

The Conformity of Vocational High School Students' Productive Knowledge Competence on Shallow Foundation Work on Construction Services

Rolly R Oroh^{*1}, Haris A S², R M Sugandi³, Isnandar⁴

¹Doctoral Students of Graduate School Universitas Negeri Malang, Malang.

²Lecturers in Graduate School Universitas Negeri Malang, Malang

Abstract: This study aims at discovering the factors of conformity of productive knowledge of vocational school students (SMK) in doing concrete structures works to the needs of construction services. The data were obtained through a written test instrument given to vocational students in several districts in North Sulawesi. This research employed quantitative research approach. The data analysis was using factor analysis technique with main component analysis method and varimax rotation method to get communal value and eigenvalues. The results of this study reveal that the dominant factors of competence of students' productive knowledge in doing shallow foundation work that required construction services is the job factor determining the technical specifications of shallow foundation and working factor of making the profile of shallow pairs of foundation.

I. INTRODUCTION

The need for skilled workers as graduates of vocational high school (SMK) competence of stone and concrete construction engineering (TKBB) will increase in line with government policy to increase sustainable infrastructure development. Students of vocational school are expected to fill positions in the work as skilled workers in the performance of construction services as the operator or executing the building work. This means that the vocational school students must have a working competency standard with sufficient knowledge in doing the work in the field of expertise. Thus, students should equip themselves with a working knowledge in the implementation of the building with various aspects of the work of the building, because the building construction in the process of development has some element of work that is integrated within the overall building construction (Allen and Iano, 2008; Ching, 2014 Tamrin, 2008).

Competence is a statement of how someone can demonstrate: the skills, knowledge and attitudes in the workplace in accordance with industry standards or in accordance with the requirements set by the industrial workplace. Catts, Falk and Wallace (2011) which states that competence can be defined as Impact of individual performance at workplace. Thus the competence becomes a reflection of the ability of each individual in performing a

particular job tasks in accordance with their areas of expertise in the workplace.

Labor competencies are envisaged in the Indonesian national competency standards (SKKNI) to the office of executive job jobs buildings (Decree 205/2015). The competencies are described in several competency units, such as the competence of carrying out shallow foundation work. Student productive competence in carrying out shallow foundation work can be measured and observed through some indicator or criterion of performance, thus the competency which will be owned by student will be relevant to requirement of construction industry. Furthermore, SKKNI 205/2015 as a standard of work competence that suits the needs of the construction industry, has determined the element of competence to perform shallow foundation work, consisting of several criteria of performance, namely: (1). Baseline ground preparation work is carried out in accordance with working drawings, technical specifications, and working methods; (2). The work of the foundation profile pairs is carried out in accordance with the working drawings, technical specifications, and working methods; (3). The work of the foundation pairs is carried out in accordance with working drawings, technical specifications, and working methods.

Productive competence of vocational students can be obtained through learning approaches productive competency program. Work based competence defined as ability of working required to demonstrate the knowledge, skills and abilities (Winterton, etc, 2006). In the curriculum structure of Vocational High School, subjects are divided into three groups, namely normative program groups, adaptive, and productive programs. The subjects of the productive program group provide teaching materials that prepare students with productive competencies so that students are able to do the job well according to their field of expertise, the teaching materials given to the vocational school students will be in accordance with what is required by the construction services industry. This shows that vocational high school is able to provide productive competencies for students to make it easier to access employment after graduation in education, in line with Verlaine and Stenström (2014) that vocational education can provide access to the labor market for students prepared to become skilled workers.

Productive competence refers to minimum standards of mastery of skills applicable in the world of work. Productive competence directs learners to make every learning process they experience can produce a product or service. Standards of competence such as in the world of work will further develop quality standards that can be accommodated in the curriculum (Nore and Lahn, 2014). Continuous quality in the implementation of vocational high school (SMK) in accordance with the construction services business, the suitability between vocational education and the labor market will become apparent (Papakitsos, 2016). The suitability of vocational education with the need for such construction services needs to be done through a work-based learning process, in line with Virolainen and Stenström (2014) stating that a vocational education system that emphasizes work-based learning models can improve students' work skills. Thus the productive competence of vocational high school students will have a suitability of the needs of construction services, if the productive competencies obtained by students in the school in accordance with what is required by construction services.

The conformity of student productive competencies can be given by vocational high school as a form of implementation of vocational education. This suggests that the importance of vocational education to equip students with students' productive competencies, as mentioned by Billet (2011) that vocational education is an important and valuable project because it helps individual students become competent in their vocation field. The importance of vocational education, as it always offers and follows the qualifications of employment needs through work experience, as mentioned by Akkerman and Bakker (2012) that the vocational education system always follows the job qualification set by each type of work. Also mentioned by Stephens (2015) arguing that work experience in vocational education is vital to help students with real-world experience entering the workforce. Thus, vocational education through vocational schools can provide assurance to students to have productive competencies that fit the needs of the construction services industry.

The conformity of productive competence of vocational high school students to the needs of construction services, can be known through 3 (three) aspects of knowledge, skills and attitudes. These three aspects become an indicator of the conformity assessment component of students' productive competencies. This is in line with Maclean and Wilson (2009) that knowledge, skills, attitudes, and values are the standards required to demonstrate competence. Furthermore, it is more widely expressed by Runner and Maclean (2008) that competence can be understood as recognized skills, knowledge, attitudes, methods and values. The competence is the goal of vocational education for vocational students, to provide the skills, knowledge and attitudes required to work in specific jobs in the areas of expertise (Kehinde and Adewuyi, 2015). Thus, the competencies of students through vocational education, will be relevant or in accordance with the needs of the industrial world.

Knowledge is an important aspect in the formation of competence, which is directed to the development or mastery of a number of capabilities. Such capabilities such as knowing, understanding, applying, analyzing-synthesizing, evaluating, solving problems, and creating. Further, it mentioned in Permendikbud No. 54 year 2013 that the aspect of knowledge is a description of the ability of vocational high school graduates in terms of having factual knowledge, conceptual, procedural, and met cognitive in science and technology. Knowledge is one dimension forming competence for each individual to perform a specific job appropriate expertise. Knowledge is the basis required by competence (Weinert, 1999). Succar, et al (2013) mentioning knowledge into dimensions a major dimension of competence combined with the skills and experience needed someone to perform a specific task. Burke (2005) states that knowledge and understanding contribute to a competency. Knowledge is the awareness, information, or understanding of the facts, principles, guidelines, concepts, or processes necessary to succeed in doing the work (Tamerica Management Company, 2011). Thus, knowledge can be the basis of a person to demonstrate his or her workplace abilities.

Knowledge consists of several categories as aspects of the formation of competence. Such knowledge categories are factual, conceptual, procedural, and met cognitive knowledge in science, technology, art, and culture. Knowledge is divided into four types, namely: situational, conceptual, procedural and strategic. Knowledge can also be described in five properties, namely: level, structure, automation, modalities and general (Stevenson, 2001; De Jong & Ferguson-Hessler, 1996). Knowledge consists of six categories of knowledge such as knowledge of human resources (*knowledge of people*), situational knowledge, knowledge of educational practice, conceptual knowledge, knowledge processes, knowledge control (Burke, 2005). Knowledge is the awareness, information, or understanding of the facts, principles, guidelines, concepts, or processes necessary to successfully perform the task. Assessment of knowledge as an element of competence should consider the impact of knowledge on individual work performance (Tamerica Management Company, 2011). Thus it can be said that knowledge can be the basis for every individual to perform their work systematically and / or in accordance with existing working methods.

Knowledge is gained through learning and experience. Knowledge includes theories and concepts as well as implicit knowledge (*tacit knowledge*) obtained from the experience of doing certain tasks. Knowledge sometimes sees as if it is a concrete manifestation of abstract intelligence, but is actually the result of the interaction between intelligence (capacity to learn) and the situation (opportunity to learn) (Winterton, etc, 2006). Assessment of knowledge as an element of competence should consider the impact of knowledge on individual work performance (Taximetrics Management Company, 2011). Knowledge is an activity that would be better described as a knowing process (Polanyi in Stevenson, 2001). Vocational knowledge possess implicit knowledge (*tacit*) (Stevenson,

2001). Students are said to have a certain skill competence, which means relatively have a basic knowledge. Knowledge is a key and central element of a process of educational institutions (Maclean and Wilson, 2009). The relationship between knowledge and competence can be seen from several things (Sukmadinata and Saudi, 2012), as follows: (1). Knowledge is not separate from deed, because deed comes from the structure of knowledge; (2). Knowledge is a construct drawn from observable deeds; (3). Knowledge is often well acquired through its use; And (4). Knowledge is contextual.

Knowledge is a measure of success in doing work to be successful. A person has knowledge and then associated with a particular job task in accordance with his competence, it will be able to generate or realize the goals and objectives of a particular job task. Knowledge becomes the basis of someone to apply or demonstrate his or her competence in the workplace. It is as mentioned in Jovanovich & Tomovic (2008) that a competency is the ability to apply or use a set of knowledge, skills, and abilities necessary to successfully perform critical work functions or tasks within defined work settings. Knowledge can be the basis of a person to be able to adapt to the job. Knowledge can also be the basis for a person to take the initiative in every job. Knowledge can be the basis of one understands to be able to understand the world of work. The structure of one's knowledge includes not only the knowledge of the substance (or information about what), but also the procedural knowledge of the method (or information about how), and the strategic knowledge of alternatives for goal setting and planning (or information about which, when and why) (Burke, 2005). While Bardwell, Holden & Calydon (2004) mentions that measure knowledge in competency-based approach centered on three stages of development, namely know-how now-why and know-how. Work process knowledge, because knowledge to guide action (*know-that*), the knowledge to interpret the actions (*know-how*), and knowledge to reflect the action (*know-why*) (Rauner, et al, 2013). It can be stated that knowledge can be a key element to the success of every workforce in the workplace.

Working knowledge given to students in schools is still considered not appropriate or relevant to the needs of the world of construction services industry. Some of the knowledge competencies provided through the subjects in the school, apparently not yet fully accommodate all the needs of productive competence of construction services. The relevance of the work competence of vocational high school students in Indonesia to the needs of the business world and the industrial world tends to be low. Several areas of building engineering skills programs in vocational high school, entering into irrelevant categories (Safitri, 2012). Competence of expertise in vocational schools across Indonesia relevance to the needs of the industrial world tends to be still low (Sudira, 2012). The relevance or relevance of vocational secondary education to the needs of the world of work has not been maximized. Non-conformance or uncoordination between the workplace and the quality of vocational high school

graduates is one of the factors that encourage the low absorption of vocational high school graduates in the world of work. This suggests that there is still a discrepancy between what students get in school and what construction services require. As stated by Islander, et al (2015) that is factually sharply increased infrastructure development is not linearly coupled with the availability of the power generated by the graduates of vocational competence PKTB with productive knowledge that fit the needs of construction services. So it becomes interesting to be more thorough to see the compatibility of students' productive knowledge competence to the needs of construction services.

Students of vocational high school TKBB who have knowledge in the field of expertise in job positions of building worker, can be seen on one of the competence unit that is dimension of shallow foundation job. According to the curriculum structure of vocational high school, the subjects are divided into three groups, namely normative program groups, adaptive, and productive programs. Productive programs equip students with productive knowledge that refers to the minimum standard of work skills applicable in the world of work. The purpose of this study is to determine the dominant factors of competence of productive knowledge of students of vocational high school TKBB in doing shallow foundation work appropriate to the needs of construction services.

II. METHODOLOGY

This research employed quantitative research approach. The sample of respondents is students of TKBB students taken from several vocational schools in North Sulawesi. The instrument of this study used a written test given to the students. The research instrument was developed from theoretical reference and adjusted to SKKNI as well as confirmation and discussion with construction service actors according to the level of labor requirement at the level of vocational high school graduates. The indicators of shallow foundation work on written test instruments that are arranged on the foundation preparatory work of the foundation soil base, the work of the foundation profile pairs and the foundation pairs work. According to the purpose of the research, the data analysis using factor analysis technique with the main component analysis method and varimax rotation method to get the value of communality and eigenvalues.

III. FINDINGS AND DISCUSSION

Based on the data obtained, it showed that the range of scores obtained by students through written test instruments on doing shallow foundation work is relatively diverse from minimal score to maximal score. Some respondents indicated relatively low levels of productive knowledge in performing shallow foundation work. If the achievement scores obtained by students are classified in three categories, then the classification would be sufficient category, average and excellent. Then the score of student achievement of respondents through written test instruments regarding knowledge of shallow foundation work indicated that 1.92%

is in sufficient category, 82.69 % classified as average and 15,39% classified as very good. The findings of this study indicates that most students provide good enough value on the understanding of shallow foundation work, but are still very few in excellent category. This indicates that there are allegations of some of the respondent's students in performing some shallow foundation work such as ground preparation work, foundation profile work and foundation partner work, have been done well, but not yet in the working drawings, working methods and technical specifications of the work. This is supported by preliminary survey results, limited observations and interviews with some vocational teachers and construction service providers that learning in school has been in accordance with the

competency-based curriculum but found some work competence has not maximally accommodate the needs of construction services. This is in line with Sutrisno, Dardiri and Sugandi (2015) stating that there are some productive competencies required in the field of construction work, but not yet presented in the school curriculum documents.

According to the purpose of this study, then based on the data obtained it was conducted factor analysis. After the extraction process factors by principal component analysis method, the obtained value of communality knowledge of students in doing work shallow foundation (see Table 1) are ranked from the largest value to the smallest value.

Instrument components	Communality Value
Constructing foundation according to the working image	0,853
Constructing bowplank as a dummy board for the foundation's ground	0,793
Composing profile set as foundation location and position postulation	0,723
Determining measurement points location of excavation	0,716
Choosing Stone Size Times As One Of The Materials Making Foundation	0,707
Determining the river Stone Foundation As The Type of Shallow Foundation	0,470

Table 1: Communality Value

According to the value of communality in Table 1, then the next factor rotation was conducted. Factor rotation stage is done with the aim to find the factor that is able to maximize the relationship between instrument components of student

productive skill variable. Furthermore, the results of the factor rotation give *eigenvalue* student skills in doing the work of shallow foundation, as given in Table 2.

Komponen Instrumen	Eigenvalue
Constructing foundation excavation according to the working plan image	3,088
Choosing Stone Size Times As One Of The Materials Making Foundation	3,088
Determining the river Stone Foundation As The Type of Shallow Foundation	3,088
Constructing bowplank as a dummy board for the foundation's ground	1,174
Composing profile set as foundation location and position postulation	1,174
Determining measurement points location of excavation	1,174

Table 2: Eigenvalue of Students Productive Knowledge.

Based on the overview of the research findings in Table 2, it can be stated that the dominant factors on competence of knowledge productive students in doing work shallow foundation according to the needs of construction services are: *first*, work factors determine the technical specifications of shallow foundation that includes the work of making excavation foundation appropriate working drawings, Choosing the size of river stone as one of the foundation-making materials, and determining the foundation stone as a shallow foundation type; and *second*, the work factor profiling including pair of shallow foundation that makes bow plank job as the board expected to benchmark excavation of the foundation, creating a profile partner as a benchmark location and the position of the foundation, and determine the location of the points of measurement results for excavation.

The importance of productive knowledge of shallow foundation work for every workforce such as students who are prepared to become skilled workers and or executive staff, become the basis of understanding work according to work competence. This is in line with Maclean and Wilson's (2009) opinion arguing that knowledge becomes the basic or important standard necessary to demonstrate competence. Furthermore, Kehinde and Adewuyi (2015) explain that knowledge of competence is required to work in certain jobs according to the field of work expertise. Thus, knowledge becomes an essential element for any skilled workforce to be able to work in a workplace well in accordance with the expertise possessed.

Based on the results and research findings through descriptive analysis and relevant research findings, it can be stated that the knowledge aspect becomes important in doing the construction work, as mentioned Elfaki and Alatawi (2015) that knowledge becomes important for the workforce in ensuring the accuracy and success of construction work as well as understanding the relationship between the various parts of the work. Furthermore, Zhu and Zhang (2012) mentioned that the knowledge aspect becomes important in understanding the situation and characteristics of the work in the field of engineering construction. Thus, it can be stated that the productive knowledge aspect of shallow foundation work becomes important in supporting the success of building construction work.

IV. CONCLUSION

The results of this study indicate that the dominant factors of students' productive knowledge in doing shallow foundation work required by the construction service is the job factor to determine the technical specification of shallow foundation covering the work of making excavation of foundation soil according to working drawings, choosing riverstones as one of the material of making the foundation pairs, And determine the shape of the stone foundation times as a shallow foundation type. Furthermore, the work factor of making a shallow pairs of foundation profile covering the work of making bowplank as a predictable board for the foundation of excavation of foundation soil, making the

profile of the pair as the benchmark location and the foundation position, and determining the location of the measurement points for soil excavation.

REFERENCES

- [1]. Akkerman, S.F., and Bakker, A., 2012, Crossing Boundaries Between School and Work During Apprenticeships, *Vocations and Learning*, 5:153–173.
- [2]. Allen, E., and Iano, J., 2009, *Fundamentals of Building Construction: Materials and Methods*, Fifth Edition, John Wiley & Sons, Inc., New Jersey.
- [3]. Beardwell, I., Holden, L., and Claydon, T., 2004, *Human Resource Management, A Contemporary Approach*, Fourth Edition, Prentice Hall, Financial Times, Pearson Education Limited, England.
- [4]. Billet, S., 2011, *Vocational Education, Purposes, Traditions and Prospects*, Springer.
- [5]. Burke, John, W., 2005, *Competency Based Education and Training*, The Falmer Press (A member of the Taylor & Francis Group), London, UK.
- [6]. Catts, R., Falk, I., and Wallace, R., 2011, *Vocational Learning, Innovative Theory and Practice*, Springer. London.
- [7]. Ching, Francis, D.K., 2014, *Building Construction Illustrated*, Fifth Edition, John Wiley & Sons, Inc., Hoboken, New Jersey.
- [8]. De Jong, T., & Ferguson-Hessler M.G.M., 1996, Types and Qualities of Knowledge, *Educational Psychologist*, 31(2), pp. 105-113.
- [9]. Isnandar, Dardiri, A., Wena, M., dan Suwarno, E., 2015, *Revitalisasi Sekolah Menengah Kejuruan Program Keahlian Teknik Bangunan*, Kerjasama Direktorat Pembinaan SMK dan UM Malang.
- [10]. Jovanovic, V., and Tomovic, M., 2008, A Competency Gap in The Comprehensive Design Education, *American Society for Engineering Education*.
- [11]. Kehinde, T. M. And Adewuyi, L. A., 2015, Vocational And Technical Education: A Viable Tool For Transformation Of The Nigerian Economy, *International Journal of Vocational and Technical Education Research* Vol.1, No.2, pp.22-31.
- [12]. Keputusan Menteri Tenaga Kerja Republik Indonesia Nomor 205 tahun 2015 tentang SKKNI (Standar Kompetensi Kerja Nasional Indonesia) pada jabatan kerja pelaksana lapangan pekerjaan.
- [13]. Maclean, R., and Wilson, D., 2009, *International Handbook of Education for the Changing World of Work Bridging Academic and Vocational Learning*, Springer Science+Business Media B.V.
- [14]. Nore, H., and Lahn, L. Ch., 2014, Bridging the Gap between Work and Education in Vocational Education and Training. A study of Norwegian Apprenticeship Training Offices and E-portfolio Systems, *International Journal for Research in Vocational Education and Training (IJRVET)*, Vol. 1, No. 1: 21-34.
- [15]. Papakitsos, E.C., 2016, Systemic Modelling for Relating Labour Market to Vocational Education,

International Journal for Research in Vocational Education and Training (IJRVET), Vol. 3, Issue 3, December 2016, 166-184.

- [16]. Perpres (Peraturan Presiden Republik Indonesia) nomor 8 tahun 2012 tentang KKNI (Kerangka Kualifikasi Nasional Indonesia)
- [17]. Rauner, F., and Maclean, R., 2008, Handbook of Technical and Vocational Education and Training Research, UNESCO-UNEVOC International Centre for Education, Germany.
- [18]. Rauner, F., dkk, 2013, Competence Development and Assessment in TVET (COMET), Theoretical Framework and Empirical Results, Springer, London.
- [19]. Safitri, Baiq, R.A., 2012, Relevansi Program Studi Keahlian Teknik Bangunan Dengan Pekerjaan Lulusan, Teknologi dan Kejuruan, vol. 35, no. 1, Pebruari 2012: 29-36.
- [20]. Stephens, G.E., 2015, Uncertified and Teaching: Industry Professionals in Career and Technical Education Classrooms, International Journal for Research in Vocational Education and Training (IJRVET), Vol. 2, No. 2: 119-135.
- [21]. Stevenson, J., 2001, Vocational knowledge and its specification, Journal of Vocational Education and Training, Volume 53, Number 4.
- [22]. Succar, B., Sher, W., and Williams, A., 2013, An integrated approach to BIM competency assessment, acquisition and application, Automation in Construction 35 (2013) 174–189, journal homepage: www.elsevier.com/locate/autcon.
- [23]. Sudira, P., 2012, Isu-Isu Strategis Desentralisasi Pendidikan Kejuruan Indonesia, Prosiding Seminar Nasional ISPI, 21-22 Januari 2012 di Yogyakarta.
- [24]. Sukmadinata, N.S., dan Syaodih, E., 2012, Kurikulum dan Pembelajaran Kompetensi, Refika Aditama, Bandung.
- [25]. Tamerica Management Company, 2011, Workforce Competencies, Northeast Indiana Fund and WorkOne, P. O. Box 977, Mandeville LA 70470.
- [26]. Tamrin, A.G., 2008, Teknik Konstruksi Bangunan Gedung, Direktorat Pembinaan Sekolah Menengah Kejuruan, Depdiknas, Jakarta.
- [27]. Virolainen, M., and Stenström, M.L., 2014, Finnish Vocational Education and Training in Comparison: Strengths and Weaknesses, International Journal for Research in Vocational Education and Training (IJRVET), Vol. 1, No. 2: 81-106.
- [28]. Weinert, F.E., 1999. Concepts of competence. Munich: Max Planck Institute for Psychological Research. Published as a contribution to the OECD project Definition and selection of competencies: theoretical and conceptual foundations (DeSeCo). Neuchâtel: DeSeCo.
- [29]. Winterton, J., Delamare, F.- Le Deist, Stringfellow, E., 2006, Typology of knowledge, skills and competences: clarification of the concept and prototype, Cedefop Reference series; 64, Luxembourg.