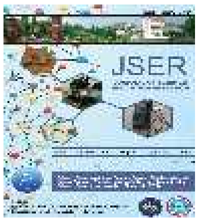
JSER 2018, 2(1), 35-38

JSER

Journal of Science Education Research

Journal homepage: www.journal.uny.ac.id/jser



The Role of Inquiry-Based Interactive Demonstration Learning Model on VIII Grade Students' Higher Order Thinking Skill

Erni Yulianti[1*] , Itsna Yunida Al Husna[2], dan Susilowati[3]

[1,2,3]Study Program of Science Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Malang

Corresponding Author. Email: erni.yulianti.fmipa@um.ac.id

Keywords:
higher order thinking skill, interactive demonstration, discovery learning

ABSTRACT

Teacher's domination in teaching science subject is still found in many schools, including junior high schools. Since then, students experience a lack of direct observation leading to not only their low conceptual understanding, but also their higher order thinking ability. Therefore, the implementation of a proper learning model becomes a crucial breakthrough. In this present paper, we focus on the influence of learning model with inquiry level of interactive demonstration (as the experimental class) and discovery-based learning model (as the control class) on the VIII grade students' higher order thinking ability. We used posttest only control group design by means of using 20 validated multiple choice questions with reliability of 0.872. The data analyses were completed comprehensively, from normality test to t-test on students' ability. As the conclusion, according to those data analyses, students' higher thinking skill is better when students are thought by interactive demonstration rather than by discovery learning.

INTRODUCTION

Berisi Science teaching and learning should focus on the constructivist approach to develop students' competency in such a way that they are willing to understand the way the nature works, known as an inquiry skill (Trianto, 2010: 152). According to our preliminary observation in a junior high school in Malang, we found that the teachers are tend to dictate their students in the class. As a result, the students undergo deficiency direct-based observation experience during their proses of exploring important concepts and details. This situation leads to an incomplete learning experience that only covers the very lowest cognitive domain (Trianto, 2010: 154) and students are not trained to think in the higher order which in turns they will have lack higher order thinking skill.

Higher order thinking skill (HOTS) can be described as a thinking skill that requires not only the ability to remember, but also other higher abilities, such as analytical skills, evaluation, and creation. They are the wider use of the mind to discover new challenges (Heong, et al, 2011). Newman and Wehlage (1992) stated that high-order thinking skills enable students to learn more deeply, understand better concepts, solve more problems, construct linked knowledge, make a hypothesize, and understand complex phenomena. High-level thinking is an important aspect of a learning process, particularly for students in solving problems. Therefore, HOTS may provide students to develop their academic performances (Heong, et al, 2011).

According to Thomas and Thorne (2011), since HOTS can be learned by and taught to students, a teacher must create a conducive learning condition making students become active to cultivate their cognitive skills in terms of high-order thinking skills. One of the best way to keep students active in learning is to implement a proper learning model. According to Yuliati (2008: 5-6), science learning is directed to be inquiry-based learning. Through inquiry learning, students can gain experience directly in the process of finding out key concepts.

One of the inquiry levels according to Wenning is interactive demonstration. It is a constructivist-centered learning model. Students are asked to predict experimental results, observe, and discuss predictions that have been made (Zimrot & Ashkenazi, 2007). Levels of Inquiry-interactive demonstration includes teacher demonstrations, developing and asking inquiry questions (Wenning, 2005). In addition, demonstrations by teachers can identify the student's initial ability is still limited to explore the students' abilities Ashkenazi and Weaver, 2007).

METHOD

We utilized a quasi-experiment with posttest only control group design. The research design is given in Table 1.

Random sampling approach was employed to choose students from all VIII grade students in SMPN 1 Singosari. The chosen classes were class VIIIB and VIIIC. Students in class VIIIB, as the control class, were thought by levels of inquiry-discovery learning. Meanwhile, students in class VIIIC, as the experimental group, were thought by levels of inquiry-interactive demonstration. To compare the results of the two distinctive learning models, students were set to take posttest. 20 multiple choice questions on the topic of pressure were prepared and validated by experts.

Prior to t-test that was performed via Microsoft Excel 2013 to evaluate students' posttest results, normality and homogeneity tests were completely done to verify the statistical test type. The normality and homogenity tests were respectively conducted by Kolmogorov Smirnov and Levene tests.

Table 1. Research Design

Class Group	Treatment	*Posttest*
Experiment (E)	X_1	O_1
Control (C)	X_2	O_1

(Creswell, 2012: 310)

RESULT

Students preliminary ability and posttest marks, on the topic of pressure, were analyzed its normality and homogeneity. The mark of students initial ability was obtained from the previous topic (the digestive system of food) exam. t-test was employed to know the student's initial ability. The different test started with the prerequisite test of normality and homogeneity.

The normality test used was Kolmogorov Smirnov test. Table 2 depicts the students' initial ability test. Based on Table 2, Dcalculated is less than Dtable, for both experiment and control classes, implying normal distribution. Furthermore, Homogeneity test was conducted by means of Levene test. Table 3 summarizes the homogeneity of students preliminary ability. Clearly, the smaler value of Fcalculated than that of Ftable indicates the homogenous criteria for the students preliminary ability. Table 4 shows t-test Result on the Students Preliminary Ability. From Table 4, we conclude that the two classes show the same performance.

Table 2. Normality Test on the Students Preliminary Ability

Class	$D_{\text{calculated}}$	D_{table}	Criteria
Experiment	0.239	0.248	Normal
Control	0.228	0.248	Normal

Table 3. Homogeneity Test on The Students Preliminary Ability

Class	$F_{\text{calculated}}$	F_{table}	Criteria
Experiment Control	1.369	4.007	Homogeneous

Table 4. t-test Result on the Students Preliminary Ability

Class	$t_{\text{calculated}}$	t_{table}	Note
Experiment Control	1.170	2.002	There is no difference between the two classes

Table 5. Normality Test on The Students Posttest

Class	$D_{\text{calculated}}$	D_{table}	Criteria
Experiment	0.204	0.248	Normal
Control	0.150	0.248	Normal

Table 6. Homogeneity Test on the Students Posttest

Class	$F_{\text{calculated}}$	F_{table}	Criteria
Experiment Control	0.803	4.007	Homogen

Table 7. t-Test Result on The Students Posttest

Class	$t_{\text{calculated}}$	t_{table}	Note
Experiment Control	3.058	1.671	$t_{\text{calculated}}$ is larger than t_{table}

The posttest score of students were obtained after applying interactive demonstration model in the experimental class and discovery learning model in the control class for 5 meetings. Table 5 summarizes the posttest normality test after the treatment. Both classes show normal criteria for the students posttest. Table 6 is the summary of the homogeneity test of posttest students after the treatments. Again, the smaller value of Fcalculated than that of Ftable (in Table 6) dictates the homogenous criteria for the students posttest.

Hypothesis test using t-test for students posttest is given in Table 7. It is noted that the tcalculated is larger than ttable meaning that the higher-order thinking ability of students studying with the levels of inquiry-interactive demonstration model is higher than that with the levels of inquiry-discovery learning model.

Levels of inquiry-interactive demonstration and levels of inquiry-discovery learning models have the same learning stages in terms of observation, manipulation, generalization, verification, and application. However, during the learning process, there are significant differences in the stage of manipulation, verification, and application. Levels of inquiry-interactive demonstration is a student-centered constructivist learning model which is able to help students develop their thinking skills. The level of thinking ability of students increases with more students involvement during the learning process.

At the stage of manipulation in levels of inquiry-interactive demonstration learning, students observe demonstrations provided by the teacher and then find problems based on the demonstration. The process of finding problems can train students' HOTS (Mainali, 2012). The verification stage in levels of inquiry-interactive demonstration learning, students get reinforcement of material from repeated demonstrations conducted by the teacher. At this stage, the teacher straightens all perceptions so that students have the same understanding. The teacher re-demonstrates clear results to makes sure that students are able to compare the results of the demonstration with their own predictions. If there is an alternative conception of the student, the teacher must complete it by giving strength to them (Wenning, 2012) by straightening the initial conception to improve students' understanding. At the application stage in levels of inquiry-interactive demonstration learning, students are given new problems that requires students to use their knowledge to analyze and solve the problems. High-level thinking skills can be developed as students face more problems. When students have gained clear understanding of a concept, more problems will help them reinforce thinking patterns and develop their thinking ability. Students are said to have high-order thinking skills when they are able to separate any unrelated informations during the problem-solving processes (Mainali, 2012). As stated by Sofiah et al (2015) that in order to achieve high-level thinking, students should be accustomed to solve problems that require thinking to analyze, judge and create.

The higher-order thinking ability of students receiving levels of inquiry-discovery learning is lower than that of students receiving levels of inquiry-interactive demonstration learning. This is because students have no direct experience in finding problems and constructing their knowledge into new understanding. Teachers have a dominant role during learning so that the thinking process of students has not reached higher levels. The thinking ability of the students is better developed when the students are directly involved in observing, asking questions, formulating problems, conducting experiments, and evaluating. Levels of inquiry-interactive demonstration helps students develop thinking skills with direct student involvement in the learning process. The students thinking ability in constructing the learned material will be easier when the students are directly involved in experiments that are conducted with direction and pattern.

The results of this study are in a good agreement with the research conducted by Hidayati et al (2015) which showed that through the learning of levels of inquiry-interactive demonstration, students' critical thinking ability is higher than the levels of inquiry-discovery learning study. Furthermore et al (2016) stated that students' problem-solving abilities that learn with levels of inquiry-interactive demonstration are higher than levels of inquiry-discovery learning. It is in line with the result reported by Febriani *et al* (2017) particularly the increase of students' creative thinking skills due to the use of scientific worksheets. According to Cohen (in Costa, 1985: 44), critical thinking skills, student's creative thinking skill, and problem-solving abilities are indicators of higher-order thinking.

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that the application of levels of inquiry-interactive demonstration can effectively develop students' high-order thinking skills. Through levels of inquiry-interactive demonstration learning, students' higher-order thinking is higher than levels of inquiry-discovery learning. Levels of inquiry-interactive demonstration can be used as an alternative learning that can develop students' high-order thinking skills.

REFERENCES

Ashkenazi, G dan Weaver, G.C. (2007). Using Lecture Demonstrations to Promote the Refinement of Concepts: The Case of Teaching Solvent Miscibilility. Chemistry Education Research and Practice, 8 (2):186-196.

Creswell, J.W. (2012). *Educational research: planning, conducting, and evaluating quantitative and qualitative research*. United States of America: Pearson, (*Online*), (http://www.*Online*cef.net), accessed on 12 June 2017.

Costa, A.L., Ed. (1985). *Developing Minds: A Resource Book for Teaching Thinking*. (*Online*), (https://eric.ed.gov/?id=ED262968), accessed on 27 April 2017.

Febriani, S., Sudomo, J., Setianingsih, W. (2017). Development of Student Worksheet Based on Problem Based Learning Approach to Increase 7th Grade Student's Creative Thinking Skills. *Journal of Science Education Research*, (*Online*), 1(1): 1-4, (https://journal.uny.ac.id/index.php/jser/article/view/16179/9790), accessed on 7 March 2017.

Fibriati, R.E, Yuliati, L., Yulianti, E. (2016). Kemampuan Pemecahan Masalah IPA Peserta Didik Kelas VII SMP yang Belajar dengan Model Levels of Inquiry-Interactive Demonstration. *Prosiding Seminar Nasional Pembelajaran IPA*, ISBN 978-602-73915-5-0:33-37.

Heong, Y.M, Widad B.O, Jailani B.M.Y, Tee T.K, Razali B.H, dan Mimi M.B.M. (2011). The Level of Marzano Higher Order Thingking Skills among Technical Education Student. *International Journal of Social Science and Hummanity*, Vol.1, No.2.

Hidayati, R.A, Yuliati, L, dan Muhardjito. (2015). *Pengaruh Levels of Inquiry-Interactive Demonstration terhadap Kemampuan Berpikir Kritis Siswa SMA pada Mata Pelajaran Fisika Kelas X*, (*Online*), (http://fisika.um.ac.id/download/doc_download/734-retnoayuhidayatiliayuliatimuhardjito.html), accessed on 1 December 2016.

Mainali, BP. (2012). Higher Order Thinking in Education. *Academic Voices a Multidisciplinary Journal*. 2 (3): 6-9.

Newman, FM dan Wehlage, GG. (1992). *Student Engagement and Achievement in American Secondary Schools*, (*Online*), (http://files.eric.ed.gov/fulltext/ED371047.pd) accessed on 15 November 2016.

Sofiyah, S., Susan, Setiawani, S. (2015). *Pengembangan Paket Tes Kemampuan Berpikir Tingkat Tinggi Matematika Berdasarkan Revisi Taksonomi Bloom pada Siswa Kelas V SD*, (*Online*), (repository.unej.ac.id), accessed on 29 April 2017.

Thomas, A. dan Thorne, G.S. *How to Increase Higher Level Thinking*. (*Online*), (http://www.cdl.org/articles/how-to-increase-high-order-thinking/), accessed on 13 June 2017.

Trianto. (2010). *Model Pembelajaran Terpadu*. Jakarta: Bumi Aksara.

Wenning, C.J. (2005). Levels of Inquiry: Hierarchies of Pedagogical Practices and Inquiry Processes. *Journal of Physics Teacher Education Online*, (*Online*), 2(3):3-11, (http://www.phy.ilstu.edu), accessed on 15 November 2016.

Wenning, C.J. (2012). The Levels of Inquiry Models of Science Teaching: Learning Sequences to Lesson Plans. *Journal Physics Teacher Education Summer 2012*, (*Online*), (http://www.phy.ilstu.edu), 15 November 2016.

Yuliati, L. (2008). Model-model Pembelajaran Fisika "Teori dan Praktek". Malang: LP3 Universitas Negeri Malang.

Zimrot, R. & Ashkenazi, G. (2007). Interactive Lecture Demonstrations: A Tool for Exploring and Enhancing Conceptual Change. Chemistry Education Research and Practice 2007, (*Online*), (http://www.rsc.org/images/Ashkenazi%20paper2%20final_tcm18-85042.pdf), accessed on 13 November 2016.