrepancy or gap between the actual situation (is a consumer situation at that time) and the desired state (ie consumers desired situation)

Service Quality

According to Christopher Lovelock and Lauren Wright (2002: 367), quality of service is a process and a system, which means that a process is how the service is generated from four process services, namely: people processing (consumer), possession processing, mental stimuli processing and information processing. As a system, services are a combination of service operation systems, service delivery system, and service marketing system. The precision of the marketing strategy of service is determined by the quality of service (service quality) as measured by the consumer-perceived service (service performance / perceived service) and the expected service consumers (consumer expectation). Quality of care is the totality of the whole mix elements throughout the services.

Furthermore, according to Valarie Zeithaml and Mary Joe Bitner (1996: 117), quality of service is how to deliver services with an excellent or a very good service perfect (superior service relative) according to consumer expectations.

III. Method

Described in the introduction that this research is qualitative descriptive study, with a prospective student population at universities in Bandung are carried out during the college entrance examination. Conducted in June-July 2015. The sample was prospective college student D4 NHI Bandung, Bandung STTTekstil D4, D3 Polytechnic STTTelkom Bandung and Bandung. The number of students are taken at random random sampling as many as 40 students from four universities as the research sample.

Interview Questions and answers about what and how the views, aspirations, hopes and decisions of students choose to take the exam in college that link and match the industry with an open question as the research instrument measuring tool

Discussion

This research was conducted on a sample of 40 students in college NHI, STTTekstil, STTTelkom and Polytechnic Bandung, with a specification of descriptive qualitative research and instrument open questions on the
statement of the views of prospective students about college link and match, ideals soon after the prospective student if at received at the college, hopes prospective students during the lectures in high pergaman and ultimately the decision of students choosing to study at the university.

Results of the study with open-ended questions to 40 students, the answers are categorized as follows:

1. That the prospective student test for the college entrance examination that link and match the industry is so easy to get a job.
2. That the prospective student test for college entrance exams such as image view that if passed and finished the college that they will work with the appropriate expertise are exactly what they learned in college.
3. That the prospective student test for the college entrance examination such as universities have the lab space laboratory facilities, a library, lecture rooms were adequate and comfortable and proper equipment technology according to the work environment in the future. Have teachers who are competent in the field of expertise, so that students are confident that the skills that they have acquired skills in the future as needed work.
4. That the prospective student test for the college entrance examination because the university has a chance to get a scholarship for students, so that students attend classes with enthusiastic racing high achievements in order to get a scholarship expected.
5. That the prospective student test for the college entrance examination because the college has a curriculum in accordance with industry
6. That the prospective student test for the college entrance examination such as universities have the complete infrastructure and technology up to date in accordance with the latest technology era.
7. And finally take a decision enthusiastic students attending colleges that link and match with the industry. And ready to follow an internship for one year in the industry as a condition of graduation thesis lecture program.

It is clearly stated in the textbook experts Vocational that vocational education that link and match the right technology with infrastructure appropriate, adequate, between the amount of equipment practicum in the ratio of students is one in (1: 1), which means a student holding a tool lab and capacity classrooms and practice space is 1: 20 students. So that makes students comfortable while doing a practicum class or lecture. So that students follow the test sieve forced himself to go to college despite having separated the family, brother to wander. However, students are sure to be entered at the university in order to quickly get the job done.

Vocational education in accordance with this industry is generally expected of students. such as tourism colleges. NHI that at the end of the semester are required to attend a one-year apprenticeship in the designated industries, such as Chef in hospitality, chef in Cruise, and other parts of the tourism department NHI.

Indeed, in general, according to the alumni, nearly all of them alumni of graduates nothing is idle or not getting a job generally alumni, college graduates after completion of his
apprenticeship and unfinished these students were asked directly employed at the company where the student intern.

This shows that the MOU or agreement that is both harmonious cooperation between universities and the world of industry. Long before he made curriculum to college officials universities had previously cooperated relationships harmonious and always maintained all time to go on and continue to continue to provide information improvement of the information technology infrastructure, tools practicum reliable and always up to date, so that the college curriculum always follow the changing times and technological development, and in the end the students will be able to work well in the right industry company in accordance with the curriculum at universities with industry. Link and match here means having a curriculum and lab infrastructure in accordance with industry targets industrial world, which is the world of industry stakeholders as the output of vocational college graduates.

By always doing good cooperation between universities and industry, the students will get better image, and with this partnership, the practical tools, laboratories and infrastructure will support lectures. So that the service quality of a college student satisfactorily. which is ultimately the student's decision to attend college that link and match with industry, other implications on student belief that students will give good recommendations on public audiences community or in other terms mouth to mouth.

REFERENCES


EDUCATION SYSTEM DEVELOPMENT D3 UNJ IN MEETING THE NEEDS OF TRANSPORTATION INDUSTRY & HR SEA TRANSPORTATION SECTOR

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ABSTRACT

The purpose of this study is to determine what are the factors that need to be considered and corrected in the development of the education system in Prodi D3 Transport FT UNJ order to meet the human resource needs in the marine transportation industry.

The research method is quantitative descriptive survey approach. Data analysis was performed using descriptive statistics and weighting techniques in the form of Cartesian quadrant to see aspects that need to be improved, maintained or sufficient.

The results shown that the aspects of infrastructure lecturer need to be repaired. While the material science that still needs to be deepened is the export-import and logistics, container terminal and yard and ship planner, ports and dredging.

Keyword: Marine transportation, human resources, education system

I. INTRODUCTION

One major challenge for educational institutions is scored graduates who are ready to work and completely absorbed as workers and independent entrepreneurs. Directorate General of Higher Education stressed that educational institutions should be able to provide courses relevant to the needs of human resources to support the economic development of Indonesia as has been proclaimed by the President of the Republic of Indonesia on the Master Plan of Indonesian Economic Development (MP3EI) in 2011-2025.

Unemployment in Indonesia is still as a major problem and the homework is quite complicated for the government. Minimal conditions of employment that the main cause besides the quality of labor in Indonesia tend to be doubted by employers.

Figure 1. Unemployment Statistic in Indonesia (BPS, 2014)

Standing Committee on Labor Competency Certification Chamber of Commerce indicated there is a discrepancy between the quality of education in Indonesia with the needs of employers especially Diploma upward. The number of unemployed in Indonesia is declining but the number of unemployed people with minimal education diploma tend to stagnate as shown in the table below.
According to UU No. 20 of 2003 on National Education System, one of the goals of education is to produce students who have the intelligence and skills needed him, society, nation and state. Education is a human resource supplier for the world of work that had dynamic requirements and demands. Therefore we need the concept of alignment or adjustment which implies the need for good coordination between the providers of education graduates with parties need to employ graduates.

D3 Transport UNJ that was established in 2001 is one of the providers of higher education graduates with professional competence in the field of marine transportation and seaport. Marine transportation and port world is growing and in need of a reliable human resources in various related sectors. The Ministry of Transportation said that human resource for public transport services is still minimal one in the sector of marine professionals. The growth of marine transportation services increased significantly but has not been matched by the availability of competent experts with sufficient quantities.

This condition is of particular concern for Prodi D3 transport as one of the suppliers of HR field of maritime transportation, which is required to meet the market demand for the world, like providing competent diploma. Prodi D3 Transport require comprehensive analysis of the evaluation of the existing education system and the development of a framework aligning education systems to improve the quality of graduates and the development of further study program.

II. METHOD

The method used in this research is descriptive quantitative method for analyzing the results of a questionnaire survey of the human resources service providers / companies, the perception of the level of student satisfaction and perceptions of graduates. The results will be formulated if the pattern of education in D3 Transport UNJ still deserves to be maintained or breakthrough need to align education with the world. For data analysis using descriptive statistics on the processing of the survey results and then performed weighting technique in the form of Cartesian quadrant to see aspects that need to be improved, maintained or sufficient.

III. Result

Survey of Student Satisfaction

Results of student satisfaction survey through a questionnaire that was circulated online is as follows:

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<td>Aspect of Transportation (transportation of students)</td>
<td>2.00</td>
</tr>
</tbody>
</table>

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Dewi Sartika Building, 2nd floor UNJ
Jakarta, October 27th 2015

42
Survey of Tracer Study

For a survey of alumni tracer study results obtained are as many as 23 (twenty-three) of respondents with various forces ranging from 2005 to 2011. The number of respondents is relatively small because the database only using social media accounts and less reach all alumni. The tracer study survey results are as follows:

Results were surveyed by 44% in the group GPA between 3.00 to 3.25; 32% in the group GPA 3.25 to 3.50; 12% in the group above 3.50 in the remaining two (2) groups of 2.00 to 2.75 and from 2.75 to 3.00.

80 (eighty) persons had attended training soft skills, 42 (forty-two) people follow the leadership and IT training while three (3) people did not follow any.

A total of 8% of graduates work in the company PT Cikarang Dry Port, while the rest is divided among various companies and general freight forwarders, stevedoring and heavy equipment. Options on PT Cikarang Dry Port is based on the development of new buildup of container in the region with the aim of Outside Jakarta Tanjung Priok port. Hinterland company is in Jababeka.

As many as 36% of graduates are placed in a position of operational personnel in accordance with the criteria D III Transport for, while the rest became the administrative staff but some are reaching an important position in the structural firm. As many as 96% of people stated that aspect of scientific field is essential and very important to use in a job. This is because the graduates are placed according to the learning objectives in Prodi while 4% of people who said it was not generally placed at the outside aspect of science in the study programs. Results showed 64% of people believe that the professional certificate or expertise is very important. It is regarding if graduates want to get a higher position in a company requires a professional certificate, but 36% of people believe not because when they are working in the company automatically they will be trained in areas of their expertise, which is part of the development of human resources in the company.

The survey showed that 92% the alma mater's reputation affects the reception pattern of work in the company, it is because many practitioners who teach in Prodi while 4% of people who said it was not generally placed at the outside aspect of science in the study programs. Results showed 64% of people believe that the professional certificate or expertise is very important. It is regarding if graduates want to get a higher position in a company requires a professional certificate, but 36% of people believe not because when they are working in the company automatically they will be trained in areas of their expertise, which is part of the development of human resources in the company.

A total of 8% do not support the job search process, generally graduates have the option of working in trade, transport and other fields. While 92% through announcements in Prodi D III transport.

As many as 68% alumni association played a role in the process of job search for graduates D III Transport UNJ, as many as 16% do not support the job search process. Generally, companies that support the job search process is PT Pelindo II (IPC), together with its subsidiaries, PT MTI, PT TPK KOJA.

Competence Survey
Based on the results of a survey conducted on some of the following companies showed competency assessment and related aspects of the quality of graduates.

Table 3. Component assessment kompetensi lulusan

<table>
<thead>
<tr>
<th>No</th>
<th>Component</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Competence in formal and informal education [in college]</td>
<td>Compatible</td>
</tr>
<tr>
<td>2</td>
<td>Integrity aspect [of discipline, honesty, motivation, work ethic]</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Expertise based on science</td>
<td>Very Good</td>
</tr>
<tr>
<td>4</td>
<td>Communication ability</td>
<td>Average in foreign language</td>
</tr>
<tr>
<td>5</td>
<td>Leadership</td>
<td>Good</td>
</tr>
<tr>
<td>6</td>
<td>Competence of IT</td>
<td>Good</td>
</tr>
<tr>
<td>7</td>
<td>Teamwork</td>
<td>Average</td>
</tr>
<tr>
<td>8</td>
<td>Self development</td>
<td>Good</td>
</tr>
</tbody>
</table>

Table 4. Company’s priority expectations

<table>
<thead>
<tr>
<th>No</th>
<th>Behaviour Expected</th>
<th>Priority Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Honesty</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Dicipline</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Adaptation and cooperation</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Ability to work under pressure</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Communication</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Motivation</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Leadership</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Confidence</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 5. Materials science priorities

<table>
<thead>
<tr>
<th>No</th>
<th>Material</th>
<th>Priority Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exim</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Logistics</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Container Terminal</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Yard &amp; Ship planner</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ports and Dredging</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Trucking</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Counters &amp; Services</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Behandle</td>
<td>4</td>
</tr>
</tbody>
</table>

IV. DISCUSSION

Based on the results of the perceptions and expectations of the necessary development to increase Prodi D3 Transport via Cartesian diagram method.

Figure 3. Results of the perceptions and expectations

Based on the results of the analysis of the aspects that need to be improved is in quadrant D:

- Aspects of infrastructure:
  o A learning tool in the classroom
  o Prodi library facilities, schools and universities
  o Laboratories relevant to the needs of science
  o Restroom facilities
  o Worship facilities

- Aspects of awareness and understanding of the institution to which the student UNJ in this case D3 Transport Prodi will be able to:
  o Counseling provides the faculty for students
  o Provide a special time for parents of students for consultation
  o Understanding the importance and difficulty of students
  o Monitor the progress of students through faculty trustee or faculty counseling
  o Understanding the interests and talents of students and try to develop

Meanwhile quadrant C is the main problem/complaint is handled by UNJ students through
faculty counseling, is not a priority to be improved but should still be maintained as well as the quadrant A and B.

From the results above, the Prodi D3 Transport in its aim to meet the needs of human resources in the field of maritime transport, it is necessary to reform-reform as follows:

- Improvement of infrastructure to meet student perceptions
- Meet the needs of the industry will be graduates with foreign language skills are very high by adding foreign language curriculum and can be applied directly in the industrial
- Needs to be increase and improvement in the level of self-confidence, leadership, motivation and communication and teamwork for students.
- The most important priority for the material science that still needs to be deepened is the import and export logistics, container terminal and yard and ship planner, ports and dredging.

REFERENCES


IDENTIFICATION OF MICROBIAL CONTAMINANTS (E. Coli, Salmonella, and Listeria) ON BULK AND PACKAGED OF BANANA CHIPS FROM HOME INDUSTRY PRODUCT

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ABSTRACT

Banana chips are fried products. In Lampung, banana chips is a very popular food and it becomes a souvenir food from Lampung. In Lampung, banana chips was produced by home industry. In sales, banana chips was sold as a bulk and packaged. The prices are relatively inexpensive when bought in bulk form of banana chips. The bulk Banana chips was contaminated microbial easy. In this study, would be assessed that the level of of Salmonella, E. coli, and Listeria contamination on banana chips, either bulk or packaged product. The results showed that the packaging treatment was found could inhibit the cross-contamination by Salmonella, E. coli and Listeria compared than no packing/bulk. The bulk Banana chips was detected 33.33% was contaminated by Salmonella 68 ± 3 to 88 ± 1 cfu and E. coli 47 ± 1 to 66 ± 2 cfu. So, The bananas chips packaged more safety than bulk/unpackaged.

Key-word: contaminants, microbes, banana, chips, industry

I. Introduction

The Banana Chips home industry are centers of typical food souvenirs from Lampung. Bananas Chips Industrial Zone located in Bandar Lampung.

In the face of business development, the employer chips in Chips home Industry need a cooperation and a partnerships program to increase knowledge, skills and network, so, Chips home Industry be able to promote product in the other place.

Skills and knowledge in the production of chips, especially in the diversification of raw material products such as bananas, fruits, and cassava to produce various chips. Banana chips effort was not optimal, this was due to lack of knowledge and skills to organize the home industry of chips. Not implementation of appropriate technology yet, was a lack of product development. So, in sales, The chips mostly was sold on the bulk form, and not in the packaged form. In a bulk form, was susceptible to cross contamination by microbes eg, Salmonella, E. coli, and listeria, both of which are cause of unaseptic process and environment, such as, from the dust. It was a very dangerous product for consumers who consumed them.

In this study would examined the level of microbial contamination such as Salmonella, E. coli, and listeria in bulk and packaged banana chips. The benefits of this research is as a consideration for the chips seller in product selling.

II. METHODS

A. Time and Place

This study was conducted in August-September 2015 and the location of research was in the Laboratory Analysis of Results of Agriculture, Department of Agricultural Technology, University of Lampung.
B. Equipment and Materials
The used tool was a petri dish, a test tube, micropipette, benzene, autoclave, incubator, hot plate, erlenmayer and mortar. The materials used are original flavor of banana chips products that have been packaged and bulk from home industry, Listeria selective medium, Media Buffer Peptone Water, Mac Conkey medium, XLD medium, and distilled water.

C. Methods
The research design was a complete randomized block design, with three replications. The procedure of research was conducted with the following procedures:

1. The bananas chips
2. Grinding
3. Mixing into BPW solution
4. Homogenisation
5. Dilution ($10^{-1}$-$10^{-5}$)
6. Pouring
7. Incubation
8. Total colony

D. Data Analysis
Data were analyzed descriptively.

III. RESULTS AND DISCUSSION

A. E.coli Contamination
Identification of E. coli contamination was done using by Mac Conkey media. Home industry that produce the bulk and packaged of banana chips were be coded A, B, C, D, E, F. E. coli contamination on the sample was presented at Table 1 below:

<table>
<thead>
<tr>
<th>banana chips Sample</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk</td>
<td>66</td>
<td>±</td>
<td>0</td>
<td>±</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>packaged</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The results showed that 33.33% of bulk chips was contaminated with E. coli 47 ± 1 to 66 ± 2 cfu. The chips packaged tend more save from contamination of E. coli than un packaged (100% product of packaging chips was identified on Mac Conkey media did not show any E. coli colonies growing (Figure 2). E. coli does not grow shows that banana chips packaged more aseptic than the bulk form. According to Brennan (2006) contamination of E. coli indicates that the product during processing was not aseptic conditions. Colony Performances of E. coli on Mac Conkey media as a follows:

B. Salmonella Contamination
Identification of Salmonella contamination was done using by XLD media. Home industry that produce the bulk and packaged of banana chips were be coded A, B, C, D, E, F.
Salmonella contamination on the sample was presented at Table 2 below:

Table 2. Salmonella contamination on the samples at Home industry of banana chips

<table>
<thead>
<tr>
<th>banana chips Sample</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk</td>
<td>88 ± 1</td>
<td>0</td>
<td>0</td>
<td>68 ± 3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>packaged</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The results showed that 33.33% of bulk chips was contaminated with Salmonella 68 ± 3 to 88 ± 1 cfu. The chips packaged tend more save from contamination of Salmonella than unpackaged (100% product of packaging chips was identified on SSA media did not show any Salmonella colonies growing (Figure 3). Salmonella does not grow shows that banana chips packaged more aseptic than the bulk form. According to Bhunia (2008) Salmonella grows rapidly on medium high in protein. While packaging chips tend to be more secure Salmonella contamination than unpackaging, contamination of Salmonella indicates that the product during processing was not aseptic conditions. Colony Performances of Salmonella on SSA media as a follows:

![figure 3. Colony Performances of Salmonella on SSA media with treatment, such as, bulk and packaged](image)

B. Listeria Contamination

Identification of listeria contamination was done using listeria selective media. Home industry that produce the bulk and packaged of banana chips were be coded A, B, C, D, E, F. Listeria contamination on the sample was presented at Table 3 below:

Table 3. Salmonella contamination on the samples at Home industry of banana chips

<table>
<thead>
<tr>
<th>banana chips Sample</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>packaged</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The results showed that 0% of bulk chips was contaminated with Listeria. packaging chips Product that was identified on Listeria selective media did not show any Listeria colonies growing (Figure 4). Colony Performances of Listeria on Listeria selective media as a follows:

![figure 4. Colony Performances of Listeria on Listeria selective media with treatment such, as bulk and packaged](image)

D. organoleptic test of Banana chips

The use of Packaging is more preferable than unpackaging or bulk, it can be seen on all of banana chips: product, such as, natural (A), choco (B), and cheese (C). The influence of the packaged and unpackaged treatment on banana chips was shown on Table 4 and Figure 5 below:

Table 3. The Acceptance Level of bulk and packaged banana chips

<table>
<thead>
<tr>
<th>Contact time</th>
<th>banana chips bulk/unpacked</th>
<th>banana chips packaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>natural</td>
<td>choc</td>
<td>cheese</td>
</tr>
<tr>
<td>natural</td>
<td>brw</td>
<td>cheese</td>
</tr>
<tr>
<td>(day)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>4.533</td>
<td>3.23</td>
</tr>
<tr>
<td></td>
<td>4.53</td>
<td>3.23</td>
</tr>
<tr>
<td></td>
<td>4.60</td>
<td>3.33</td>
</tr>
<tr>
<td></td>
<td>4.633</td>
<td>4.500</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>4.6</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>4.43</td>
<td>4.30</td>
</tr>
<tr>
<td></td>
<td>ns</td>
<td>**</td>
</tr>
<tr>
<td></td>
<td>00**</td>
<td>**</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>00</td>
</tr>
</tbody>
</table>

Description: The results of the t test are significant; ** = different significantly

On Table 3, shows that the increase of air contact influenced on banana chips aromatic. Based on organoleptic test, aromatic of unpackaged treatment lowers the level of preference aromatic of banana chips, from 4.5 (very like) to 1.9 (not like). This is in contrast with packaged banana chips only declining from 4.5 to 3.7 (still like). All of unpackaged /bulk chips, such as, A) natural banana chips; (B) chocolate banana chips; and (C) banana chips cheese was have bad of aroma, color, and overall acceptance. This phenomenon can be seen from the trend of decline in the level of preference in the following figure:

The conclusion from this research was the packaging treatment could inhibit the cross-contamination of Salmonella, E. coli and Listeria compared than unpackaging / bulk (33.33% was contaminated with Salmonella 68 ± 3 to 88 ± 1 cfu and 33.33% was contaminated with E coli 47 ± 1 to 66 ± 2 cfu. Based on acceptance level test, aromatic of unpackaged treatment lowers the level of aromatic preference on banana chips from 4.5 (very like) to 1.9 (not like). This is in contrast with banana chips that was packaged, the level of aromatic preference only declining to 3.7 scale (still favored/like).

REFERENCES

LESSON LEARN FOR COMPARISON OF SINGLE PILE AXIAL CAPACITY BASED ON SOIL PARAMETER AND STATIC LOADING TEST RESULT

A CASE: Development and Upgrading of State University of Jakarta

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State University of Jakarta
Tri.sutomo10@gmail.com

Abstract

The Development and Upgrading of UNJ Project is located in DKI Jakarta Province-Indonesia. In the development project of this Building, to verify the design of square concrete piles 450 mm x 450 mm. The strength of concrete is K-350 ($f'_c=29$ MPa) with length of pile 18 meter. The data used in this research is secondary. Indirect methods is used to the evaluation of the soil characteristic parameters for prediction ultimate bearing capacity. To prediction ultimate end bearing capacity used Vesic Method, Janbu's Method, Terzaghi Bearing-Capacity Equation, and Mayerhof. Ultimate static pile shaft or skin resistance capacity in this research used are: $\alpha$ method, $\beta$ method, and $\lambda$ method.

Load test applied with 200% of load is 290 Ton. To estimate the failure load so that allowable pile capacity from static loading test using a interpretation by several methods as follows: Davisson’s (1972); Chin’s (1970, 1971); De Beer’s (1967); Brinch Hansen’s 90% criterion (1963); Brinch Hansen’s 80% criterion (1963); Mazurkiewicz’s (1972); Fuller and Hoy’s (1970); Butler and Hoy’s (1977); and Vander Veen’s (1953). A combination of side resistance by $\lambda$-method and point bearing by Janbu’s is too conservative; the combination Mayerhof and $\alpha$-method may be too large for prediction axial ultimate bearing capacity. The interpretation static loading test data are using methods of Davisson’s (1972); Chin’s (1970, 1971); De Beer’s (1967); Brinch Hansen’s 90% criterion (1963); and Brinch Hansen’s 80% criterion (1963) are deviation +10%. The deviation may be tolerated and value is nearest from minimum result of axial ultimate bearing capacity using soil parameter.

Keyword : Axial Capacity, Static Loading Test
I. INTRODUCTION

The design of foundations of structures such as buildings, bridges, and dams generally requires a knowledge of such factors as [1] (a) the load that will be transmitted by the superstructure to the foundation system, (b) the requirements of the local building code, (c) the behavior and stress-related deformability of soils that will support the foundation system, and (d) the geological conditions of the soil under consideration [2]. To a foundation engineer, should be understood principles of foundation engineering is intended primarily for undergraduate civil engineering students. The engineer must consider the superstructure load, the subsoil conditions, and the desired tolerable settlement, to ensure compliance with safety and serviceability requirements [1, 3, 4, 5, 2, 6, 7].

The prediction of axial capacity of piles has been a challenge since the beginning of the geotechnical engineering profession. Several methods and approaches have been developed to overcome the uncertainties in the predictions. The methods include some simplifying assumptions and empirical approaches regarding soil stratigraphy, soil-pile structure interaction, and distribution of soil resistance along the pile. Therefore, they do not provide truly quantitative values directly useful in foundation design [8]. In the design of axially loaded piles, the side resistance and tip resistance of piles are of great interest. Numerous laboratory and field pile load tests have been conducted to provide better estimates of these resistances, in which these resistances are subsequently correlated to some soil parameters obtained from laboratory and field soil tests [9]. The basic approach to calculate the resistance of piles to compressive loads is the ‘static’ or soil mechanics approach. For practical design purposes engineers must base their calculations of carrying capacity on the application of the load at a relatively short time after installation. Three basic approaches to design. These are the following [10, 6]: (1) Static load tests; (2) Empirical or analytical calculations, and (3) Dynamic load tests.

In general the application of in-situ tests to pile design is done through: (1) Indirect Methods or (2) Direct Methods. Indirect methods require the evaluation of the soil characteristic parameters, such as the internal friction angle $\phi$ and the undrained shear strength $s_u$, from in-situ test results. This requires consideration of complicated boundary-value problems [11]. On the other hand, with direct methods, one can make use of the results from in situ test measurements for the analysis and the design of foundations without the evaluation of any soil characteristic parameter. The application of direct methods to the analysis and the design of foundations is, however, usually based on empirical or semi empirical relationships. Indirect methods for pile design include Vesic (1977) [12], Coyle and Castello (1981) [13], for cohesionless soil, and $s_u$ method [5], $\alpha$ method [14, 6], $\beta$ method [15], and $\lambda$ method [16] for cohesive soil. Direct methods used for pile design have been mainly based on the standard penetration test (SPT) and the cone penetration test (CPT).

A. Soil Properties for Static Pile Capacity

For static pile (and group) capacity analysis the angle of internal friction $\phi$ and the cohesion $c$ of the soil are needed. Immediate controversy arises since some designers use undrained (or total) stress parameters, whereas others—particularly more recently—use effective stress values [17].

The soil parameters may be determined from laboratory triaxial tests on "undisturbed" samples. These are quite satisfactory for piles installed in predrilled holes but may be considerably in error for driven piles. The normal increase in soil density with depth will always produce several "soil layers" having values of $\gamma$, $\phi$, and $c$ that are somewhat different from those obtained using a single layer even for the same soil.

Piles are structural members of timber, concrete, and/or steel that are used to transmit surface loads to lower levels in the soil mass. This transfer may be by vertical distribution of
the load along the pile shaft or a direct application of load to a lower stratum through the pile point. A vertical distribution of the load is made using a friction (or floating) pile and a direct load application is made by a point, or end-bearing, pile. This distinction is purely one of convenience since all piles carry load as a combination of side resistance and point bearing except when the pile penetrates an extremely soft soil to a solid base. All static pile capacities can be computed by the following equations:

\[ P_{ult} = P_{pu} + \sum f_{si} \] (1)

Where

- \( P_{ult} \) = ultimate (maximum) pile capacity in compression—usually defined as that load producing a large penetration rate in a load test;
- \( P_{pu} \) = ultimate pile tip or point capacity; and
- \( f_{si} \) = skin/shaft resistance.

**a. Ultimate Static Pile Point Capacity**

The ultimate static pile point capacity in any soil can be computed using the bearing-capacity factor \( q \) and \( c \) (Eq. 2).

\[ P_{pu} = A_p \left( c N'_c d_c + \eta \bar{q} N'_q d_q + \frac{1}{2} \gamma' B_p N'_y \right) \] (2)

where

- \( A_p \) = area of pile point effective in bearing;
- \( c \) = cohesion of soil beneath pile point (or \( s_u \));
- \( N'_c \) = bearing capacity factor for cohesion;
- \( N'_q \) = bearing capacity factor (may include overburden effects).

\[ d_c = 1 + 0.4 \tan^{-1} \frac{L}{B} \] (for \( D/B \) or \( L/B > 1 \))

\[ d_q = 1 + 2 \tan \phi (1 - \sin \phi) \tan^{-1} \frac{L}{B} \]

\( \bar{q} = \gamma' L = \) effective vertical (or overburden) pressure at pile; and \( \eta = 1.0 \) for all except the Vesic (1975).

Where \( N'_y \) = bearing capacity factor for base width \( = N_y \) since it is not affected by depth, and

neglecting the \( N'_y \) term and making adjustment for pile weight, we may rewrite Eq.3

\[ P_{pu} = A_p \left[ c N'_c d_c + \eta \bar{q} (N'_q - 1) d_q \right] \] (3)

**i. The Vesic Method**

According to Vesic (1975) the bearing-capacity factors \( N'_q \) and \( N'_c \) of Eq. (4) and (5), can be computed based on the following [18]:

\[ N'_q = \frac{3}{3 - \sin \phi} \exp \left\{ \frac{\pi}{2} \left[ \phi \tan \phi \right] \tan^2 (45^0) \right\} \] (4)

\[ N'_c = (N'_q - 1) \cot \phi \] (5)

The reduced rigidity index \( I'_{rr} \) in this equation is computed using the volumetric strain \( \varepsilon_v \) (Eq. 6). The rigidity index \( I_r \) is computed using the shear modulus \( G' \) and soil cohesion and shear strength \( s \) (or \( \tau \)) as \( \varepsilon_v \) (Eq.7). When undrained soil conditions exist or the soil is in a dense state, take \( \varepsilon_v = 0 = \) so that

\[ I_r = I'_{rr} \]

\[ I_r = \frac{G'}{1 + \bar{q} \tan \phi} = \frac{G'}{s} = \frac{G'}{\tau} \] (7)

To compute \( G' = \) shear modulus of the pile using the Eq (8) given earlier where Poisson’s ratio is usually taken as 0.15 for concrete and 0.33 for steel. [5]. For concrete pile, \( E_c = 4700 \sqrt{f_c} \)

\[ G' = \frac{E}{2(1 + \mu)} \] (8)

The following are several SPT \( N \)-value correlations for angle of friction \( \phi \) [19], who obtained them from the Japanese Railway Standards (Eq.9):

\[ \phi = \sqrt{18 N'_{70} + 15} \] (for roads and (9.a) bridges)
\[ \theta = 0.36 N_\gamma + 27 \quad \text{(for buildings)} \quad (9.b) \]
\[ \theta = 4.5 N_\gamma + 20 \quad \text{(in general)} \quad (9.c) \]

ii. The Janbu's Method

To compute \( N'_q \) (with angle \( \psi \) in radians) as follows (Eq.10), there are two uncertainties involved in this procedure [20]. They are: (1) Difficulty in determining the values \( \psi \) of for different situation at base level, and (2) the settlement required at the base level of pile for the full development plastic zone [20].

\[ N'_q = \left( \tan \phi + \sqrt{1 + \tan^2 \phi} \right)^2 e^{2 \psi \tan \phi} \]  

\[ (10) \]

iii. The Terzaghi Bearing-Capacity Equation

One of the early sets of bearing-capacity equations was proposed by Terzaghi (1943) as Eq.10. Terzaghi's equations were produced from a slightly modified bearing-capacity theory developed by Prandtl (ca. 1920) from using the theory of plasticity to analyze the punching of a rigid base into a softer (soil) material [21]. Where neglecting the \( N'_y \) term, we may rewrite Eq.11.

\[ P_{pu} = A_p \left[ c N_c s_c + \bar{q} N_q \right] + \frac{1}{2} \gamma B N_y s_y \]  

\[ (11) \]

\[ P_{pu} = A_p \left[ c N_c s_c + \bar{q} N_q \right] \]  

\[ (12) \]

Where \( s_c = 1.3 \) for square and rounded pile. \( N_q \) are bearing capacity factor. Eq.12 and \( N_c \) same as Vesic’s

\[ N_q = \frac{a^2}{2 \cos^2 \left( \frac{45^0 + \theta}{2} \right)} \]  

\[ (13) \]

\[ a = e^{\frac{2\pi - \theta}{2} \tan \phi} \]

\[ (14) \]


For standard penetration test (SPT) data Meyerhof (1956, 1976) proposed, Eq.13. Where \( B = \text{width or diameter of pile point} \); \( L_b = \text{pile penetration depth into point-bearing stratum} \); \[ \frac{L_b}{B} \]

\[ = \text{average depth ratio of point into point-bearing stratum}. \]

\[ P_{pu} = A_p (40N) \frac{L_b}{B} \leq 380NA_p \]

B. Ultimate Static Pile Shaft/Skin Resistance Capacity

The \( \alpha \) method [14, 6], \( \beta \) method [15], and \( \lambda \) method [16] are commonly used in prediction ultimate skin resistance capacity.

\[ f_s = \sum f_{si} A_s \]

\[ (15) \]

i. The \( \alpha \) method

A general method for pile shaft skin resistance that was initially proposed by [14, 6] is:

\[ f_{si} = \alpha c + \bar{q} \gamma \tan \delta \]

\[ (16) \]

which includes both adhesion \( \alpha c \) and friction. Equation (14) is not much used in this general form but rather simply as Eq.17. where, \( f_{si} = \text{skin resistance at} \ z_i \); \( \alpha = \text{coefficient from} \ Fig. \ 1 \); \( c = \text{average cohesion or} \ s_y \) for the soil stratum of interest; \( \bar{q} = \text{effective average (or midheight) vertical stress} \) on element \( \Delta L \); \( K = \text{coefficient of lateral earth pressure ranging from} \ K_0 \) to about 1.75, depending on volume displacement, initial soil density, etc., \( \delta \) is effective friction angle between soil and pile material.

\[ f_{si} = \alpha c \text{ or } f_s = \alpha s_u \]

\[ (17) \]

The coefficient of lateral earth pressure, \( K \) [5] is:

\[ K = \frac{K_a + F_w K_0 + K_p}{2 + F_w} \]

\[ (18) \]
where the $K_i$ values are as Rankine active/passive earth pressure coefficients (Eq.18) and $F_\alpha$ = weighting factor for $K_0$ ranging from 1.0 upward.

$$K'_a = \frac{\cos \beta - \sqrt{\cos^2 \beta - \cos^2 \varphi}}{\cos \beta + \sqrt{\cos^2 \beta - \cos^2 \varphi}} \quad \text{dan} \quad (19)$$

$$K'_p = \frac{\cos \beta + \sqrt{\cos^2 \beta - \cos^2 \varphi}}{\cos \beta - \sqrt{\cos^2 \beta - \cos^2 \varphi}}$$

For estimating the lateral earth-pressure coefficient, $K$ for precast concrete about 1.45 to 1.6 (Mansur and Hunter, 1970), API (1984) is 1.0. The effective friction angle between soil and pile material, $\delta$, given at Table 1.

Table 1. Pile skin friction angle ($\delta$)

<table>
<thead>
<tr>
<th>Type</th>
<th>$\delta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>el</td>
<td>20°</td>
</tr>
<tr>
<td>rubber</td>
<td>$3/4 \phi$</td>
</tr>
<tr>
<td>concrete</td>
<td>$3/4 \phi$</td>
</tr>
</tbody>
</table>

Source: (NAVFAC DM 7.2; Rajapakse, 2008)

ii. **The $\lambda$ method**

A method of obtaining the skin resistance of a pile in overconsolidated clays and have claimed a correlation between design and load tests on the order of ± 10 percent. The original development was based primarily on pile load tests. These were on long piles used for offshore oil production structures and founded in clays located in or along the U.S. coastline of the Gulf of Mexico. This method has also been used in other marine installations with some success (e.g., North Sea oil production structures). In equation form the method is given as Eq.20. Where $\lambda$ coefficient, which can be obtained from Fig. 2, is pile length-dependent, and applies over the total pile embedment depth [16]:

$$f_s = \lambda (\bar{q} + 2s_u) \quad (20)$$

iii. **The $\beta$ method**

This method [15], makes the following assumptions: (1) Soil remolding adjacent to the pile during driving reduces the effective stress cohesion intercept on a Mohr's circle to zero; (2) The effective stress acting on the pile surface after dissipation of excess pore pressures generated by volume displacement is at least equal to the horizontal effective stress ($K_0$) prior to pile installation; and (3) The major shear distortion during pile loading is confined to a relatively thin zone around the pile shaft, and drainage of this thin zone either occurs rapidly during loading or has already occurred in the delay between driving and loading.
With these assumptions Burland (1973) developed a simple design equation [also the second term of Eq. 13], written as $\beta = K \tan \delta$, we can rewrite the equation for skin resistance as:

$$f_s = \tilde{q}\beta$$

(21)

Zeitlen and Paikowsky (1982) suggest that the limiting $f_s$ is automatically accounted for by the decrease in $\phi'$ with effective normal pressure [22] confining pressure. To obtain $\phi'$ at some depth of interest when a reference value of $\phi_0$ is available as from a triaxial test using an effective normal pressure of $\tilde{q}_0$ the following equation is suggested

$$\phi' = \phi_0 - 5.5 \log \frac{\eta \tilde{q}}{\tilde{q}_0}$$

(22)

where $\eta = \frac{1+2K_0}{3}$ and $K_0$ = at-rest earth pressure coefficient,

$$K_0 = 1 - \sin \tilde{\phi} [5].$$

b. Static Loading Test

A preliminary pile design is first carried out on the basis of site investigations, laboratory soil testing, and office study. Pile load tests are then carried out to refine and finalize the design. For these conditions, the test piles are generally tested to failure. This standard has been prepared to cover routine methods of testing to determine if a pile has adequate bearing capacity [23, 24, 25, 26, 27, 28]. The main aspects of test equipment and instruments consist of load application arrangements and the instruments to measure the resulting movements or deformations. Load applied by hydraulic jack is measured either by a calibrated load cell placed between the jack and the pile or by a calibrated pressure gauge located between the pump and the hydraulic jack. The two main types of movement measurements in a pile load test are pile butt axial movement measurement and incremental strain measurements along the pile length. Pile butt axial movement measurements are required in all pile load tests. The incremental strain measurements are used to determine the distribution of load transfer from the pile to the soil and are generally considered as an optional measurement feature.

i. Test Procedures

Practicing engineers and researchers have used many pile load test methods that have been reported in several publications (ASTM D1143-81, Butler and Hoy, 1977; Fellenius, 1975, 1980; Mohan et al., 1967; New York State DDT, 1974; Swedish Pile Commission, 1970; Weele, 1957; Whitaker, 1957, 1963; Whitaker and Cooke, 1961). From the available numerous load test methods the following four methods can be identified as the basic load test methods (Joshi and Sharma, 1987) [29]: (1) Slow Maintained Load Test Method (SM Test); (2) Quick Maintained Load Test Method (QM Test); (3) Constant Rate of Penetration Test Method (CRP Test); (4) Swedish Cyclic Test Method (SC Test).

ii. Interpretation of Test Data

Generally, load and settlement test data are plotted with load along the abscissa and settlement along ordinate [30, 31]. However, these coordinates can be interchanged depending on the engineer’s preference. The plotted settlement could either be gross (the total movement of pile butt under full test load) or the net (the distance the pile has permanently moved after it has rebounded upon removal of the test load). These plotted data are then used to estimate the failure load so that allowable pile capacity can be calculated.

These methods are using [25, 26, 27, 28, 29, 30, 31]: (1) Davisson’s method (1972); (2) Chin’s method (1970, 1971); (3) De Beer’s method (1967) or De Beer and Wallays’ method (1972); (4) Brinch Hansen’s 90 percent criterion (1963); (5) Brinch Hansen’s 80 percent criterion (1963); (6) Mazurkiewicz’s method (1972); (7) Fuller and Hoy’s method (1970); (8)
Butler and Hoy’s method (1977); and (9) Vander Veen’s method (1953).

II. METHODOLOGY

The data used in this research is secondary data from Development and Upgrading of UNJ Project. Indirect methods is used to the evaluation of the soil characteristic parameters for prediction ultimate bearing capacity. To estimate the failure load so that allowable pile capacity from static loading test using a Interpretation by several methods. Between indirect methods and Interpretation of Test Data is comapared to analysis and result.

III. DISCUSSION

The Development and Upgrading of UNJ Project is located in DKI Jakarta Province-Indonesia. In the development project of this Building, to verify the design of square concrete piles 450 mm x 450 mm. The strength of concrete is K-350 (f’c=29 MPa) with length of pile 18 meter. Based on soil properties from bore hole at Table 2, and result of point bearing capacity at Table 3. Skin resistance result in Table 4 for The α method; Table 5 and 6 for The β method and The λ method. As a combination of side resistance and point bearing with SF=2.5 is shown at Table 7.

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Layer Thickness (m)</th>
<th>y’</th>
<th>N-SPT (N₆₀)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>9.9</td>
<td>4</td>
<td>Clay silty</td>
</tr>
<tr>
<td>13</td>
<td>11</td>
<td>9.9</td>
<td>28</td>
<td>Fine sand</td>
</tr>
<tr>
<td>18</td>
<td>5</td>
<td>9.9</td>
<td>34</td>
<td>Coarse sand and silty</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>11.2</td>
<td>34</td>
<td>Fine sand</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>10.5</td>
<td>40</td>
<td>Gravel-sand</td>
</tr>
</tbody>
</table>

Table 3. Ultimate Static Pile Point Capacity Result

<table>
<thead>
<tr>
<th>Method</th>
<th>Point/End Bearing (kN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terzaghi (1943)</td>
<td>1166.2</td>
</tr>
<tr>
<td>Mayerhof (1956, 1976)</td>
<td>2462.4</td>
</tr>
<tr>
<td>Vesic's (1973;1975)</td>
<td>1416.2</td>
</tr>
<tr>
<td>Janbu's (1976)</td>
<td>926.1</td>
</tr>
</tbody>
</table>
Table 4. The \( \alpha \) method skin resistance result

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Layer (m)</th>
<th>( \gamma' ) (kN/m(^3))</th>
<th>( c_u ) (kN/m(^2))</th>
<th>( \phi )</th>
<th>K</th>
<th>( q_u ) (kN/m(^2))</th>
<th>( q_{u(\text{av})} = s_{u(\text{av})} ) (kN/m(^2))</th>
<th>( \alpha )</th>
<th>( \delta = 3/4\phi )</th>
<th>( \tan \delta )</th>
<th>( f_{si} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>9.9</td>
<td>19.8</td>
<td>28.23</td>
<td>0.84</td>
<td>19.8</td>
<td>19.80</td>
<td>1.021</td>
<td>21.18</td>
<td>0.39</td>
<td>26.67</td>
</tr>
<tr>
<td>13</td>
<td>11</td>
<td>9.9</td>
<td>128.7</td>
<td>35.64</td>
<td>0.81</td>
<td>108.9</td>
<td>74.25</td>
<td>0.803</td>
<td>26.73</td>
<td>0.50</td>
<td>133.48</td>
</tr>
<tr>
<td>18</td>
<td>5</td>
<td>9.9</td>
<td>178.2</td>
<td>37.49</td>
<td>0.80</td>
<td>49.5</td>
<td>99.00</td>
<td>0.742</td>
<td>28.12</td>
<td>0.53</td>
<td>174.47</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>11.2</td>
<td>212.8</td>
<td>37.49</td>
<td>0.80</td>
<td>11.2</td>
<td>104.60</td>
<td>0.729</td>
<td>28.12</td>
<td>0.53</td>
<td>199.68</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>10.5</td>
<td>210.0</td>
<td>39.34</td>
<td>0.79</td>
<td>10.5</td>
<td>109.85</td>
<td>0.716</td>
<td>29.51</td>
<td>0.57</td>
<td>199.47</td>
</tr>
<tr>
<td>40</td>
<td>20</td>
<td>11.5</td>
<td>460.0</td>
<td>31.63</td>
<td>0.83</td>
<td>230</td>
<td>224.85</td>
<td>0.500</td>
<td>23.72</td>
<td>0.44</td>
<td>311.53</td>
</tr>
</tbody>
</table>

In depth 18 meter \( \sum f_{si} = 334.61 \)

Skin resistance is \( f_2 = \sum f_{si} A_s = 334.61 \times 18 \times 1.8 = 10841 \) kN

Table 5. The \( \beta \) method skin resistance result

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Layer (m)</th>
<th>( \gamma' ) (kN/m(^3))</th>
<th>( c_u ) (kN/m(^2))</th>
<th>( q_u ) (kN/m(^2))</th>
<th>( q_{u(\text{av})} = s_{u(\text{av})} ) (kN/m(^2))</th>
<th>( \phi )</th>
<th>( K_0 )</th>
<th>K</th>
<th>( \eta )</th>
<th>( \eta q_{u(\text{av})} )</th>
<th>( \phi' )</th>
<th>( \delta = 3/4\phi )</th>
<th>( \tan \delta )</th>
<th>( f_{si} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>9.9</td>
<td>19.8</td>
<td>19.8</td>
<td>19.80</td>
<td>0.5</td>
<td>0.8</td>
<td>0.6</td>
<td>13.5</td>
<td>29.1</td>
<td>21.85</td>
<td>0.4</td>
<td>0</td>
<td>13.38</td>
</tr>
<tr>
<td>13</td>
<td>11</td>
<td>9.9</td>
<td>128.7</td>
<td>108.9</td>
<td>74.25</td>
<td>0.4</td>
<td>0.8</td>
<td>0.6</td>
<td>45.4</td>
<td>37.7</td>
<td>28.30</td>
<td>0.5</td>
<td>0.4</td>
<td>88.04</td>
</tr>
<tr>
<td>18</td>
<td>5</td>
<td>9.9</td>
<td>178.2</td>
<td>49.5</td>
<td>99.00</td>
<td>0.3</td>
<td>0.8</td>
<td>0.5</td>
<td>58.8</td>
<td>37.0</td>
<td>27.81</td>
<td>0.5</td>
<td>0.3</td>
<td>116.55</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>11.2</td>
<td>212.8</td>
<td>11.2</td>
<td>104.60</td>
<td>0.3</td>
<td>0.8</td>
<td>0.5</td>
<td>62.1</td>
<td>33.4</td>
<td>25.05</td>
<td>0.4</td>
<td>0.7</td>
<td>118.24</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>10.5</td>
<td>210.0</td>
<td>10.5</td>
<td>109.85</td>
<td>0.3</td>
<td>0.7</td>
<td>0.5</td>
<td>63.4</td>
<td>35.0</td>
<td>26.29</td>
<td>0.4</td>
<td>0.9</td>
<td>124.59</td>
</tr>
<tr>
<td>40</td>
<td>20</td>
<td>11.5</td>
<td>460.0</td>
<td>230</td>
<td>224.85</td>
<td>0.4</td>
<td>0.8</td>
<td>0.6</td>
<td>146.24</td>
<td>32.7</td>
<td>24.53</td>
<td>0.4</td>
<td>0.6</td>
<td>257.94</td>
</tr>
</tbody>
</table>

In depth 18 meter \( \sum f_{si} = 217.9 \)
Skin resistance is \( f_s = \sum f_{si} \ A_s = 217.97 \times 18 \times 1.8 = 7062 \ kN \)

Table 6. *The λ method skin resistance result*

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Layer (m)</th>
<th>( \gamma' ) (kN/m(^3))</th>
<th>( c_u ) (kN/m(^2))</th>
<th>( q_u ) (kN/m(^2))</th>
<th>( q_{u(avg)} = s_{u(avg)} ) (kN/m(^2))</th>
<th>( \phi )</th>
<th>( \lambda )</th>
<th>( f_{si} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>9.9</td>
<td>19.8</td>
<td>19.8</td>
<td>19.8</td>
<td>28.234</td>
<td>0.4</td>
<td>23.76</td>
</tr>
<tr>
<td>13</td>
<td>11</td>
<td>9.9</td>
<td>128.7</td>
<td>108.9</td>
<td>74.25</td>
<td>35.640</td>
<td>0.22</td>
<td>60.98</td>
</tr>
<tr>
<td>18</td>
<td>5</td>
<td>9.9</td>
<td>178.2</td>
<td>49.5</td>
<td>99</td>
<td>37.491</td>
<td>0.18</td>
<td>67.72</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>11.2</td>
<td>212.8</td>
<td>11.2</td>
<td>104.6</td>
<td>37.491</td>
<td>0.17</td>
<td>71.74</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>10.5</td>
<td>210</td>
<td>10.5</td>
<td>109.85</td>
<td>39.343</td>
<td>0.15</td>
<td>64.46</td>
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<tr>
<td>40</td>
<td>20</td>
<td>11.5</td>
<td>460</td>
<td>230</td>
<td>224.85</td>
<td>31.629</td>
<td>0.13</td>
<td>118.3</td>
</tr>
</tbody>
</table>

In depth 18 meter \( \sum f_{si} = 152.5 \)

Skin resistance is \( f_s = \sum f_{si} \ A_s = 152.5 \times 18 \times 1.8 = 4940 \ kN \)
Table 7. Combination of side resistance and point bearing (ultimate capacity) with SF=2.5, in kN

<table>
<thead>
<tr>
<th>Method</th>
<th>α</th>
<th>β</th>
<th>λ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terzaghi (1943)</td>
<td>466</td>
<td>4803</td>
<td>3291</td>
</tr>
<tr>
<td>Mayerhof (1956, 1976)</td>
<td>985</td>
<td>5321</td>
<td>3810</td>
</tr>
<tr>
<td>Vesic’s (1973;1975)</td>
<td>566</td>
<td>4903</td>
<td>3391</td>
</tr>
<tr>
<td>Janbu’s (1976)</td>
<td>370</td>
<td>4707</td>
<td>3195</td>
</tr>
</tbody>
</table>

From Table 7, Combination of side resistance by λ-method and point bearing by Janbu’s is conservative. Where the result of ultimate bearing capacity is 2346 kN or 235 Ton. The higher prediction by combination Mayerhof and α-method (532.1 Ton).

Based on load test data at a location of the project, for Load 200% is 290 Ton. Movement (mm) and load applied shown in Table 8. These plotted data are then used to estimate the failure load so that allowable pile capacity are using several methods.

The result of interpretation data shown in Table 9. The interpretation methods result as follow: Fig.3: Davisson’s method (1972); Fig.4: Chin’s method (1970, 1971); Fig.5: De Beer’s method (1967) or De Beer and Wallays’ method (1972); Fig.6: Brinch Hansen’s 90 percent criterion (1963);Fig.7: Brinch Hansen’s 80 percent criterion (1963); Fig.8: Mazurkiewicz’s method (1972); Fig.9: Fuller and Hoy’s method (1970); Fig.10: Butler and Hoy’s method (1977); and Fig.11: Vander Veen’s method (1953).

<table>
<thead>
<tr>
<th>Method of interpretation</th>
<th>$Q_{\text{ultimate}}$ (Ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davisson’s (1972)</td>
<td>220</td>
</tr>
<tr>
<td>Chin’s (1970, 1971)</td>
<td>252</td>
</tr>
<tr>
<td>De Beer’s (1967)</td>
<td>220</td>
</tr>
<tr>
<td>Brinch Hansen’s 90% criterion (1963)</td>
<td>290</td>
</tr>
<tr>
<td>Brinch Hansen’s 80% criterion (1963)</td>
<td>280</td>
</tr>
<tr>
<td>Mazurkiewicz’s (1972)</td>
<td>215</td>
</tr>
<tr>
<td>Fuller and Hoy’s (1970)</td>
<td>160</td>
</tr>
<tr>
<td>Butler and Hoy’s (1977)</td>
<td>155</td>
</tr>
<tr>
<td>Vander Veen’s (1953)</td>
<td>190</td>
</tr>
</tbody>
</table>
Figure 3. Davisson’s method (1972)

Figure 4. Chin’s method (1970, 1971)

Figure 5. De Beer’s method (1967) or De Beer and Wallays’ method (1972)

Figure 6: Brinch Hansen’s 90 percent criterion (1963)

Figure 7. Brinch Hansen’s 80 percent criterion (1963)

Figure 8. Mazurkiewicz’s method (1972)

Figure 9. Fuller and Hoy’s method (1970)
A comparison between ultimate capacity based on soil characteristic parameter as of indirect methods to the analysis and the design of foundations with maximum (235 Ton) and minimum (532 Ton) results and static loading test interpretation result as shown in Table 10. The result of comparison with minimum result of ultimate bearing capacity by a combination of side resistance by $\lambda$-method and point bearing by Janbu’s, shown that interpretation by methods of Davisson’s (1972); Chin’s (1970, 1971); De Beer’s (1967); Brinch Hansen’s 90% criterion (1963); and Brinch Hansen’s 80% criterion (1963) are deviation +10%. The deviation is tolerated.

Table 10. Comparison result

<table>
<thead>
<tr>
<th>Method of interpretation</th>
<th>$Q_{\text{ult}}$ (Ton)</th>
<th>Compared with soil parameter result of $Q_{\text{ult}}$</th>
<th>% of Min</th>
<th>% of Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davisson’s (1972)</td>
<td>220</td>
<td></td>
<td>93.62</td>
<td>17.60</td>
</tr>
<tr>
<td>Chin’s (1970, 1971)</td>
<td>252</td>
<td></td>
<td>107.23</td>
<td>20.16</td>
</tr>
<tr>
<td>De Beer’s (1967)</td>
<td>220</td>
<td></td>
<td>93.62</td>
<td>17.60</td>
</tr>
<tr>
<td>Brinch Hansen’s 90% criterion (1963)</td>
<td>290</td>
<td></td>
<td>123.40</td>
<td>23.20</td>
</tr>
<tr>
<td>Brinch Hansen’s 80% criterion (1963)</td>
<td>280</td>
<td></td>
<td>119.15</td>
<td>22.40</td>
</tr>
<tr>
<td>Mazurkiewicz’s (1972)</td>
<td>215</td>
<td></td>
<td>91.49</td>
<td>17.20</td>
</tr>
<tr>
<td>Fuller and Hoy’s (1970)</td>
<td>160</td>
<td></td>
<td>68.09</td>
<td>12.80</td>
</tr>
<tr>
<td>Butler and Hoy’s (1977)</td>
<td>155</td>
<td></td>
<td>65.96</td>
<td>12.40</td>
</tr>
<tr>
<td>Vander Veen’s (1953)</td>
<td>190</td>
<td></td>
<td>80.85</td>
<td>15.20</td>
</tr>
</tbody>
</table>

IV. CONCLUSION

From these observations it appears that the combination of side resistance by $\lambda$-method and point bearing by Janbu’s is too conservative; the combination Mayerhof and $\alpha$-method may be too large for prediction axial ultimate bearing capacity.

The interpretation static loading test data are using methods of Davisson’s (1972); Chin’s (1970, 1971); De Beer’s (1967); Brinch Hansen’s 90% criterion (1963); and Brinch Hansen’s 80% criterion (1963) are deviation +10%. The deviation may be tolerated and value is nearest from minimum result of axial ultimate bearing capacity using soil parameter.

The results of this research hopes can become of lesson learn to teaching of foundation engineering in education degree program, thereby encouraging students to conduct research related to this issue.
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Work Based Learning (WBL) Approaching for Support Achieving Competency

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Abstract

This study aims to support the achievement of the graduates competence in vocational education (vocational) with Work-based Learning approach (WBL). Work Based Learning has become the hallmark of vocational education in various countries aimed to improving the competence of graduates. One of the characteristics of vocational education is to prepare students enter the workforce, so vocational education should be based on demand driven the need for the region of work. Implementation of the WBL program is a joint program between the region of education and the region of work, integrate the academic study to career development and approaches through training in the workplace, in the workplace, as a means for graduates in choosing a career, a place to develop attitudes and work behavior. This is contained in the curriculum developed jointly between educational institutions in the industrialized region. As a consequence the implementation of WBL program can not be implemented partially, but must be supported by the roles of relevant institutions, namely the institution/school, Dudi, professional associations, chambers of commerce, ministry, local governments, and bonding alumni.

Keywords: WBL, competence, graduates

I. INTRODUCTION

Vocational education is a type of education that has special characteristics, which is oriented to prepare students for work in a particular field. To that end, vocational education can not be separated from its attachment to the region of work, because the region of work is considered as a chain that should not be dropped out of a series of vocational training systems. The region of work and vocational education is like a moving object and its shadow, they can not separate or stand alone. Vocational education is built and developed with the needs and situation of the workforce in order to meet growing market demands. Vocational education can not be closed to the developments taking place in the region of work, including the development and use of technology and its impact on the demand skills graduates. (Ivan, 2008). Thus, the demand for job skills change very dynamically always be observed, monitored, and relied upon or reference to developing vocational education, especially in developing learning strategies in accordance with the development of the region of work. It was also an attempt to maintain the sustainability of vocational education in the midst of change and development of knowledge and technology that have a direct impact to the demands of the knowledge, attitudes, and skills of graduates. Since 1993 the Government in this regard by the Ministry of Education and Culture has introduced a policy link and match, where the policy is operationalized in the form of Dual System Education (PSG), (Wardiman, 1998). Several factors can be identified as an attempt to maintain the sustainability of
vocational education within the framework of the preparation of graduates in accordance with the demands of the working region, among others the preparation of human resources, curriculum relevance, adjustment facilities and infrastructure, the management of vocational education, including the response to the demands of job skills. The implementation of the Work-Based Learning (WBL) is one of the alternatives in response to the demands of work skills and prepare students to enter the working region.

Work Based Learning (WBL) has become the hallmark of vocational education in various countries in different countries. Work-based learning model that has been grounded in the region of vocational (this model has not indisputable) today made the WBL to be implemented if success to be achieved. Experience in developed countries shows that this method is able to bridge the gaps transition (transition) between the region of education (education) and the region of work (workforce) which is a major challenge that must be addressed and be resolved (Sawchuk, 2010).

The consequences of the WBL for vocational education providers are required to be aware and understand from planning, implementation and evaluation. Involvement of stakeholders (school, workplace and government) in managing vocational education that puts WBL as a learning model continue to be explored, developed and maintained its sustainability. Programs that half (incomplete (mastery), rather than the demands of the above) and independent project-oriented (when complete the project no continuity) because it depends on funding abroad, it will make things unclear, including models of WBL will actually give contributions to vocational education is not regarded as a good model. Indeed, the adoption and adaptation is necessary to adjust the culture of the nation. This is the importance of understanding and shared commitment to build and develop vocational education through the application/implementation of WBL in vocational education.

B. Problems

a. Analysis of Region Demands of work against Graduates

Region Competence Demands of Work

In 1992, The Secretary's Commission on Achieving Necessary Skills (SCANS), conduct a study to identify and describe the skills needed in the workplace to improve the performance of workers to be more effective (Kane, 1990). In the end SCANS skills make two groups namely the basic skills and competencies in the workplace, as shown in Table 1.

Table 1. SCANS skills

<table>
<thead>
<tr>
<th>Foundation Skills</th>
<th>1. Basic Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Thinking Skills</td>
</tr>
<tr>
<td></td>
<td>3. Personal Qualities</td>
</tr>
<tr>
<td>Workplace Competencies</td>
<td>4. Resources</td>
</tr>
<tr>
<td></td>
<td>5. Interpersonal</td>
</tr>
<tr>
<td></td>
<td>6. Information</td>
</tr>
<tr>
<td></td>
<td>7. Systems</td>
</tr>
<tr>
<td></td>
<td>8. Technology</td>
</tr>
</tbody>
</table>

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Jakarta, October 27, 2015
b. Vocational Curriculum

According to Regulation Of Ministry Of Education And Culture No. 22 of 2006, the structure of the vocational education curriculum in this case is the Vocational High School (SMK) contains compulsory subjects, vocational basic subjects, local content, and self-development. The implications of the structure of the curriculum, vocational subjects were divided into three groups: normative, adaptive and productive. Specifically on the productive group includes a number of subjects that are grouped in the Basic Competence Vocational and Vocational Competency. Basic Competence learning materials Vocational and Vocational Competence program tailored to the needs expertise to meet the standards of competence in the region of work.

Normative group is a group of subjects were allocated remains which include religious education, Civics, Bahasa, Physical Education and Health, and Arts and Culture. Adaptive group consisted of subjects English, Mathematics, Science, Social Studies, Computer Skills and Information Management, and Entrepreneurship. Productive group consists of a number of subjects that are grouped in the Basic Competence Vocational and Vocational Competency. Examples of curriculum structure SMK / MAK can be seen in Table 2 below (MONE, 2007):

### Table 2. Vocation Curriculum

<table>
<thead>
<tr>
<th>Group</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normative</td>
<td>Religious</td>
</tr>
<tr>
<td></td>
<td>Civic</td>
</tr>
<tr>
<td></td>
<td>Civic</td>
</tr>
<tr>
<td></td>
<td>Art and Culture</td>
</tr>
<tr>
<td></td>
<td>Sports Physical and Health Education</td>
</tr>
<tr>
<td>Adaptive</td>
<td>English</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
</tr>
<tr>
<td></td>
<td>Exact Science</td>
</tr>
<tr>
<td></td>
<td>Physics</td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
</tr>
<tr>
<td></td>
<td>Social Science</td>
</tr>
<tr>
<td></td>
<td>Entrepreneurship</td>
</tr>
<tr>
<td></td>
<td>Computer and Management Information</td>
</tr>
<tr>
<td>Produktive</td>
<td>Basic of Competence Vocational</td>
</tr>
<tr>
<td></td>
<td>Vocational Competency</td>
</tr>
<tr>
<td></td>
<td>Local Content</td>
</tr>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>17 component</td>
</tr>
</tbody>
</table>
In the point of the demands competencies for graduates seen the gap between the demands generated by education (graduate). To overcome this there should be harmonization between the region of education with the region of work.

An alignment adjustment effort as a supplier of human resource education with the region of work as an absorbent HR changing very dynamically. Picture 1 below is an attempt aligning education with the region of work made in the Framework Alignment:

Picture 1. Alignment Framework for Region Education to the Region of Work
(Source : Alignment of the Region of Work Ministry of National Education)

Developments in the region of educational institutions today is characterized by the increasing number of graduates each year. Increasing the number of graduates, if not matched by the quality and relevance of education, especially in educational institutions will increase the number of graduates is not absorbed in the labor market due to the inability of educational institutions to meet the requirements of competence demanded by the business and industrial region.

With the identification of the required professional competence, then the process of curriculum development and preparation can be done more systematically. Curriculum development can be undertaken jointly with the association between educational institutions and other relevant components incorporated in the consortium fields of science and expertise. This group is expected to draw up a curriculum appropriate to the needs of the community (the output).

Further education institutions can influence the work of the consortium which form the base for planning curriculum and education-oriented region of work. Way of the output produced by educational institutions will be accepted by the business and industrial region and the community of other users. Therefore, in designing the curriculum oriented workforce education institutions should involve all elements/stakeholders concerned and must be supported by the quality of inputs (students), teachers or lecturers who have competence, and adequate facilities. And more important things to note is the curriculum-oriented region of work should have air-orientation
on the market to anticipate the needs of the industrial market and adjust teaching and training to respond to market demands. To answer all of the required curriculum based on an ideal region of work so that graduates of educational institutions can respond and adapt to the needs of business and industry are constantly changing.

Relation to the alignment between the region of education with the region of work is that the Work Based Learning can be used as an alternative to align the needs of the industry (in the form of competent graduates) or demand by the region of education that produce or providers of graduates (supply), so step by step the gap can be minimized.

II. Discussion
1. Work Based Learning definition
According to Reg Revans and Gregory Bateson in his Raelin (2008) explains that the learning rate should be equal to or exceeds the rate of change, learning not only create but also to adjust, expand and deepen their knowledge. Without knowledge of new or adjusted, it is impossible to change the meaning of our actions or the actions themselves. Unfortunately, we have become conditioned to class model that separates theory from practice, which makes learning does not seem practical, relevant, and boring.

While the Work Based Learning (WBL) is a lesson or program when campus/school organizations work together create learning experiences and new opportunities in the workplace (Boud, 2001). To make learning as a way of life then learning should take place in a natural and fun. Separation of theory of practice make learning seem irrelevant, useless and boring. WBL requires a combination of rational analysis,
imagination and intuition that are useful in developing thinking. While the WBL program in the school can be a Production Unit, Implementasi Program Career, Career Introduction Program, schools Company (hotels, restaurants), and the Cooperative Bank in school and apprenticeship programs.

Based on the research results, WBL is an approach to learning quite successful (Mike Goodwin, 2006). In addition WBL approach said to be an effective and educational institutions that implement the WBL approach is no longer using the traditional learning (DfES, 2005). The purpose of the WBL is to achieve competencies needed for join the workforce consisting of Foundation Skills and Workplace Competencies (Thomas R. Bailey, 2004).

The implications of the above understanding that the basic concept of WBL has the following characteristics:

- Integrate between academic study and approach to career development through training in the work office.
- Do in the work office.
- As a means for graduates in choosing a career.
- Place learn to develop attitudes and behavior work.
- WBL is a joint program between the region of education and the region of work.

2. Urgency of Program in implementing WBL

In implementing the program in order WBL are able to run well, including:

1. Follow-up studies of research results related to the implementation of the WBL. Aiming to improve the implementation of the WBL next program, the needs of student

2. Identify competencies required of students. The need for graduates WBL is intended for graduates as apprentice process before entering the real working region. This process aims to facilitate the adaptation or adjustment to the environment and the demands of the job.

3. Industry demands. The industry can meet the demand for labor, and can employ the apprentice graduates to employment contracts.

3. Curriculum

According to Regulation No. 49 Year 2014 on National Standards for Higher Education, in Article 1 point 6 stated that "The curriculum is a set of plans and arrangements regarding learning outcomes of graduates, study materials, processes, and assessments are used as guidelines in enforcement
courses. Precondition curriculum should be formulated in advance (prerequisite) so that learning objectives can be achieved. Thus in the preparation of curriculum-based work (work based curriculum) should integrate the classroom with experience in the region of work. Work Based Learning program is defined as college/school and work organization to establish new experiences and opportunities in the workplace. Thus the curriculum based on the region of work (Work Based Curriculum) should be planned in such a way so as to provide a new experience for the learners to the region of work.

Implementation of the Dual System Education Program become a reference in the preparation of the curriculum in vocational. The involvement of parties business / industries (Dudi) become very important in the preparation and synchronize implementable curriculum in every school. Especially enactment (Curriculum Education Unit) SBC opportunities for curriculum development in each educational unit with Dudi very do-able, considering vocational never be released with Dudi, since one purpose of convening vocational school is to educate students be able to work in the fields certain.

In implementing the curriculum of various teaching approaches applied in vocational include problem-based learning (Problem Based Learning), cooperative learning (cooperative learning), learning-based inquiry (Inquiry Based Learning), learning authentic (Authentic Instruction), project-based learning / task (Project Based Learning), Work-Based Learning (Work Based Learning), and learning-based services (Service Learning) (Nurhadi et al, 2004).

Of learning methods above puts work-based learning (Worked Based Learning) position is very important in vocational curriculum implementation, where WBL is a learning approach that allows students to use the context of the workplace to learn the subject matter and the use of such material in the workplace. So combine the subject matter gain new experiences for students.

4. Competence

Because WBL is a joint program, the curriculum was made with the involvement of both parties, namely educational institutions with the industry. Curriculum
must be made to meet demands of the students' competence,

5. Study Approaching
In implementing the core curriculum strategies and learning approaches that can be applied, among others, problem-based learning (Problem Based Learning), cooperative learning (cooperative learning), learning-based inquiry (Inquiry Based Learning), learning authentic (Authentic Instruction), project-based learning/task (Project based Learning), and learning-based services (Service learning) (Nurhadi et al, 2004).

6. Counseling (Instructure)
The guidance of an instructor or teacher in this case is needed to help the participants to achieve the competency/skills required. According Billett (2003: 242), the guidance is needed to gain the ability to extend the capabilities of vocational practices of another practice that is still associated with the study. Instructors in the implementation of the WBL program is composed of two persons namely instructor who is appointed directly by the industry (companies) to guide the participants and trainers coming from the institution/school. (Michele Simons, 2004).

7. Roles of Related Institutions
The WBL in order to run properly needs the support and the role of the parties concerned. Government, policy makers, and stakeholders have an important contribution in the implementation of this program (Raelin, A. Joseph, 2007)
a. Role of Education (students, teachers, facilities, learning process, output)
Educational institutions as churning to print and produce graduates that can be accepted by the labor market in this case is the region of business and industry should be supported by components that support that is input in this regard is the students who are qualified, teachers/lecturers who not only master the theory but also practical, adequate infrastructure and not outdated, comfortable study space, as well as a curriculum that can adapt to the labor market
b. Dudi role (the process of training, competence, accommodating graduates, certification, funds) Region Business and Industry can play a role:
   o Provide input on the job description/position prevailing in the company,
   o Provide input on standards of competency/skill/profession, both for standard local, regional, national and even international.
   o Can be actively involved in evaluating the curriculum.
• Provide education and training opportunities in the business/industry.
• Testing and provide certification for graduates in accordance with the level of competence/expertise in cooperation with the relevant agencies.
• Can help to be link or channel for graduates.

c. The role of policy-making, Dudi’s container, and the industry standard as an organization container business / industry is expected to play a role:

• Encourage Dudi can contribute to involve its members in an effort to contribute to the educational institutions in creating graduates who have the competence and professional skills in accordance with the needs of business and industry.
• Creating a recognized Dudi competency standards.

d. Role of Professional Associations (inputs about competencies required) This association is instrumental in giving input on the standard of competence in a broad range of expertise and certification of appropriate levels and types of competencies required (to give input in the manufacture of the curriculum)

e. Role of Ministry (labor problems, policy). Ministry as government agencies that deal with employment issues in all levels and qualifications or in terms of quantity and quality, particularly in relation to the graduates. In addition, it also handles the placement and distribution of employment. Ministry's role in the dream-based curriculum that is ideal region of work are:

• Managing the alumni in the sense of helping handle on the placement and distribution of graduates
• As a mediator between the region of education with industrial region in terms Provides information about the portraits of graduates expected by DUDI.

f. The role of local government (autonomy, excellence and potential of the region) In the regional autonomy local government authority is very important to improve the quality of educational institutions in producing graduates that can be accepted by the labor market. In this case also each region will be able to show the potential of the region so as to generate income or other impacts. For the role of the principal is among others are:

• Provide opportunities and facilities for the public to produce a workforce that is appropriate to the
needs of local, regional, national and even international
  o As one of the sources of funds
  o Determinants of education policy at the local level

g. Role of Alumni (graduates). Provide information (sharing) about the conditions, situations and demands of the working region of the workforce that is up to date, because the graduates to interact directly with the region of work / industry.

III. Conclusion

1. Work Based Learning (WBL) is a lesson or program where college/school organizations work together create learning experiences and new opportunities in the workplace

2. Implementation of the program is the WWBL is a joint program between the region of education and the region of work, integrate between academic studies and approaches to career development through training in the workplace, in the workplace, as a means for graduates in choosing a career, a place to learn to develop attitudes and behavior work. This is contained in the curriculum developed jointly between educational institutions in the industrialized region.

3. The aim is to achieve competence WBL in accordance with the demands of the working region as an alternative alignment between the region of work with education.

4. Implementation of the WBL program can not be implemented partially, but must be supported by the roles of relevant institutions, namely the institution / school institutions, Dudi, professional associations, chambers of commerce. Ministry, local governments, and the alumni association.

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The Use of Excavated Soil as Brick Building Material

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ABSTRACT

We can find excavation projects in many parts of Jakarta every day. The utilization of the excavated soil is less than optimal because it is merely dumped into cemetery. The type of soil in Jakarta area is generally clay which is used as building material of bricks, tiles or other pottery. However, the number of clay is now decrease as a result of the reduced of rice fields.

Of the above problem, this study aims to exploit the excavated soil in Jakarta as bricks building material to cope with limited clay as raw material for brick industry and to overcome the problem of traffic congestion as a result of wasted excavation soil in accordance with SNI 15-2094-2000 about solid red brick for building wall.

The method used is an experimental study in a laboratory by replacing clay commonly obtained from rice fields with excavated soil. The result, physically or mechanically, can be concluded that excavated soil can be used as building material of solid red brick due to the value of its pressure better than clay which is usually used as raw material for solid red brick.

Keywords: Bricks, excavated soil, physical properties and mechanical properties

I. INTRODUCTION

1.1 Research background

Traffic Jam happens all the time in Jakarta, even on holiday. One thing that cause the traffic jam is excavation project. The coordination among government agencies, such as the State Electricity Company (PLN), the Regional Water Company (PDAM), State Gas Company (PGN) and Public Works Department (PU) is one of the causes of high frequency of excavation project. This project creates traffic jam during and after the implementation, for example the excavated soil which is piled on the roadside, causing narrowing road.

Brick has long been known as building construction material and used by both rural and urban communities. The use of brick is widely used for civil engineering applications as well as on the residential building wall, building, fence, channel and foundations. In building construction, brick has generally functioned as both non-structural and structural material.

Generally, brick industry is done by small scale industries by using simple and traditional technologies. Clay, with or without additives, is one of basic building materials for making solid red brick. The use of clay as replenish application or as filler material makes it run out quickly. It creates a serious impact for the industry. Picking clay from rice fields at a depth of 1 meter causing the ground surface
down and the soil physical condition becomes relatively hard so that the land will not fertile to be replanted. Recovery of hard ground surface with fertilization takes many years. The development of large scale solid red brick industries affects environmental governance and food security in the future. The type of soil in the area of Jakarta is clay so that the excavated soil can be a solution for this problem. The excavated soil can be used as the building material of brick and reduce the damage of rice fields.

1.2 Research purpose
The purpose of this study is using the excavated soil in Jakarta as a brick building material to cope with limited clay as raw material for brick industry and to overcome the problem of traffic congestion as a result of wasted excavation soil in accordance with SNI 15-2094-2000 about solid red brick for building wall.

1.3 Benefit of research
This research provides alternative utilization of excavated soil to make it has more economic value and to reduce clay as raw material for the brick building.

1.4 Scope of problem
This study takes a few limitations as follows:
1. The excavated soil is taken from the excavation project in East Jakarta area only
2. The standard used is SNI 15-2094-2000 about solid red brick for building wall
3. FAS values used is 0.6

II. THEORITICAL REVIEW

2.1 Understanding solid red brick
According to SNI 15-2094-2000, traditionally solid red brick is a building material in rectangular shaped, solid or perforated, with maximum hole volume 15%, and used for the building walls construction, made of clay mixed with or without additives, and burned at a certain temperature.

Oscar Fithrah Nur (2008), said that brick is a building material, made of clay and other minerals that is formed in certain sizes. Basically, there are three types of clay used as raw material for brick (Civil Engeneering Materials, 2001), they are:
- Surface clays, is found on the surface of the earth that comes from natural sedimentation. This type of clay has 10-25% of acid
- Shales, is also a product of nature but has undergone high pressure treatment and insoluble in water.
- Fired clays, is a stronger brick than the other

There are three methods of brick process making (Civil Engeneering Materials, 2001), they are:
- Stiff-mud process, made with 12-15% of water
- Soft-mud process, made with 20-30% of water
- Dry-press process, made with 7-10% of water (very low plasticity)

2.2 Raw material for solid red brick
According to I Ketut Sudarsana (2001), brick is generally made of clay mixed with water and molded using a mold made of wood or steel, then dried and finally burned in furnace with high temperature between 900º - 1000ºC.

1. Clay
The basic building material of solid red brick is clay. Hartono (1990) said, clay is a basic material in the building brick,
both of burned and dried brick. Clay consists of microscopic and sub-microscopic particles, in flat shaped which is particles of mica, clay minerals, and other delicate minerals. Clay also have smaller particles than 0.002 mm silt and has a specific weight range of 2.7-2.9

2. Water
Water is needed to make the clay elastic so it can be easily molded. Resilient and elastic nature of brick is needed in order the brick is not easily cracked and broken when molding and drying process.

2.3 Excavated soil
We can see excavation project in Jakarta almost every time. The implementation of these excavation projects is not in an integrated manner. For example, after finishing excavation project for electrical cables, they start another excavation project for telephone cable, water pipes, gas pipes and drains

The excavated soil in Jakarta generally is clay which is a basic building material of brick, tiles or other types of pottery. Clay can change its condition if it mixed with water, it can change from solid, semi-solid, plastic or soft. These changes depend on the amount of water. Clay is also cohesive. It can be sticky and can change its properties, when processed under high temperature, into an extremely hard and dense material. In terms of minerals, a thing can be called as clay if it has certain mineral particles that produce plasticity on the ground when mixed with water.

III. Research result

3.1 Data description

3.1.1 Test object preparation
The Specimen used in this study is the excavated soil as building material of brick.

3.1.2 Quality testing of solid red brick
After the test specimen is determined, it captured and marked. After the specimen is ready, it is tested covering the nature looks, size, strength, density, amount of harmful salt and water absorption.

3.2 Testing Results
The test results are presented in tabular form in accordance with the tests conducted.

3.2.1 Result of nature looks test
Based on SNI 15-2094-2000, it needs 10 pieces of brick to test its nature looks. This test includes checking the brick surface, to examine whether or not it has defect, angle, and flat surface. The determination of this test use the ideal pass boundary method (Sudjana, 2009), calculated as follows:

\[
\text{Ideal Average: } X = \frac{1}{2} \times \text{Score}
\]

\[
\text{Standard Deviation Max: } \text{SD} = \frac{1}{3} \times \text{Average}
\]

Hence, the formula will be:

\[
X + 0.25 \text{ SD}
\]

Thus, if the score result ≥ 5.42 considered as pass and if the score result ≤ 5.42 considered as did not pass. The result of the conducted research in the form of tables as follows:
Table 1 Result of nature looks test (there is no defect on the brick)

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Specimen number</th>
<th>Score</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td></td>
<td>No defect</td>
</tr>
<tr>
<td>Excavated soil</td>
<td>√ √ √ √ √ √ √ X √ √</td>
<td></td>
<td>No defect</td>
</tr>
</tbody>
</table>

Table 2 Result of nature looks test (the brick has angles in each of its side)

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Specimen number</th>
<th>Score</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td></td>
<td>Has angle</td>
</tr>
<tr>
<td>Excavated soil</td>
<td>√ √ √ √ √ √ √ √ √ X</td>
<td></td>
<td>Has angle</td>
</tr>
</tbody>
</table>

Table 3 Result of nature looks test (the brick surface must be flat)

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Specimen number</th>
<th>Score</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td></td>
<td>Flat</td>
</tr>
<tr>
<td>Excavated soil</td>
<td>√ √ √ √ √ √ √ √ √ √</td>
<td></td>
<td>Flat</td>
</tr>
</tbody>
</table>

3.2.2 Result of size test
According to SNI 15-2094-2000, it needs minimum 10 (ten) pieces of specimens to do the test size. Each length, width, height, and thickness of a solid red brick done at least 3 (three) times in different places, and then calculated the average value of the three measurements.

Table 4 Result of dimensional measurement test (Average score of 10 specimens) against SNI 15-2094-2000

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Length</th>
<th>Width</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>193.5</td>
<td>100.3</td>
<td>38.4</td>
</tr>
<tr>
<td>Excavated soil</td>
<td>190.2</td>
<td>104.6</td>
<td>38.5</td>
</tr>
<tr>
<td>SNI</td>
<td>225mm-235mm</td>
<td>100mm-112mm</td>
<td>45mm-55mm</td>
</tr>
</tbody>
</table>

3.2.3 Result of amount of harmful salt test
According to SII 0021-78, the amount of harmful salt in a solid red brick must be less than 50%

Table 5 Result of amount of harmful salt test (Average score of 10 specimens) against SII 0021-78

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Average amount of harmful salt (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>1%</td>
</tr>
<tr>
<td>Excavated soil</td>
<td>0%</td>
</tr>
<tr>
<td>SII</td>
<td>The amount of harmful salt &lt; 50%</td>
</tr>
</tbody>
</table>

3.2.5 Result of density test
According to SNI 15-2094-2000, the density of a solid red brick is 1.2 gram/cm³

Table 7 Result of density test (Average score of 10 specimens) against SNI 15-2094-2000

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Average amount of water absorption (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>Accepted by SNI</td>
</tr>
<tr>
<td>Excavated soil</td>
<td>Accepted by SNI</td>
</tr>
<tr>
<td>SNI</td>
<td>The amount of water absorption &lt; 20%</td>
</tr>
</tbody>
</table>
3.2.6 Result of strength test

According to SNI 15-2094-2000, the minimum strength of a red brick is 50 kg/cm³ or 5 N/mm²

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Average of strength (N/mm² / MPa)</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>2.882</td>
<td>Not accepted</td>
</tr>
<tr>
<td>Excavated soil</td>
<td>3.162</td>
<td>Not accepted</td>
</tr>
<tr>
<td>SNI</td>
<td>Strength &gt; 5 N/mm²</td>
<td></td>
</tr>
</tbody>
</table>

Table 8 Result of strength test (Average score of 30 specimens) against SNI 15-2094-2000

III. Result discussion

3.3.1 The nature looks

Any defect or crack on a brick surface will affect its application. It can reduce its strength so it is not recommended to use as construction material because it can be dangerous. While the lack of angle in a brick will affect the thickness of plaster when plastering.

Research results shown in table 1 stated that the entire sample from each group meet SNI 15-2094-2000.

The nature looks tests are not seen from the location of the red brick burned.

3.3.2 Size

The use of dimensional measurement test (length, width, height) in the size table is accordance with SNI 15-2094-2000. On testing the size and tolerance of solid red brick, the minimum allowable tolerance is 225 mm - 235 mm length, 10.8 mm - 11.2 mm width, and the thickness is 4.9 mm - 5.5 mm.

Table 2 shown the results of dimensional measurement test. Not all specimens meet SNI 15-2094-2000 because of the solid red brick size on the market today is smaller than required by SNI, due to the price efficiency. So the researcher only sees the permitted tolerance limits size.

3.3.3 The harmful salt

According to SII 0021-78, the amount of harmful salt in a brick should be less than 50%. From the test results, the researcher obtained very small level of salt or even none in the entire samples. It means that all samples meet SII 0021-78.

The beach sand that is usually used as a clay substitute material replaced by river sand, so the content of salt in the sand is very little and below what is required by SNI and SII.

3.3.4 Water Absorption

From the result table above, the water absorption test of clay and excavated soil still meet SNI 15-2094-2000 with an average value of water absorption 19.20%, 16.77%. In conclusion, the red brick used in this research meet the requirements SNI, which is <20%.

A decrease in water absorption is likely occur due to solid red brick made from the excavated soil is easily processed in mixing and creating more solid material.

3.3.5 Density

According SNI 15-2094-2000, the minimum value of solid red brick density is 1.2 g/cm³. From the result table above, it shown that the entire sample specimens meet SNI 15-2094-2000. Because the average density value is more than 1.2 gr/cm³. The brick made of clay
is 1.62 g/cm³ and the brick made of excavated soil is 1.78 g/cm³.

3.3.6 Strength

The strength test is conducted to test whether or not a construction material is able to bear the pressure. The greater the value of its strength, the better quality of the construction material. The minimum strength allowed by SNI 15-2094-2000 is 5 N/mm².

From the result table above, it is shown that not all specimens meet the SNI 15-2094-2000. However, the strength of brick made of excavated soil is increase from 2.682 MPa to 3.162 Mpa. It is influenced by the value of water absorption, density and the nature looks of the brick. The clay as a brick material is replaced by the use of excavated soil. It can be concluded that the excavated soil can be used as building material of solid red brick.

IV. Conclusion

Although the strength value of the sample in this research is still not meet the requirements of SNI 15-2094-2000, it has higher value compared to brick made of clay, that is 3.162 Mpa. This is corresponded with the value of water absorption and density of the brick. In conclusion, the excavated soil can be used as a building material of brick.

REFERENCES


PERFORM ANALYZE OF PROTOTYPE OF SEA WAVE ELECTRICAL POWER GENERATOR FOR OUTERMOST AND BACKWARD REGION

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Abstract

This research aims to: harness ocean wave energy into electricity renewable energy by making Prototype of Sea Wave Electrical Power Generator For Outermost and Backward Region. Expected outcomes of this research is Prototype of Sea Wave Electrical Power Generator capable of utilizing vertical ocean wave energy into electrical energy as an alternative and renewable energy sources in Indonesia. The method used in this study is experimental, to build a prototype based on preliminary research data then tested in order to obtain the expected stability of the electrical energy for direct application in the field.

Keywords: Prototype, Alternative Energy, Power Generator, Sea Wave.

I. Introduction

68 years after Indonesia's independence but the distribution of development has not been fully felt by all the people of Indonesia, one of them is access to energy for people living in remote areas, coastal, left behind, the outermost and foremost not reached by the electricity network, because it is very far from the source of electricity generation.

According to the census of 2010 the Indonesian population of 237 million, up 13% from 2000, population growth has resulted in demand for power increases. In 2011 there were 3.6 million new subscribers are spread across Indonesia, an increase of 36.9% from the previous year, of the number of new 3.5 million that can be served, the rest will have to wait because of limited power supply. The total subscriber base of 45.9 million, up 8.15% from the previous year and amounted to 75188.86 MVA power connected, up 11% from the previous year. These conditions resulted in generation capacity that is not capable of pursuing high growth rate of the electrical energy needs, therefore it is 'reasonable' if until now PT. PLN (Persero) has not been able to meet the target of 100% electrification plus the high subsidies for electricity as much as 98 trillion that must be borne by the government as the effects of the surge in world oil prices. This is what ultimately became the slow economic growth remote areas, coastal, left behind, the outermost and foremost.

For that needed alternative to new power plants that are able to solve the problems mentioned above, one source of electrical energy potential to be one of the alternatives in the supply of energy resources for the community remote areas, coastal, left behind, the outermost and foremost is the utilization of wave energy. Advantage of this energy is the willingness abundant, high energy density, the potential area which is not limited, and belongs to the category of environmentally friendly power sources and renewable.

Efforts to do is to create a system of Hydro Power Marine utilizing vertical wave energy into mechanical energy to pump sea water into the reservoir of pressurized water to drive turbines connected to electric generators. These systems are very useful addition to
raising the value of the electrification because generally the Frontier, Outermost and Disadvantaged area almost 'untouched' by power lines as well as to assist the government in the success of the National Medium Term Development Plan 2010-2014 on the acceleration of regional development (Frontier, Outermost and Disadvantaged).

The problem in this research is how to harness ocean wave energy into electrical energy by designing and building a prototype Power Seawater, that is able to convert wave energy into electrical energy as a source of alternative and renewable energy, especially for people in the Frontier, the outer and Disadvantaged region as well as a source of electrical energy for fishermen.

The purpose of this research is to produce a prototype Power Seawater which can be applied as a source of electrical energy, including for fishermen in order to reduce dependence on fuel and electricity subsidy, to assist the government in achieving the target of 100% electrification ratio on the day of 75th independence of the Republic of Indonesia in 2020, while increasing economic level of society in the Frontier, Outermost and Disadvantaged area to help the government in the success of the program Accelerated Development of Disadvantaged Regions.

This study is very important because the development of remote areas, coastal, left behind, the outermost and foremost have been included in 11 national development priorities in the National Medium Term Development Plan from 2010 to 2014, and the government is trying to increase the average economic growth in the region lagged from 6.6% in 2010 to 7.1% in 2014.

This study is a continuation of previous research that Hydroelectric Power Sea Wave and combine with Wave Powered Generator patent by Raichlen et al (Unites States patent, 4,594,853, June 17, 1986) and wave Motor by Mordechai Welczer et al. (Unites States Patent, 4,076,463, February 28, 1978) the results of this merger produces Hydroelectric sea, that can convert the energy of vertical motion of ocean waves into energy to pump sea water into the reservoir of pressurized water to drive turbines connected to electric generator.

II. Research Method

It works by placing a pontoon energy to convert the vertical motion of ocean waves into energy to pump sea water into the reservoir of pressurized water to drive turbines connected to electric generators. The system can also be applied to the fishing chart for lighting and automatic driving fishing nets

![Figure 1 Design Prototype](image)

Research stages include:

1. Common problems with identifying a problem for society remote, coastal, left behind, the outermost and foremost are not currently getting electricity network.

2. Pre-research by studying the literature on the type of plant and makes preliminary design, collect satellite data and the start of the study site surve.

3. Calculating Energy Conversion to perform mathematical calculations conversion of wave energy into energy of motion, pressure and electrical
4. Designing and determining the size of the model plant system to determine the size of the model that will be created is then calculated to obtain a suitable model, efficient and economical.

5. Optimization Model to get the size that result in the most optimal electrical energy.

6. Selection of materials by tracing all the ingredients needed in making prototype, given the prototype will be placed on the beach (salt water) so it should be classified which part should require corrosion resistant.

7. Ponton and pump manufacture based on the size of the model that has been calculated.

8. Testing pump to get the power press and suction pump.

9. Making the buffer and amplifier unit that will be used to link the pontoon units, pumps, reservoirs, turbines and generators.

10. Manufacture of turbine units based on the size of the model that has been.

11. Selection of generator units by using a generator which has been in the market in order to make it easier for people to develop their system.

12. Testing of the turbine generator unit to determine the characteristics of turbine rotation, voltage, current and frequency generated.

13. Conclusion, produce a picture of the performance of each unit.

### III. Results and Discussion

a. Constants

\[ \pi = 3.14, \text{ gravity } 9.8 \text{ m/s}^2 \text{ and sea water density } = 1,030 \text{ kg/m}^3, \text{ the weight of seawater } = 10,094 \text{ N/m}^3. \]

b. Calculation Assumptions

Maximum wave height \( (h) = 2 \text{m}, \) wave period \( (T) = 4 \text{s}, \) the wave is assumed linear, turbine efficiency of 0.88.

c. Piston diameter \( (D_1) = 8 \text{ inch diameter output } (D_{out}) = 1 \text{ inch length of the cylinder } (L_{cil}) = 0.5 \text{ m}, \) the length of the piston step = 40 cm.

d. Incoming water speed \( (V_1) \)

Incoming water speed is pump stride length per unit time, because the pumping position is \( \frac{1}{2} T, \) then the time required to pump water throughout pumps step is 2 s, thus the water inlet velocity of 0.2 m/s.

e. Pump inlet pressure \( (P_1) \)

With 8 inch pipe diameter (0.203 m), the size of the piston surface area is 0.032 m². Because the pump inlet pressure is defined as the ratio of force to the surface area of the piston pump, the size of the pump inlet pressure of 35 947 N/m².
f. Water exit speed (V2)

2-inch diameter pipe output (0.051m), the amount of pump output surface area is 0.002 m². Because of the magnitude of the speed of the water outlet is defined as the product of the ratio of the surface area of the piston (A1) and the speed of the water inlet (V1) with a surface area of the pump exit (A2) or V2 = (A1 x V1) / A2, then the amount of water exit velocity of 3.2 m/s.

g. Exit pressure pump (P2)

The magnitude of the pressure pump is a comparison of time pressure and the piston surface area to the surface area of the pipe exit. Exit pressure pump is 575.150 N/m²

h. The water discharge (Q)

Water discharge is defined as the volume of water displaced into the reservoir per unit time. Discharge of water flowing into the reservoir was 0.0032 m³/s

IV. Conclusion

Prototype is built to produce water discharge 0.0032 m³/s with water pressure out 575 150 N / m² and the speed of 3.2 m/s. Prototype potentially produces electric power that can be used for Outermost and Backward Region

REFERENCES


RELEVANCE OF TEACHING MATERIALS THE HYGIENE AND SANITATION OF WORK ENVIRONMENT IN HOME ECONOMICS DEPARTMENT

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Abstract
Health and safety issues to be very important, because the realization of occupational safety and health can reduce operating costs shall mean the job. If in carrying out the work of an accident, it will increase costs, which ultimately reduces company profits. Giving lectures Sanitation Hygiene and Occupational Health Safety on vocational students, especially the Department of Home Economics is a necessity in the face of environmental health in employment. The use of chemicals, machine tools, and electric power is an important consideration, so that students have enough knowledge about risk management and job hazard analysis to produce optimum performance of the product is safe for the company and the occupational environment.

Based on research on 75 students of the Department of Home Economics Faculty of Engineering, State University of Jakarta indicate that the behavioral attitude aspect Sanitation Hygiene Occupational Environment 92.03% received well, aspects of knowledge sanitary equipment and work areas receive the agreed 68%, knowledge of occupational accidents judge agreed 42% , knowledge of personal hygiene accept the agreed 72%, knowledge of hygiene and sanitation judge agreed 42%, and 74% agree occupational health and safety materials provided to students. The results of brainstorming with lecturers show lectures sanitation hygiene and occupational safety an average of 85 % relevant to the implementation of practical lectures. The teaching material can be identified, they are environmental sanitation, industry hygiene, personal hygiene, and occupational health and safety.

This means the provision of material relevance Sanitation Hygiene showed most respondents already know what actions to take in the behavior of sanitary hygiene and occupational health safety during the field work practices.

Keywords: Behavior, Sanitation, Hygiene, Environmental Health, Occupational Health Safety.

A. Introduction
Occupational health and safety issues (OHS) is generally in Indonesia is often overlooked. This is indicated by the high number of occupational accidents. This is certainly very worrying. The level of concern for the business community to OHS is still low. Though employees are an important asset of the company.

In carrying out a job, security and safety are important factors that should be the primary concern of all parties. Our success in carrying out the work not only be measured from the completion of the work. Many things that used as a parameter assessment of the success of a job. The occupation considered successful if the security and safety of all available resources is assured, can be completed on time or even faster than the time specified, give the advantage to the company, and gives satisfaction to all parties (managers, employees and employers).

Security and safety issues to be very important, because with the realization of security and safety can reduce operating costs shall mean the job. If in carrying out the work of an accident, it will increase costs, which ultimately reduces company profits. In the
case of severe accidents, losses incurred not only the financial aspect (funding), but it can cause defects in workers may even die.

The Number of workplace accidents recorded was also considered not describe actual facts on the ground that the rate of work accidents is much higher. As acknowledged by various groups within the Department of Manpower, the number of work accidents recorded only suspected represent no more than half the course of a number of occupational accidents that occur. It is caused by several problems, including a lack of interest of the public to report work accidents to the authorities, particularly the Social Security company. Reporting of workplace accidents is actually required by law, but there are two barriers that are considered cumbersome administrative procedures and the value of employment insurance claims are inadequate. In addition, penalties for companies that do not report cases of workplace accidents is very light.

Most of the cases of occupational accidents occur in the productive age group. Death is the result of a work accident that its value can not be measured economically. Accidents that result in lifelong disability, in addition to the impact on non-material losses, also caused huge material losses, even greater when compared with the costs incurred by people with serious illnesses such as heart disease and cancer.

Food processing carried out in the kitchen, there are many place processing equipment used to make food ingredients to mature. Food handlers who work in the food processing where the processing and use of existing equipment as well as possible. Likewise, salon workers used cosmetic ingredients for hair and skin care. Students also operate electrical equipment to support the practice in the laboratory. Many accidents in the workplace because workers do not pay attention to health and safety procedures contained in the workplace. Mainly working in the kitchen is very much an emerging risk, because there is a fire in the kitchen and hot oil can cause accidents. Accidents in the laboratory can also occur due to the negligence of the students, such as not applying the instructions to perform activities or operate machinery.

Safety and occupational security have much influence on the accident factors, employees must comply with the standard (OHS) in order not to make things that are negative for the employee. Many accidents caused by illnesses suffered by students without the knowledge of supervisors (OHS), monitoring of the physical condition should be applied when entering the work space so that early detection of health workers will begin when the job. Occupational Health and safety need to be considered in the occupational environment, since health is a state or situation of a healthy person both body and spirit while safety a situation where workers are guaranteed safety at work both in the use of machines, appliances, instruments of labor, processing is also the place labor and environment are also guaranteed. If the student is in good health both physical and spiritual, and supported by facilities and infrastructure are assured safety, the labor productivity will be increased. Health problem is a complex issue, which is interrelated with other issues beyond health itself. Many factors affect the health of both the health of the individual and public health, among other things: heredity, environment, behavior, and health services.

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Department of Home Economics is one of the majors in the Faculty of Engineering which has a study program food, dressmaking, Makeup, and Home Economics Education. On this field, the students are directed into professional workers in the field of work directly related to chemicals, equipment, machinery, electric power and processing space. Thus the students are given a course of sanitary hygiene and safety. The courses are weighted 2 units this semester credit is given to the material that is not necessarily relevant to the field of student work. However, students are given a basic understanding of sanitation and hygiene and safety before they practice in the lab. At the time of observation, researchers saw a few things lacking in the application of sanitary hygiene and safety in the kitchen among other practices while still a student practices that do not bring personal hygiene supplies such as aprons, napkins and headgear. Additionally during the ongoing practice of students is still less cautious when using fire in the stove, students still need to be given the motivation by teachers to implement sanitary hygiene and safety during practice. Some of these examples may be the cause of cases of occupational accidents in the kitchen or in the laboratory. Although it has been affixed to order enters the laboratory, the order is only limited appeal and not something mandatory for students.

B. Literature Review

Hygiene is the science of health and prevention of disease (Sri Rejeki, 2015: 2). Hygiene more talk about bacteria as the cause of the disease. A cook in addition to be able to process foods that taste good, attractive appearance, also must be edible. For that, the food must be free of bacteria or germs are harmful to human health. Likewise, should be able to apply makeup or skin customer's hair with a clean appearance and healthy condition so as not to cause disease to customers or beautician own. So Hygiene is a science that studies health are closely related to personal, environmental, food and drinks because it is a prerequisite for achieving health status. Meanwhile, according to the WHO sanitation is an attempt to supervise some of the factors which affect the physical environment to humans, especially to things that have a damaging effect physical development, health, and survival.

The scope of the hygiene problems can not be separated from the problem of sanitation, and the activities of food processing, sanitation and hygiene issues carried out together. Personal health, especially for those who are involved and working in a beauty salon to note, because it is in addition important to himself also has an interest to customers and the sustainability of the company. Environmental hygiene is the main target to be repaired (corrected) and prevented (prevention of) the things that are associated with it, in particular addressed to the problem; water, waste, air pollution, housing, supervision carrier (vector) of the disease and so on. All this is aimed at the creation of factors of human physical environment harmonious and perfect, so that people can benefit from physical development, and health and human survival can be maintained and improved. Hygiene company is part of the science of
public health (public health), as well as part of medical science (preventive medicine).

Hygiene companies is more directed at (Suma’mur, 2014: 247).

Geared towards the labor community more easily approachable and medically examined periodically from the general public.

a. Special attention to the work environment.
b. Targeted increase productivity..
c. Powered by law within the scope of employment.

Application of this company hygiene can only be done properly if all the activity in a company known clearly, including the use of various machinery and equipment, tooling, and so on. This can be made on the basis of allegations about the dangers that may occur to workers and the general public. This modest allegation must be proven accuracy with measurements accordingly. Thus obtained objective assessment work environment.

Occupational Health and Safety (OHS)

According to Mondy (2008 : 36) Safety is the protection of employees from injuries caused by work-related accidents. Safety risks are aspects of the work environment that may cause fire, fear of electricity, cuts, bruises, sprains, broken bones, loss of organs, eyesight, and hearing. Whereas occupational health according to Mondy (2008 : 38) is freedom from physical violence. The health risks are all factors in the work environment to work beyond the specified time period, an environment that can make emotional stress or physical disorder.

Health workers can be disrupted due to illness, stress, or because of an accident. Good health programs will benefit the workers materially, other than that they can work in a more comfortable environment, so overall the workers will be able to work more productively.

The government gives a guarantee to employees by arranging About Accidents Act 1947 No. 33, which was declared effective on January 6, 1951, followed by the enactment of Government Regulation On Statement accident regulations 1947 (Regulation No. 2 of 1948), which is a proof about realizing the importance of safety in the company. Law of the Republic of Indonesia Number 3 of 1992, stating that it was appropriate for the workforce also play an active role and take responsibility for the implementation of the program of maintenance and improvement of welfare for the realization of the protection of workers and their families well. So, not only companies who are responsible for this problem, but the employees also have to take an active role in this regard in order to achieve common prosperity.

Occupational safety and health leads to physiological conditions and psychological-physical labor caused by the working environment provided by the company. If a company implement measures of effective safety and health, it is a tiny fraction of workers who suffer injury or illness short term and long term as a result of their work in the company.

Occupational safety and health program aims to provide a conducive environment for the workers to achieve, in any event both accidents and occupational diseases were mild or fatal must be accounted for by the parties concerned (Rika Hadiguna, 2009). Meanwhile, according to Rizky Argama (2008) and Suma’mur (2014), made the purpose of occupational safety and health program is to reduce the company’s costs when incurred accidents and illnesses due to employment. Some objectives Occupational Health and Safety program is:

1. Preventing physical and financial losses from both employees and companies
2. To prevent disruption to the productivity of the company
3. Save the cost of insurance premiums
4. Avoiding lawsuits and as a corporate social responsibility to its employees.

Businesses that can be done to achieve safety and avoiding occupational accidents, among others:
a. Job Hazard Analysis (Job Hazard Analysis)

Job Hazard Analysis is a process to study and analyze a particular type of work then divide the job into steps to eliminate the dangers that may occur.

In conducting the Job Hazard Analysis, there are several steps that need to be done:

1) Engaging Employees.

It is very important to involve employees in the process of job hazard analysis. They have a unique understanding for his work, and it is an invaluable information to find a hazard.

2) Reviewing Accident Previous History.

Review with the employee about the history of accidents and injuries that have occurred, as well as losses incurred, is important. This is the main indicator in analyzing hazards that might occur in the workplace.

3) Perform Revisited Preparation Work.

Discussions with employees about the dangers that exist and they know in the work environment. Do a brainstorm with employees to find an idea or ideas that aim to eliminate or control hazards.


Making a list of hazardous work with the risk of unacceptable or high, based on the most likely and the most high risk levels. This is a top priority in conducting job hazard analysis.


The purpose of this is that employees are aware of the steps that must be done in doing a job, so that work accidents can be minimized.

b. Risk Management

Risk Management is intended to anticipate possible losses / loss (time, productivity, etc.) related to the safety and handling of law program.

c. Safety Engineer

Provide training, empowering supervisors/managers to be able to anticipate/look at the situation less 'safe' and eliminate.

d. Ergonomics

Ergonomics is the study of the relationship between man and his work, which includes tasks that must be done, equipment and tooling used, as well as the work environment. The potential sources of diseases related to work are as diverse as the symptoms of the disease. Some institutions have systematically studied the work environment, and have identified the cause of dangerous diseases come from arsenic, asbestos, benzene, bichlorometil eter, coal dust fumes furnace coke, cotton dust, lead, radiation and vinil florida. The workers were likely exposed to the dangers if covers workers in the chemical and oil refining labs, miners, workers of textile mills and steel mills, workers in the lead smelting, medical technicians, painters, shoe-making, and industry workers. The research more will certainly be able to reveal other hazards that would like to be diagnosed and treated by the company for the welfare of their workforce in the future.

Subjects Hygiene Sanitation and Occupational Safety

Sanitation Hygiene courses given on any existing courses in the science department of Home Economics and weighs 2 semester credit units. The purpose of giving this course is that students have knowledge about personal hygiene, environmental sanitation and safety. The benefits of this knowledge is the students can carry out the practice in the field are safe and sound with a net result (to avoid contamination) and free of infectious diseases.

Sanitation Hygiene course is given to students through a learning process that discussion, assignments and presentations. After students receive materials that lecturers give the task to the task even discussed the subject of environmental sanitation, which survey simply at a place of business-related field of study such as restaurants or beauty salon to get information about the application of hygiene.
and sanitation in the study program or in the social.

In accordance with the objective of Safety, which creates a working atmosphere that is safe, comfortable and achieve the highest productivity, then it should be implemented or applied Safety on the type of field work including food laboratory, makeup and clothing. Factors affecting the success of an efficient and effective sanitation hygiene and safety is the behavior of someone in implementing and applying it. As subjects, sanitation, hygiene and safety of work included in the standard of competence refers to the National Competence Indonesia Standard (SKKNI) in the field of Hotels and Restaurants. The competency standards are to apply safety, occupational health. Basic competence of sanitary hygiene and safety at work contained in the course

By providing knowledge, education, and training on hygiene and sanitation Safety to students study program Food, may prevent the behavior and improve the environmental conditions are not safe while working in the laboratory. The purpose of giving courses of sanitary hygiene and safety Work is students have the knowledge and ability of the sanitary hygiene, preventing workplace accidents, to understand the hazards that exist in the workplace or practices or in the field of makeup that is in the laboratory dressing and using preventive measures of occupational accidents.

To determine the relevance of the course material Sanitation Hygiene and Operating Safety, the necessary information data through descriptive research in the Department of Family Welfare Faculty of Engineering, State University of Jakarta in 2014. Data collection techniques through: a) brainstorming with lecturers who teach courses to obtain curriculum Sanitation Hygiene in accordance with the field of study the student, b) giving questionnaires to 75 students, and c) observations and interviews to 10 students. Results of the research is a descriptive data distribution frequency and identification of the relevance of teaching materials.

To measure knowledge and attitudes of students in the behavior of sanitary hygiene and safety at work in practice learning using tests and questionnaires with four alternative answers, namely SS = strongly agree, S = agree, TS = disagree and STS = strongly disagree. Assessment for each positive question is SS = 4, C = 3, TS = 2, STS = 1. To identify students in the behavioral actions of sanitary hygiene and safety at work in practice learning student using two alternative answers to a questionnaire to obtain certainty, it means never experience with a score of 1 and No means never having with a score of 0.

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C. Discussion

To obtain the data of knowledge, attitude and practice of students about the relevance of the course material, then made observations and administration of a questionnaire about knowledge, attitudes and behavioral measures of sanitation hygiene and safety.

1. Respondents in the knowledge of Behavioral Sanitation Hygiene and K3 on Practices

Based on the data obtained from the respondents' answers to the multiple choice 70 students. Knowledge of students in the behavior of sanitary occupational hygiene and safety at work in practice belong to the good category of 57.69%, 42.31% enough, and not less category (0%). This data was obtained through a knowledge test sanitary hygiene behavior (42.31% good) and knowledge of safety behavior (74.36% good). This means that 57.69% of respondents have understood the knowledge of sanitary hygiene and safety at work and 42.31% of the respondents know about the knowledge of sanitary hygiene and safety at work, although not 100% understand. According to the data distribution of student knowledge, values are on the dominant trends in both categories since most value more is above average. Thus the general knowledge of students about the behavior of sanitary hygiene and occupational safety done by respondents included good categories.

2. Attitude Respondents in hygiene and sanitation behavior is salvation work in practice

Based on data obtained from the results of a questionnaire answered by 75 respondents attitude of the students can be classified in good category, where the percentage of good categories 92.03 % and 7.69% of the category enough from 75 respondents. This shows that 92.03 % of the students have had awareness in attitude to always behave sanitary hygiene and safety at work, so that students can apply sanitary hygiene and safety during practice, According to the data distribution of the respondents' attitudes, values are on the dominant trends in both categories since partially more value is above the average. attitude aspects include attitudes toward behavioral health and safety, hygiene sanitation, personal hygiene, sanitation equipment and accidents.
Based on the above it can be concluded that the greater awareness in attitude to always behave sanitary hygiene and safety at work that occurred during the practice of the food processing practices or dressing practices will run smoothly and safely. From the results of the data obtained by the average percentage of 17.96 in the attitude of students who obtained 57.69% of data categories including good category, 42.31% in the category adequate and 0% in the poor category, meaning that hygiene and sanitation behavior in terms of student attitude good category aspects include action on the application of occupational safety, implementation of environmental sanitation, sanitation equipment, and personal hygiene during practice.

3. Respondents action In Behavior sanitary hygiene and safety at work in practice.

From the results of the data showed that students in behavioral actions of sanitary hygiene and safety work done 74% of respondents included in both categories. This means that most of the respondents already know what actions to take in the behavior of sanitary hygiene and safety during practice. Student actions in the implementation of work safety aspect that is to know how to operate machinery is 92.3% of respondents claimed to know how to operate machinery, 7.7% students expressed do not know how to operate machinery, especially for large machines such as ovens gas because there operator or laboratory assistants who help to operate machinery if these. But the actions of the respondents ideally should also understand and know how to operate machinery.

The actions of the respondents in the behavior of sanitary hygiene and safety at work is covers the provision of bins, operate machinery and equipment practices, personal hygiene, and the use of tools in the laboratory practices. Personal hygiene and practical work space was also made by the respondent.

4. Results of brainstorming together several lecturers and student interviews

Teaching materials on the subjects of sanitary hygiene and safety are in accordance with the development faced especially during practices in the laboratory and in the field of employment. Given the current laboratory practice, students often use the machines with high electric power that the operation must use the correct procedure. In addition, in practice, students of cosmetology using cosmetic products made from chemicals such as hairspray, cosmetics curly signs, cosmetic hair dyes, and other chemicals that require the use of procedures and proper storage.

Students of the Department of Home Economics is poised to become a major work force that is ready to work in the appropriate fields. As a prospective employee in the company Beauty, worked at the food company, hospitality or clothing company, with more modern technological equipment the Home Economics graduates should
understand about sanitation Hygiene and Safety especially personal hygiene, because it is the initial capital for an employee. Hygiene, sanitation, and safety work is the knowledge and skills of the "absolute" must be studied by students of IKK to meet a better personal life as a professional employee who is always in touch with customers. It is appropriate Suma'mur opinion (1987: 2) Occupational Health Safety goal is to protect the rights of labor safety in doing the work for the welfare and increase the production and productivity of work, to ensure the safety of others who are in the workplace environment and source production maintained and used efficiently. Law No. 14 yr. 1969: "all workers are entitled to protection or safety, health, morals, the maintenance of morale and treatment in accordance with human dignity and moral religion".

Depth discussion of the results obtained by the formulation of the joint lecturers sanitary hygiene and occupational safety courses. Results of filling the questionnaire with lecturers showed 85% agree the course material of sanitary hygiene and safety relevant to college practices, such as Chemicals Cosmetics (100%), Food Processing (92%), Textile Chemicals (95%), and lectures other practices above 70% agree. This material is obtained through the identification in any practical activities related to hygiene and safety of the respondents. Teaching materials of Sanitation Hygiene and Safety course relevant field of study and practice average 85% agree are 1) Definition, benefits and scope of sanitation and hygiene. 2) Sanitation water. 3) Sanitation trash. 4) Sanitation and food hygiene. 5) personal hygiene. 6) Environmental Hygiene and Company. 7) Bacteria and microorganisms 8) Ingredients cleaners and cleaning equipment. 9) The definition and purpose of work safety. 10) The legal basis of safety and occupational health and safety organizations. 11) Accidents. 12) Hygiene and health work space. 13) The influence of the working environment on health (occupational diseases). 14) Ergonomics, physiology and nutrition workers.

The learning methods which are used in presenting the material Sanitation Hygiene and Safety at work is the case discussions, presentations, project assignments, and observation.

D. CLOSING

Based on the analysis of data and the discussion above it can be concluded as follows:

1. Aspects of knowledge of the behavior of sanitary hygiene and health safety, knowledge of students can be classified in good category, 57.69%, from 6 student knowledge level indicator, the indicator on the Occupational Safety knowledge, knowledge of sanitation and hygiene in scope, personnel hygiene, sanitation environment, work area and sanitary equipment, and workplace accidents

2. Aspects of behavioral attitudes sanitary hygiene and occupational health safety, the attitude of the respondents can be classified in either category, where a good percentage of 92.03% category,

3. Aspects of behavioral measures of sanitary hygiene and health safety, measures students classified 74% is included in both categories. This means that most of the respondents already know what actions to take in the behavior of sanitary hygiene and safety work during the practice.

4. Teaching materials of Sanitation Hygiene and occupational Safety course which relevant and need to study and practice are 1) Definition, benefits and scope of sanitation and hygiene. 2) Sanitation water. 3) Sanitation trash. 4) Sanitation and food hygiene. 5) personal hygiene. 6) Environmental Hygiene and Company. 7) Bacteria and microorganisms 8) Ingredients cleaners and cleaning equipment. 9) The definition and purpose of work safety. 10) The legal basis of safety and occupational health and safety organizations. 11) Accidents. 12) Hygiene and health work space. 13) The influence of the working environment on health (occupational diseases). 14) Ergonomics, physiology and nutrition workers.
5. Lecture Sanitation Hygiene Health and safety is one of the important and relevant knowledge in the occupational fields of home economics. Graduates of the Department of Home Economics will work in the field of food, Health and beauty, and fashion the use of chemical products and machine tools increasingly modern and hygienic appearance. Therefore, needs to be enhanced learning systems Sanitation Hygiene Health and Safety at Work, especially the syllabus to make it more relevant to the needs of each study program.

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