Improving the capability of decision making high school students through physical practicum activities using HOTV-lab model

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Abstract. This study aims to get a picture of the improvement of decision-making ability of high school students as the effect of using HOTV-Lab model in Physics practicum activities. The research method used is pre-experiment with design one group pretest-posttest design. The subject of research is 40 students in one of high school in West Bandung. The subjects were chosen by random sampling technique. Instruments used for data collection decision-making ability at the time before and after Physical practicum activities is a test of decision-making ability in the form of essay test. Increased decision-making ability of high school students was analyzed using the concept of normalized average gain scores, <g> formulated by Hake. The results showed that 78% of students had a high increase, 19% of students had moderate increase and 3% had a low increase in decision-making ability. This suggests that the use of the HOTV-Lab model in Physical practicum activities has a moderate effectiveness in facilitating improved decision-making capabilities.

1. Introduction
In the skills of the 21st century dreadfully needs high-order thinking skills. One part of high-level thinking is the decision-making skill. Decision-making involves a person to choose a decision or policy of two or more alternatives with considerations that may be influential in the future. Decision-making skills are influenced by critical thinking skills to solve problems. The role of critical thinking skills has in making decisions based on reason appropriately referring to data. While the decisions taken can be used for problem solving. Problem solving is an activity that is done in analyzing the situation systematically to get a solution. While decision making is a series of activities in making decision choices in the process of problem solving. Thus, decision-making is part of problem solving, and decision-making occurs at every step of the problem-solving process. Education trains students to have decision-making skills in the future. Bad decisions can be fatal to the decision maker or the people involved in the policy in the decision. Therefore, students' decision-making skills need to be trained. In determining an action to be taken also requires tactics and strategies.

One way to train students to improve their decision-making skills is through practicum activities. But practicum activities to date have not been effective. Based on observations in one of the high school in West Bandung regency, laboratory activities commenced did not get the estimated results. Things found
during the observation, namely 1) Laboratory space within a certain time is often used as a class so that the practicum is through in regular class or exchange classes, this is quite upsetting preparation lab; 2) Insufficient school equipment for practicum on certain materials; 3) The practice is verified to ascertain the concepts, laws and principles that have been given in erstwhile learning; 4) Sometimes the results of the lab does not prove a concept well because of the restrictions of observations or tools used. Thus the practice method becomes futile and does not train learners to think critically and proficiently in making decisions.

At this time educators have begun to gain access to use various technologies to improve the effectiveness of the learning and teaching process. Computers as one of the technologically valued products appropriately used as teaching aids. Learning can be more effective, efficient, interesting, and interactive if facilitated by the media of learning. The learning media itself utilizes many diverse technologies known as educational technology. The use of instructional technology has a positive impact on the interest and enthusiasm of learners in the learning process. A variety of instructional approaches packaged in computer-aided instructional programs such as simulations, tutorials and games can be obtained via computer. One form of technology that has been widely used as a substitute for a real laboratory is a virtual laboratory. Simulation of real environment created by computer. Virtual lab users can interact through computers with results that reveal the content of an environmental reality called virtual reality. Actual lab activities can be replaced by using computer-aided virtual lab media without compromising the essence of learning itself. Virtual lab can be used as a learning resource for students, so that students are more motivated to study the subject matter of physics. Learning by practice method plays an active role in developing students' learning process skills. But the lab has traditionally had some limitations and problems. Among security issues, inadequate facilities, require a lot of time and cost and difficult to get accurate test results. To solve problems from traditional physics laboratories, sought ways for learners to actively build their own knowledge. One way that can be pursued with a virtual lab scenario through computer-based simulation. Virtual Lab, too, is used in systems that aim to replace equipment on a real lab with a set of virtual equipment. Students can manipulate the various parameters of the simulation and observe the results. Another approach is to a virtual lab that can provide virtual workplaces that comply with physical law [5].

Practicum with verification method only gives experience working in laboratory like artisans. Learners only follow the instructions presented in the procedure or steps of activities that must be passed. Therefore it is necessary to change the design of practical activities for learners have high-level thinking skills such as appropriate decision-making. In accordance with the expected ability to learners capable of high-level thinking, developed high-level thinking lab activities better known as Higher Order Thinking Laboratory (HOT Lab). [3] HOT Lab is a combination of Creative Problem Solving (CPS) and Problem Solving Laboratory (PSL) models. Activities in HOT Labs help learners with problem identifiers, design procedures, gather information and process experiment data. HOT Lab is a laboratory troubleshooting activity that trains learners to practice making decisions based on physics [16].

Physics lessons are a lesson on natural phenomena, but not all physics material can be observed directly by students. This makes it difficult for students to understand the concept of physics. One of the material physics that studies the motion of very small particles of a substance is the kinetic theory of a gas. The material of the gas kinetic theory discusses the characteristics of gas particles in enclosed spaces. In connection with the Boyle Law trial, Charles Law, Gay-Lussac Law, Boyle-Gay-Lussac equation, gas kinetic theory studies the relationship of macroscopic properties of gases such as pressure, volume and temperature of the gas. During this study of physics on the material kinetic theory of gas is very difficult if through practical activities in real. Therefore, the authors conducted a study using a virtual lab to facilitate students in understanding the macroscopic properties of gas in a confined space.

2. Method
The research method used is pre-experiment with one-pretest-posttest design to compare the enhancement of decision-making skill of learners who get practicum activity with HOTVL model and practicum activity with laboratory verification model. The subjects were chosen by random sampling technique. The subjects consisted of the control class and the experimental class. Both classes were given a primary test. Then the experimental class is treated by applying the HOTVL model while the
control class gets treatment with the verification lab model. Next the two classes were given the final test. Instruments used for data collection decision-making ability at the time before and after Physical practicum activities is a test of decision-making ability in the form of essay test. Increased decision-making ability of high school students was analyzed using the concept of regularized average gain scores, <$g>$ formulated by Hake. Technique of collecting data using question test of decision making.

3. Result and Discussion
The results showed that 78% of students experienced a high proliferation, 19% of students had restrained increase and 3% had a low increase in decision-making ability. Practical activities with the HOTV Lab model train students through observation to identify problems, make some alternative decisions, make the best decisions and act to contrivance decisions.

4. Conclusion
From the results of the research, it shows that the use of HOTV-Lab model in Physics practicum activity has the effectiveness of being in facilitating the improvement of decision-making ability. The application of HOTV Lab design is more effective on improving decision making skills compared to the application of lab verification design on kinetic gasses concept. Therefore, the application of HOTV Lab design more making an allowance for for use in physics learning in another concept, as well as in physics learning in the other recognized education level.

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