



Training of HOTS-Based Teaching Factory to Improve Teachers' Competencies at SMK Muhammadiyah 6 Jakarta

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ABSTRACT

This training aims at developing teachers' professionalisms and competencies that consist of analyzing, evaluating, creativity, and being able to conclude or solving problems at SMK Muhammadiyah 6, Jakarta. The training activities were conducted from 10 to 12 February 2020 at SMK Muhammadiyah 6 Jakarta. The number of participants who participated in the training was 17 people. The training uses lecture, discussion, demonstration, and practice methods. After the training, the participants practiced teaching factory topics based on HOTS and assisted by the PKM Team. The training resulted that the participants were satisfied that they showed the presence of enthusiasts at each training meeting. Participants presented a very well assessment of the attitude of activeness, cooperation, and responsibility towards mastering the development of HOTS-based teaching factories. The supporting factors for the PKM activities are (1) the availability of the team resources, (2) the enthusiasm of the participants, and (3) the support of the principal.

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INTRODUCTION

Background

Vocational education is a secondary education preparing to enhance the quality of the Indonesian workforce. The Presidential Instruction No. 9, the year of 2016 concerning the Revitalization of Vocational High Schools, followed by a memorandum of understanding between the relevant ministries became a rocket driving vocational education in Indonesia. According to the results of research conducted by Wahjusaputri, Fitriani, Syarif, & Article (2019), industrial workers in Indonesia were dominated by vocational education graduates for less than 65% in 2016-2020 due to the revitalization of SMKs in the development of teaching factory learning. It has succeeded in increasing the competency and quality of students' competitiveness who are ready to work in the business and industrial world. Revitalization of vocational high schools, specifically in teaching and learning of factories, conveys the main changes in the teaching and learning process in vocational high schools tailored to existing programs in the business and industrial world (*DU-DI*). The key to the education system in Indonesia is to prepare the students to win the competition in the quality of human resources, namely teachers as educators, learning systems, and infrastructure. The concept of a teaching factory is a learning system that unites the classroom learning with the work environment in the industrial world so that the students have real work experience relevant to the needs of the working world.

Thus, the teaching and learning factory involves teaching and learning in which the program of subjects in schools collaborates action-oriented activities within factory-to-classroom activities regarding Standard Operational Procedures (SOPs) in the industry (Rentzos, Doukas, Mavrikios, Mourtzis, & Chryssolouris, 2014).

It is essential to realize together with all parties in the Indonesian education world, who compete against the era of education industry 4.0, improving the students' competence in teaching factory learning. Participation in learning based on HOTS (Higher Level Thinking Skills) also benefits the students because with the ability to think at a high level, students think creatively, critically, innovatively, and solve problems that occur in the future. Higher-order thinking skills (HOTS) make students learn independently (Heutagogy Learning). This result supports the ability of qualified human resources, in which the teacher is the front guard in the world of education.

The government encourages training, mentoring, strengthening, and coaching teachers in developing HOTS (Higher Order Thinking Skills)-based learning to create competent students in the work field according to the needs of business and industry in the 4.0 industrial era. Through this HOTS-based learning development training, the teachers improve the knowledge, skills, and competencies of high-level thinking, namely: Critical Thinking, Creative and Innovative, Communication Skill, Collaboration Skill, and Confidence. High-level thinking is a thinking process that consists of complicated pro-

cedures; it needs to be relevant to various skills such as analyzing, synthesizing, comparing, inferencing, interpreting, judging, and reasoning either inductively or deductively to solve extraordinary problems (Smith (1992); Zohar and Dori (2003) Budsankom, Sawangboon, Darmongpanit, & Chuesirimonkol (2015)). The purpose of the teaching and learning process that is relevant and well-planned supports students' success in analyzing HOTS-based questions (Zebua & Harmalis, 2019).

SMK Muhammadiyah 6 Jakarta (The Muhammadiyah 6 Vocational High School Jakarta) is one of the private vocational high schools standing on the Joint Building of Muhammadiyah Matraman College 27 Aisyah Kindergarten, located on Jl. KH. A. Dahlan No. 20, Matraman, East Jakarta. The headmaster of The Muhammadiyah 6 Vocational High School Jakarta is Drs. Muhtadin Syah. The Muhammadiyah 6 Vocational High School Jakarta is an accredited A with Office Administration Study Program (2 classes) and Accounting Study Program (1 Class). Based on the analysis of the situation above, The Students Creativity Program (*PKM*) activities conducted by The UHAMKA lecturers, students, and partners were training, mentoring, strengthening, and coaching in the development of questions based on HOTS (Higher Order Thinking Skills) teaching factory learning. The obstacles of this training were the teacher and education staff did not have experience in designing questions based on Higher Order Thinking Skills (HOTS) related their teachings, the teacher did not have the skills and knowledge about developing questions based on Higher Order Thinking Skills (HOTS), the development of questions was still in a conventional way--was not HOTS-based question development.

LITERATURE REVIEW

Teaching Factory

A teaching factory is a product/service-based learning concept that refers to standards and procedures related to the business and industrial world (*DU-DI*). Learning materials in schools are adjusted to industry programs create industrial classes as the atmosphere of the working environment in the business and industrial world (*DU-DI*) (Rentzos, Doukas, Mavrikios, Mourtzis, & Chryssolouris, 2014). In teaching factory learning, a trainer from the industry provides learning materials according to the desires and needs of the industry so that the students have an understanding of science, technology, production of goods, the value of cooperation with colleagues (Reisinger et al., 2019). Sintha *et.al.* (2019) stated that the potential competency of the students in the innovation and implementation of teaching factory-based learning catered in the School Management component as 70%, Workshop-Lab 85%, Training -Learning Pattern 80%, Marketing-Promotion 70%, Products-Services 78%, HR (productive-subject teachers) 90% and Industrial Relations 75%. However, the concept of teaching factory gives opportunities for the students to obtain some advantages in (1) providing materials equipped with programs in the industrial environment, (2) experiencing hands-on work in the industrial world, (3) training to work together in teamwork to solve a problem (Chryssolouris, Mavrikios, & Rentzos, 2016).

Furthermore, Stojkić, Bošnjak, & Zanin (2019), explained that in the framework of the success of the teaching factory learning process, teachers and students must have a high order thinking skills (HOTS). HOTS-based helps teachers in teaching and learning with teaching materials used, for example, modules that can improve students' higher-order thinking skills (Winarno et al., 2015). However, to improve teacher competency in the teaching development process, a High Order Thinking Skills (HOTS) training was conducted.

Training

Training is a well-planned effort of the organization (school) to help teachers as educators obtaining knowledge, abilities, skills, and behaviors related to workers so that implemented in the areas of they teach. The training program is in the form of training held at school (in the job training) or outside of school (out the job training) such as attending seminars, workshops and others. According to Jeffry and Rulianto (2017), the training held by the school does not only develop teachers but also provides benefits for other human resources (educational staff) to get a competitive advantage. The training program plays a role in an organization to determine the efficiency and effectiveness of school management. The training program provides some tangible benefits namely (1) increasing the quantity and quality of achieving the performance standards seek by schools; (2) forming more attitudes, loyalties, and profitable cooperation; (3) reducing the frequency and cost of work accidents; (4) assisting teachers in their improvement and development. This statement is in line with the statement made by Schermerhorn (2010) said that training is an activity that helps and improves specific skills.

Higher Order Thinking Skills (HOTS)

Higher-Order Thinking Skills (HOTS) is a high-level thinking skill that demands critical, creative, analytical thinking of information and data in solving problems (Barratt, 2014). In the category of transfer of knowledge, HOTS require students not only to remember but also to understand and to be able to use what they have learned (Anderson, Krathwohl, *et. al.*, 2001). The category of HOTS in critical thinking includes definitions that refer to reflective thinking that focuses on mental processes to determine what to believe or do, reasoning, questions and inquiry, observing and describing, comparing and connecting, finding complexity, and exploring points of view (Norris & Ennis, Barahal, 2008). In the problem-solving category, Brookhart described it as a mental process whereby a person wants to achieve a particular purpose or goal but does not automatically recognize the right path or solution t. A student cannot automatically recognize the right way to achieve the desired goal. He/she must use one or more high-level thinking processes. This thinking process is named problem-solving (Nitko & Brookhart, 2007). Although experts and researchers differ in defining HOTS, they commonly agree that higher-order thinking or learning means the ability to go beyond the information provided to instill critical attitudes, metacognitive intelligence, and problem-solving (McLaughlin & Luca,

2000). Developing critical thinking requires practice in finding patterns, developing explanations, making hypotheses, making generalizations, and documenting findings with evidence (Eggen, 2012). High-level thinking is a type of thinking that tries to explore questions about existing knowledge related to issues that are not clearly defined and do not have definite answers (Haig, 2014). Yee (2016) revealed that the ability to think highly needed by students in solving problems through the discovery of ideas. Following the 2013 curriculum, the need for high-level thinking skills is continuously obligatory by students in carrying out learning, either to obtain an understanding of the subject matter or to be able to solve questions as an evaluation of the learning that is carried out.

MATERIALS AND METHODS

Research Framework

Team (*PKM*) (lecturers and students) socialized the need for training, mentoring, and coaching activities to the partners (schools). Within this socialization, it is expected that the partners (schools) supported the activities of *the PKM* program institutionally, materially, and morally. In the socialization of PKM activities, The Service Team did not only deliver kind of the activities but also presented the background, purpose, and objectives of PKM activities so that participants got an initial idea of the idea of these PKM activities. The socialization includes the following:

1. Providing specific learning materials based on Higher Order Thinking Skills (HOTS) specifically in the instructions. The teacher not only teaches language and concepts but also informs the students what they need to do in higher-order thinking.
2. Providing training on HOTS-based question development design to teachers through question and answer forums and discussions on individual and group class.

Question-Development Training of HOTS-Based Teaching Factory

The realization of HOTS-based teaching factory learning development activities was conducted directly during training, mentoring, strengthening, and coaching to teachers. SMK Muhammadiyah 6 Jakarta teachers majoring business and office management received various realistic solutions to the problem of teaching and learning process as follows: (1) The UHAMKA Service Team provided training, mentoring, reinforcement and guidance to the teachers of SMK Muhammadiyah 6 Jakarta in improving their competency in planning and developing the questions of teaching factory learning, especially in the areas of business expertise and office management based on Higher Order Thinking Skills (HOTS) as an effort to improve the quality of learning and the quality of graduates of SMK Muhammadiyah 6 Jakarta; (2) Through training programs, mentoring, strengthening and coaching conducted by The UHAMKA Service Team (lecturers and students) to teachers of SMK Muhammadiyah 6 Jakarta improve social skills (soft skills), educate students to think highly at critical levels (critical thinking), cre-

ative and innovation (creative and innovative), communication skills (communication skills), the ability to work together (collaboration) and self-confidence (confidence) to face problems in the era of education 4.0; (3) Provide work references in terms of developing HOTS-based questions, business subject matter and office management so that teachers have High-Level Thinking Skills.

Participants

The participants of this *PKM* are the principal, teachers in business, and office management major as well as the educational staff of SMK Muhammadiyah 6, Jakarta with a total of 17 people. The headmaster of SMK Muhammadiyah 6 Jakarta is Drs. Muhtadin Syah. These *PKM* activities are located on Jalan KH. A. Dahlan No. 20, Matraman, East Jakarta.

Activity Method

The problem-solving method was used by the UHAMKA Service Team used in the development of HOTS-based questions teaching and learning according to the Dick and Carry model, adjusted to the needs of teachers at SMK Muhammadiyah 6 Jakarta consisting of four stages, namely: (1) the preliminary stage as the initial stage which gathering student information; (2) the planning stage of HOTS-based teaching factory learning model for teachers as the development of initial product forms; (3) the testing, evaluation, and revision stages, and (4) the implementation phase of teaching factory learning. To measure the successful application of the development of HOTS-based teaching factory learning questions was obtained by the average value of the questionnaire given to the teachers. The data collection techniques were: (1) Observation; (3) Interview; (4) questionnaire and (5) documentation. After implementing the Focus Group Discussion (FGD), the next step was model evaluation. The Focus Group Discussion (FGD) activity involved 20 experts (expert judgment) consisting of 2 lecturers from The UHAMKA Service Team Team, 2 students of The UHAMKA; 1 school principal, 16 productive-teachers in each department at SMK Muhammadiyah 6 Jakarta. One function of descriptive analysis is to present data on the results of community service activities in a simple form so that it is easy to get a picture of the results. By analyzing the results of validation (assessment) data of the service activities from experts who have provided useful inputs to improve the model development of questions based on Higher Order Thinking Skills (HOTS) and its completeness.

RESULTS AND DISCUSSION

The *PKM* activities resulted in the evaluation of the participants' attitudes regarding activeness and responsibility in the activities of developing HOTS-based questions related to teaching-factory in groups as well as *PKM* participants individually. Also, the participants' attitudes evaluated the ability of the process of developing questions based on Higher Order Thinking Skills (HOTS).

Based on a questionnaire given to 17 teachers as participants in the *PKM* activities, the assessment of the activeness of the participants (principals, teachers, and education staff) resulted as one of the aspects observed by the Service Team. The results of evaluating *PKM* activities are presented in the Table 1., Table 2., Table 3., and Table 4.

The activities of The UHAMKA *PKM* Service Team were well-conducted. Support of all parties, both from the Principal SMK Muhammadiyah 6 Jakarta (Drs. Muhtadin), productive-subject-teachers who participated in the *PKM* activities with all enthusiasm in the activities. Also, many parties involved in this activity, including students who were getting involved with high enthusiasm, were determined to carry out the *PKM* activities as well as possible. The enthusiasm of all seventeen trainees made these activities lively that indicated by the attendance of the trainees according to the invitation, starting at 13:00. As can see in Picture 1.

The training, mentoring, reinforcement, and coaching activities for teachers at SMK Muhammadiyah 6 Jakarta conducted according to the material in the form of developing Higher Order Thinking Skills (HOTS) questions was new knowledge that was discussed in the world of education. Besides, the results of observations and information from teachers in the field of management and office business at SMK Muhammadiyah 6 Jakarta were conducted through a need assessment questionnaire given at the socializing time. Most of the participants stated that they had never participated in the topic of developing teaching factory based learning-related Higher-Order Thinking Skills (HOTS) for teachers of office management and business major at SMK Muhammadiyah 6 Jakarta. Considering this reason, The UHAMKA Service Team became even more convinced that the topic of *PKM* activities provided was highly needed in this relevant field. Various assessments carried out in *PKM* activities including attitude assessment, namely participants' activeness in participating in material delivery activities, cooperative attitude, and responsibility in completing tasks among group members, as well as evaluating mastery of HOTS questions through independent assignments of turning common questions into HOTS questions and developing HOTS questions in groups, and performance evaluation through presentations. Overall assessment of the activeness of participants' attitudes in participating in *PKM* activities was in the category of "Good" which valued 75%. Although the category was "Good", the evaluation of the attitude assessed in this activity showed that teachers still need to improve the eagerness, especially in terms of asking/answering that contributed 37% of all aspects of the assessment. Evaluation of attitude assessment resulted that the teacher still maintained and kept this attitude in every activity undertaken by the teacher, both in teaching and in scientific activities between colleagues in school and between schools.

The second assessment was the attitude of responsibility of the *PKM* participants in HOTS Problem Development in groups that showed an average of 79% or in "The Good" category. Based on the three aspects assessed, the aspect of "correcting mistakes" contributed the smallest number as of 63%. The

Table 1.
The results of the Assessment of Participants' Attitudes Assessment Results

No	Aspects observed	Criteria	Observation Results				Average (%)	
			1	2	3	4	Yes	No
1	Paying attention to the explanation of the UHAMKA Servant Team Team	Yes	17	17	17	17	17	-
		No	-	-	-	-	-	-
2	Take notes on the explanation from the UHAMKA Servant Team	Yes	9	11	13	15	12	-
		No	8	6	4	2	-	5
3	Actively ask / answer	Yes	7	9	10	12	9	-
		No	10	8	7	5	-	7,5
Average of All Aspects						75%	37%	

Source: Respondent Data Processing (2020)

Table 2.
The results of the Assessment of Participants' Responsibility
in Developing HOTS Questions in Groups

No	Aspects observed	Average of each group (4 observer)				Average (%)	
		1	2	3	4	Skor	%
1	Complete assignments on time	4	4	4	4	4	100
2	Complete the task accordingly command	3	3	3	3	3	75
3	Correct the error problems	3	3	2	2	2,5	63
Average of all aspects						3	79 %

Source: Respondent Data Processing
(2020)

Table 3.
The Results of Assessment on Participants in Developing Questions of
Business and Management Major based on HOTS

Group	Subject matter	Number of questions	Rating result	
			Correct	Wrong
1	Checking source and supporting documents at a trading company	5	4	1
2	Recording transactions into <u>dagan</u> inventory books	5	3	2
3	Prepare a trial balance at a trading company	5	4	1
4	Prepare a profit / loss statement, changes in capital, balance sheet and cash flow for a trading company	5	4	1
5	Prepare closing journals, <u>post closing</u> journals and compile a trial balance after closing for trading companies	5	4	1
	total	25	19	6
		Rerata (%)	76 %	24 %

Source: Respondent Data Processing (2020)

Table 4.
The Results of Assessment on Participant in Performing
Presentation in Developing HOTS Question

No	Aspects observed	Criteria	Observation result by observer				Average (%)	
			1	2	3	4	Yes	No
1	The ability to convey idea	Yes	4	4	4	4	4 (100%)	-
		No	-	-	-	-	-	-
2	The ability to express	Yes	4	3	4	4	3,75 (93,7%)	-
		No	-	1	-	-	-	0,25 (6,25%)
3	Ability to respond question	Yes	4	3	3	3	3,25 (81,25%)	-
		No	-	1	1	1	-	0,75 (18,75%)
4	The ability to respect a friend's question	Yes	4	4	3	3	3,5 (87,5%)	-
		No	-	-	1	1	-	0,5 (12,5%)
5		Yes	3	3	3	3	3,0 (75%)	-
		No	1	1	1	1	-	1 (25%)
Rerata (%)						88%	16%	

Source: Respondent Data Processing (2020)



Picture 1.
The Activities of the UHAMKA PKM

assessment of the attitude of responsibility resulted in the very necessary commitment of teachers in improving themselves so that the teachers always behave politely and ethically in the teaching and learning process. It is a must for teachers to be much better in responsibility because teachers are role models for students especially when teachers ask their students to be responsible for doing the task. The next assessment related to the development of HOTS-based business and management skills which was the ability of the *PKM* participants to develop common questions into HOTS-based (independent training) showed good categories because 76% of participants working on correct questions while 24% participants were wrong working on HOTS-based. The evaluation assessments were training, mentoring, and reinforcing in developing HOTS-based questions of teaching-factory in the business and office management. These activities brought great changes to teachers in the process of learning innovation provided to students. Teachers as the frontline in education must study harder, both independently at home by practicing continuously and together in the MGMP forum. Additionally, teachers must read a lot and broaden their horizons so that they can develop their knowledge not only from one book. The next assessment was the *PKM* participant's performance skills (presentation) in developing HOTS questions showing that the ability to convey ideas, provide arguments about HOTS-based learning, respond to questions from the UHAMKA Service Team, respect peers' questions and the ability to accept suggestions from participants and the UHAMKA Service Team showed a very good category from the number of seventeen participants reached an average of 88% with "very good categories". Indeed, the aspects of the ability to argue contributed 6.25%. An evaluation of the results of this study showed that teachers and staff of SMK Muhammadiyah 6 Jakarta as The UHAMKA *PKM* participants mastered HOTS-based learning material provided by The Service Team, even though in the relatively useful short time. The barring factor in the implementation of this training activity was almost not found, because of the cooperation between The UHAMKA Service Team with the headmaster and teachers until the training activities were conducted, from the first meeting to the third meeting.

CONCLUSIONS AND SUGGESTIONS

Conclusion

This *PKM* activity has succeeded in providing an understanding of the characteristics and techniques of developing questions in the teaching factory learning issues specifically in the major of business and office management based on Higher Order Thinking Skills (HOTS), providing direct experience in turning common questions into HOTS-based questions and in developing about HOTS-based teaching factory learning for teachers of SMK Muhammadiyah 6 Jakarta. Based on the assessment of attitudes; activeness, cooperation, and responsibility were in the "good" and "very good" categories, respectively. The assessment of mastery in developing teaching factory questions, especially in the major of

business and office management, based on HOTS through independent and group assignments, resulted in that were "quite satisfactory", because most teachers had begun to master well, but teachers and education staff need to study harder and more practice at home and in the MGMP forum. The performance evaluation showed very good results.

The PKM activities through training, mentoring, reinforcement, and coaching to teachers and educational staff of SMK Muhammadiyah 6 Jakarta received full support from partners (schools), especially school stakeholders, namely school principals and teachers as educators provided public policies, implemented authentic assessment based on HOTS following the demands of the 2013 curriculum.

Suggestion

The UHAMKA PKM Service Team activities suggested:

1. For the DKI Jakarta Provincial Education Office, as an important matter of thought, a comprehensive HOTS-based question development training program will be held for private teachers at various levels of education and all subjects, so that teachers know, understand, and able to develop the questions they can.
2. For productive-teachers in the major of business and office management and other subject teachers should actively learn about the ins and outs of developing HOTS-based questions and how to apply the questions so that they can apply in their respective subjects.
3. For students to be able to identify the characters of higher-level thinking critical thinking, creativity and innovation, communication skills, collaboration skills, and confidence in solving learning problems.

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