

An Implementation of HOTS Based Learning Strategy in Vocational High Schools

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One way to produce graduates with good quality is by increasing the quality of learning. The learning process must be able to produce the competencies required in the current era, which is needed for the business and the industrial world (DUDI). Particularly, Vocational High Schools are in high need of graduates who have a good level of critical thinking, creative thinking, communication, collaboration and confidence, as well as the capability to solve problems independently. Learning process in Vocational High Schools is expected to have used Higher Order Thinking Skill (HOTS) based learning since it can help train and stimulate student's abilities to solve the problems given in the learning process independently. Based on the field activity findings, which was done by taking a sample of 15 schools using a purposive sampling method. There have been several teachers who applied learning method but still experienced errors in applying the HOTS based learning evaluation process. The pre-test results showed that 49.30% of teachers still did poorly in the application of HOTS learning in the classroom. After the treatment, which was proper and correct HOTS based learning, the post-test result showed an improvement that was only 4.23% of teachers who still did poorly in the application of HOTS based learning. Through the significant changes during the training, the teacher began to understand the details of HOTS based learning evaluation system so that they can apply it in the teaching and learning process and produce graduates required by HOTS learning itself, which is to produce students or graduates who are capable of thinking creatively, innovatively and independently and can solve problems well.

Key words: *Higher order thinking skill, learning, vocational high school*



Introduction

Producing good quality Human Resources (HR) requires a good quality system or process as well. Implementing education can produce human resources that have necessary quality by applying teaching and learning process in schools that can shape students into competent human resources needed by the Business and industrial world. By investigating Indonesia, it can be known whether Indonesia will find it difficult to compete with other countries in the era of globalisation, and tight competition, today and in the future. Therefore, it becomes the responsibility of the educational world, especially vocational education, to create competent graduates. Its learning processes will develop competencies required by the industrial world (Sonhaji *et al.*, 2019). There are many demands on Human Resources (HR) that have competencies required by BUSINESS AND INDUSTRIAL WORLD. Throughout the world, education policy currently focuses more on competency development (Judith Gulikers *et al.*, 2019). Graduate's competence can be interpreted as a minimum standard of ability and educational process skills possessed by someone to be able to do certain types of work (Sudana *et al.*, 2019; Roblek *et al.*, 2016).

Educational institutions, especially vocational high schools that provide ready to use human resources, require their graduates to be able to work at the secondary level of the global job market. Vocational high school is an institution that provides graduates who are ready to use in any field. Therefore they must be able to prepare graduates who are capable of competing in any condition this time and in the future (Dharma *et al.*, 2013; Hanushek *et al.*, 2017; Sudana *et al.*, 2019). The learning process greatly influences the quality of graduates of a school. Learning that is needed at the moment does not only require students to memorise and remember the lessons, but also can turn students into graduates who are able to think creatively or innovatively (SR Maulita *et al.*, 2019), and can complete a project well as well as evaluate the results of the project. The learning requires students to have high-level and critical thinking so that the students have the sense to continue innovate, remember and develop the learning they obtain (Barnett & Francis, 2012; Liu *et al.*, 2017). This situation requires an educator to be able to prepare the evaluation of learning that can train students to be more creative and can complete a project up to the evaluation stage since the relationship between teachers and students in classroom collaboration can foster a deep understanding and practice good communication for students (Malandrakis & Pani, 2016). Educators are important actors in providing learning needed by students that are required by the current and future needs. The curriculum concept currently used is a one that promotes Project Based Learning (PBL), which is learning that requires students to be able to solve a problem well by applying good cooperation and communication among friends. An educator is expected to apply HOTS based learning evaluation in every subject, especially for Vocational High School teachers because the schools highly require the graduates to work according to Business and Industrial World needs. At present, many schools implement HOTS based

learning and require their teachers to apply HOTS based learning evaluations as well. In reality, there are still many teachers who evaluate the students by requiring them to memorise and explain, or there are also some teachers who think that they have implemented HOTS by doing observations and tests. It is a misconception that exists in the field. This is caused by several factors, one of it is the lack of teacher's knowledge to make an evaluation of learning that includes three domains, which are analysing, evaluating and creating (designing) or known as HOTS (Higher Order Thinking Skill). HOTS based learning is needed to keep with the current and future scientific and technological developments because it encourages students in mastering 21st century or 4C skills, namely; communication, collaboration, critical thinking and problem solving, and creative and innovative. A thought process that students must develop to prepare themselves to face the world of work must go beyond learning simple facts and content. The material obtained from HOTS learning process, which using higher-level thinking processes, will be more easily transferred, and make students easier to understand in-depth concepts about an idea. It will be possible to apply that knowledge in solving a new problem (Jennifer Lyn S. Ramos *et al.*, 2013). This kind of learning system is needed and must be applied by schools, especially vocational high schools that prepare graduates to be ready to work in the field. Therefore, this research provides a very good contribution to teachers, particularly in vocational high schools, where this research provides HOTS learning training to teachers. The results provide a significant understanding to the teacher regarding HOTS based learning which will later be applied to students at school.

Literature Review

Vocational High School and Educators

The development of the education world is currently entering an era marked by the rife of technological innovation, thus demanding an adjustment to the education system to be in line with the demands of the world of work. Vocational High School is part of the education system that prepares graduates to be able to work in one occupational group or one occupation than other fields of work. Vocational education also aims at and is responsible for preparing graduates who are ready to use and have the ability or competence required in the field (Business and the industrial world), both current and future needs, by adding apprenticeship learning (Abdullah *et al.*, 2011; Oluwale *et a.*, 2013; Eichhorst *et al.*, 2015; Zholdasbekova, 2016; Hanushek *et al.*, 2017). Vocational education is one type of education that has an important role in producing productive people in certain fields through repeated training of adapting, thinking and doing work thus producing excellent competence and good job prospects in the labour market. Therefore, it will help the economy to improve by reducing unemployment (Sudana *et al.*, 2018). The presence of vocational education is now increasingly desired by the community; especially those who are directly involved in the

world of work. The character of Vocational Education itself is very special and specific, that is by conducting assessment based on industry characteristics or that meets industry standards, not only by achieving the material in the form of students individual understanding. Another difference is that its focus on learning/special assessment, which is competency-based (Gavin, 2002).

Vocational high school teachers must also have high-quality competencies to help develop students competencies that meet the needs in the field (Susanne, 2014). A teacher must have abilities and experience that can adapt the existing developments to provide learning to students as required. Most decision-makers in the world sometimes do not have the knowledge of the issues appear in vocational education or does not have personal experience in the vocational field (Billett, 2011; Fejes & Susanne, 2012; Andersson *et al.*, 2013). Teacher's awareness of science and technology development is needed because it will affect the teaching and learning process in the classroom. A teacher, especially in vocational education, is able to teach students with learning that can stimulate students' ability to work thoroughly and can stimulate students' critical thinking skills so that they can have good communication and cooperation or social skills because all these things are needed in Business and industrial world, and not only limited to students' hard skills (Shaheen, 2012; Brennan & Green, 2013; Sudana *et al.*, 2015).

Higher Order Thinking Skills

Higher-order thinking skills is a concept that records various types of learning and differences in the number of cognitive processing. This is a way to help students think and not only memorise, and also improve their cognitive abilities. This skill gives us a level hierarchy that creates higher-order thinking skills. HOTS based learning leads to the three learning levels, namely C4 (Analysing), C5 (Evaluating) and C6 (Designing/Creating). Learning to practice high-level thinking is very important in preparing the 21st-century human resources; thus this issue must be realised by the school leaders, especially by teachers who implement learning with the system (Robyn, 2014).

The implementation of HOTS based learning does not only helps students learn but also helps them use knowledge outside the classroom (independent learning). Through the levels of higher-order thinking skills concept, students will realise why the information they are learning is very important and useful in their lives (Widana *et al.*, 2018). They can apply the information to solve problems at home or at work and gain new experiences with their knowledge (Ron *et al.*, 2016); thus it is very important for teachers to understand the learning concepts. HOTS learning requires the skills and creativity of a teacher, so it can be applied to classroom learning so that students can understand and appreciate the learning process (Yen & Halili, 2015).

Methodology / Materials

This research is a quasi-experimental type of research. The experimental research design used was one group pretest-posttest. The design used in this study aims to determine the improvement of vocational teacher skills in conducting HOTS-based evaluations after being given intensive treatment or training. In this design, a pre-test is given before the treatment to determine the initial ability of HOTS based assessment, and a post-test is given at the end of the process (final test). The following is a quasi-experimental research design of one group pretest-posttest. The quasi-experimental research design can be seen in Table 1.

Table 1: Research Design

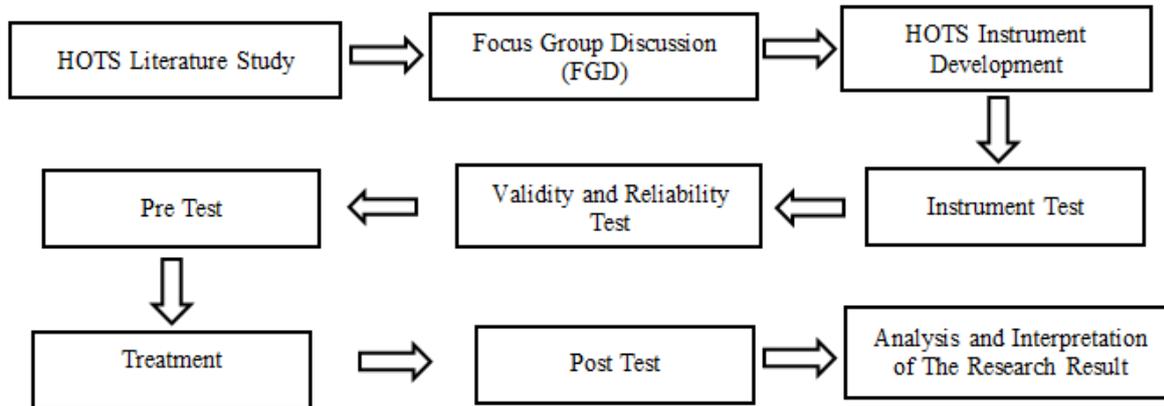
Pre-test	Treatment	Post-test
T1	X	T2

Data collection instruments used in this study was questionnaires using a Likert scale that was modified into four scales which are Highly Understand, Understand, Do Not Understand, and Highly Do Not Understand. The instrument was used to measure the ability of vocational teachers regarding HOTS based learning, consisting of three indicators including (1) HOTS learning planning, (2) HOTS learning process, and (3) HOTS based learning assessment. To get an accurate and reliable instrument, this research instrument will also be tested in order to prove its validity and reliability estimation. The instrument draft was first validated by 5 experts then the content validity was calculated using Aiken V formula. The score of the experts' assessment results was entered into the Aiken's V statistic, which was formulated as $V = \sum s / [n (c-1)]$. The results of the Aiken's V coefficient on this study instruments was 0.76 so that the validity could be interpreted as moderate validity. Furthermore, to test the construction validity used exploratory factor analysis. Based on the explanatory factor analysis results, the anti-image correlation value of each item of the instrument exceeded 0.5, which means it was valid. Meanwhile, to test the reliability estimation used the Cronbach Alpha formula. The Cronbach Alpha value for the HOTS instrument in this study was 0.815, meaning that the instrument used categorised as very reliable.

Data analysis in this research used qualitative and quantitative approaches. Qualitative data analysis in the form of descriptive analysis is used to analyse the extent of vocational teacher's ability in implementing HOTS based learning. At the same time, the quantitative analysis used paired t-test to see the significance of the teacher's ability in applying HOTS based learning after being given assistance. The stages and procedures of this research are described in Figure 1. Based on this picture, the first stage in this research is HOTS literature study. The second stage is FGD, FGD activities produced the development of HOTS instrument. Furthermore, the instrument was tested for validity and reliability. The next step

was done pre-test, action, and post-test. The final stage was analysis and interpretation of the research result.

Figure 1. Research Stages and Procedures



Results and Findings

The results of this study are obtained by processing questionnaires data given to vocational teachers. In total, there were 71 teachers did the questionnaires in which items were about teacher's understanding of HOTS based learning. Overall characteristics of respondents can be seen in Table 2.

Table 2: Respondent's characteristics

No.	Respondent Data	Percentage
1	Gender	
	Male	49.30%
	Female	50.70%
	Total	100%

2	Teaching Experience	
	0-5 years	63.38%
	6-10 years	22.54%
	11-15 years	8.45%
	16-20 years	1.41%
	21-26 years	1.41%
	>25 years	22.54%
	Total	100%

3	Last Education	
	Bachelor	92.96%
	Teacher Prof Program (PPG)	7.04%
	Master	0%
	Doctoral	0%
	Total	100%

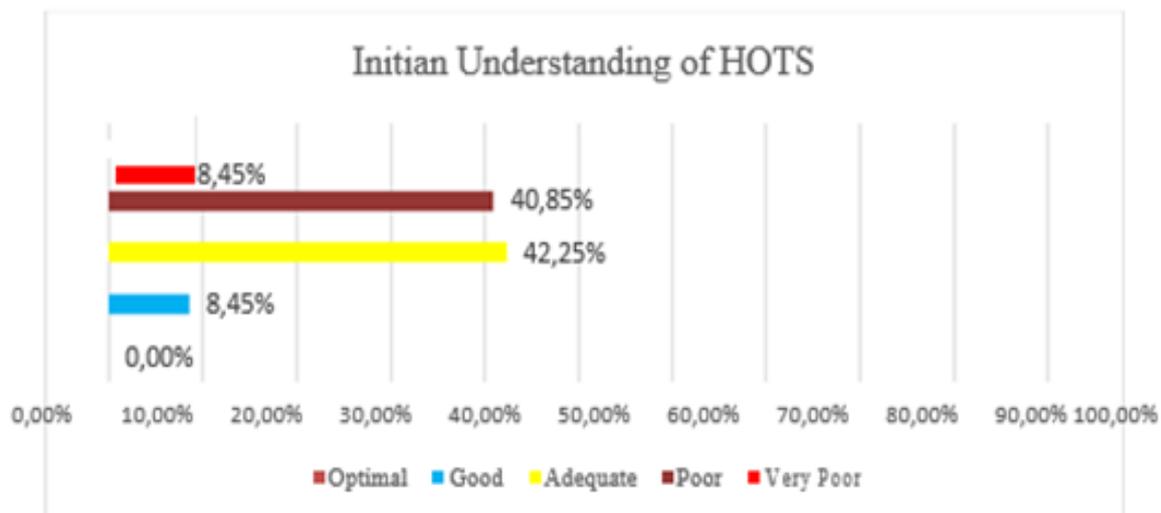
Based on the table above, there are 50.70% female respondents and 49.30% male respondents. According to the teaching experience, the majority of vocational teachers who became respondents in this study had teaching experiences between 0 to 5 years, with a percentage of 63.38%. Meanwhile, those with teaching experience ranges from 6 to 10 years and more than 25 years, occupied 22.54% of the respondents. This shows that, based on the teaching experience aspect, the respondents involved in this study have met the research criteria, which is to explore junior and senior teachers of understanding regarding the implementation of HOTS based learning in Vocational high school. Furthermore, based on the last education aspect, it was dominated by teachers with Bachelor level, which is 92.96%.

Meanwhile, the rest of the respondents are those with Teacher Professional Program (PPG), which is 7.04%. However, those are not the only aspects considered to become a professional teacher or a teacher who can create students required by the needs in the field and competencies determined by Business and Industrial World. The teacher also needs to have personal experience and understanding of learning concepts that are adaptable to the existing science and technology (Billett, 2011; Fejes & Susanne, 2012; Andersson *et al.*, 2013; Susanne, 2014; Sudana *et al.*, 2019).

Initial Understanding of Hots

The study result shows the initial understanding level of vocational teachers about HOTS based learning. To find it out, respondents were given a questionnaire which contained items regarding HOTS-based planning, learning process and assessment. The percentage of the initial understanding level of vocational teachers can be seen in Figure 1.

Figure 2. Initial understanding of Vocational Teachers of HOTS



Based on the picture above, the overall teacher's initial level of understanding of HOTS is at the level of adequate and poor. 42.25% of respondents have an adequate level of understanding in planning and conducting HOTS learning and conducting HOTS-based assessments. The result is those who have "Poor" and "Very Poor" level of understanding, which in total is 49.30%. This is a very important finding where half of the Vocational Teacher respondents have not yet implemented HOTS based learning optimally, whether in terms of planning, processes, and assessment of HOTS based learning. There are only 8.45% or six teachers who have conducted HOTS based learning well. This is contradictory to the importance of HOTS learning implementation. If HOTS learning is implemented properly, then the learning process will produce students who are ready to use in the world of work, because HOTS based learning educates students to be able to have high-level thinking and to

think independently and creatively to complete new problems faced by them (Ramos *et al.*, 2013).

Final Understanding of HOTS

This question item is intended to determine the understanding of vocational teachers after being given HOTS based learning training assistance. In the process, teachers were given training on how to make HOTS-based Lesson Plan; how to develop 21st-century skills in students such as critical and creative thinking, problem-solving, and collaboration skills. In addition, vocational teachers were also given training on how to create and detect HOTS-based questions. The increase of ability level of vocational teachers in implementing HOTS based learning can be seen in Figure 3.

Figure 3. Post-Assistance HOTS of Vocational Teachers

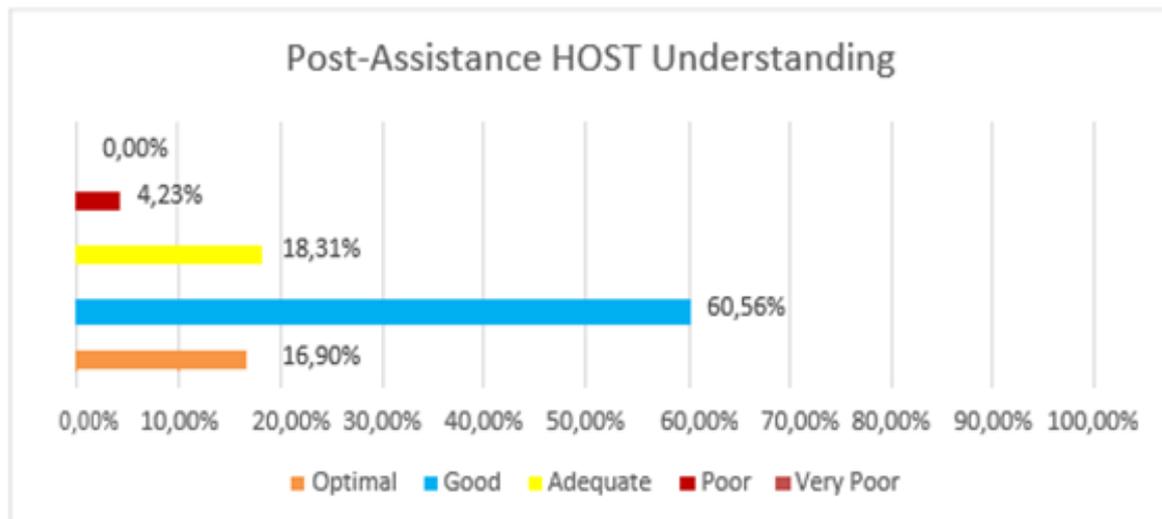


Figure 3 showed the increased ability of vocational teachers before and after the assistance. After the assistance, the majority of vocational teachers increased their understanding in implementing HOTS based learning where the teachers in the "Optimal" criteria is 16.90%; and the "Good" criteria is 60.56%. There is only 4.23% of teachers who still have a poor understanding of implementing HOTS based learning. This improvement data shows the need for intensive attention to teachers in the form of training or mentoring. Based on the data found in the field, it proves that teachers, especially in vocational education need a monitor or supervision in implementing HOTS based learning and evaluation in the proper and correct teaching and learning process according to the existing provisions.

The Effect of Mentoring Towards the Understanding of HOTS Vocational Teachers

In this study, pre-test and post-test were used to determine the significance of increasing the understanding of vocational teachers after being given HOTS assistance. Therefore, the alternative hypothesis (H_a) tested in this study is: "There is a significant increase in the understanding of vocational teachers about HOTS based learning". The following are the results of the hypothesis test analysis result using the paired t-test.

Table 3: Result of Paired t-test

Pair	Paired Differences			<i>t</i>	<i>Sig.</i>
	Mean	Std. Deviation	Std. Error Mean		
Post-test	1.8084E1	20.08037	2.38310	7.589	.000
Pre-test					

Table 3 showed that the significance value (*Sig.*) is smaller than the significance level (α) .05 ($.00 < .05$). Thus it can be concluded that there is a significant influence on the understanding of vocational teachers after being given HOTS based learning assistance. This means that training has a significant influence on improving teachers understanding in implementing HOTS based learning. The research results show that HOTS based learning is very useful for teachers as a guide in the class so that they are able to train students to become graduates who have competencies required by Business and industrial world, as stated by Shaheen (2012), Sudana, *et al.* (2015), and Sudana and Apriyani (2018), that students must own not only the hard skills but also the soft skills, which can be achieved by applying HOTS based learning and evaluation process.

Conclusion

HOTS based learning is needed to keep up with the evolution of current and future science and technology and to meet the needs of Business and industrial world of human resources that have required competencies. The materials obtained by students from the learning process affects the ability that will students use when finding a job. Therefore, applying HOTS based learning is very helpful for students to polish their abilities since at school. The contribution of providing training for teachers to improve their understanding of HOTS based learning and evaluation has much-helped teachers to fix the errors about HOTS based learning that have been made so far. The many contributions obtained from the training are the teacher can distinguish low level, middle and higher at the evaluation stage of learning; teachers can understand and apply scientific learning models and apply HOTS based



learning. It can be seen from the post-test results that show a significant number of the training result and how the teachers have developed evaluation tools that include the concept of analytic thinking, evaluation as well as design, where they are parts of HOTS based learning.

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