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# *The Effects of Discovery Learning Model Nuanced Science Literacy Towards Students' Competence in Learning Natural Science*

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***Abstract*- Results of the observation conducted on VII grade students of SMPN 1 Kampar Timur showed that they have lack of interest in learning process, lack of cooperating in discussion, and lack of tolerance towards others. Furthermore, most of them do not pay attention to teachers' explanation and their cognitive, affective, and psychomotor competences are still low. Therefore, one way to solve the problems above is by using discovery learning model nuanced science literacy. The purpose of the research was to know the effects of discovery learning model nuanced science literacy towards students' cognitive, affective, and psychomotor competences.**

**The research was a quasi experimental research. The population of the research was VII grade students of SMPN 1 Kampar Timur year 2017/2018. Samples were obtained by using random sampling technique. As a result, class VII 3 was experimental class which was treated by using discovery learning model nuanced science literacy and VII 1 was control class which was treated by using direct instruction model nuanced science literacy. Instruments of the research were objective test and observation sheets. The techniques of data analysis used were T-test and *Mann Whithney U* Test.**

**Based on data analysis and discussion, it was concluded that students' learning outcomes by using discovery learning model nuanced science literacy were different from students' learning outcomes by using direct instruction model nuanced science literacy. The result showed that the average score of cognitive competence in experimental class was 84.50. Meanwhile, the average score of cognitive competence in control class was 72.86. Beside that, affective and psychomotor competences in experimental class were in "very good" category; whereas, affective and psychomotor competences in control class were in "good" category.**

***Keywords*- Effects; Discovery Learning; Science Literacy; Learning Competence.**

## I. INTRODUCTION

Government Regulation No 32 year 2013 article 2A, regarding National Education Standard, gives points about the need to arrange and implement eight national education standards. They are content standards, standard process, graduates competence standards, personnel standards and education, infrastructure standards, management standards, standards for education funding, and educational assessment standards (Government Regulation, 2013).

Expected learning process in the article is not certainly easy to do. Teachers' role as an educator will determine whether the learning process can work well or not. Active learning, which involve students more in activities to access various information and knowledge to be further discussed

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and explored in the learning process, could be applied to improve students' competence so that they can get experience to enhance their comprehension. Students are demanded to be able to master the stated competencies.

Learning process is a teaching learning activity related to teachers' activities, students' activities, interaction patterns and processes between teachers and students, and learning sources in a learning environment which are included in a framework of educational program implementation. (Ad Roiijakkers, 1999).

Effect of discovery learning model *nuanced* science literacy can improve students' competence individually. By students' achievement in every domain in competence, it is hoped that students are able to master knowledge, technology, art and culture, have humanity, nationalistic and nationhood insight, think and act creatively in abstract and concrete domain in order to get real learning experiences. As a result, students can have faithful, certain character, self-confidence, and responsible in interacting to environment, nature, world and its civilization.

Based on observation and interview conducted to Biology teachers in SMPN 1 Kampar Timur, it can be concluded that the teachers have used one of learning models suggested in 2013 curriculum. It is discovery learning model. Nevertheless, application of the discovery learning model in school, especially in grade VII IPA, on students' learning competences has not been optimal. It can be seen from students' score which is still below 70 or minimum criteria of mastery (KKM). Table 1 shows the score of students' mid-term test in Natural Science (IPA) subject in SMPN 1 Kampar Timur.

Table 1. The Mid-term Test Scores of VII Grade Students in Natural Science Subject in SMPN 1 Kampar Timur year 2017/2018

| No | Class | Number of Students | Average Score |
|---|---|---|---|
| 1 | VII1 | 28 | 71,14 |
| 2 | VII2 | 28 | 81,82 |
| 3 | VII3 | 28 | 60,60 |
| 4 | VII4 | 28 | 77,64 |
| **Average** | | | 72,80 |

Source: Score Book of Grade VII SMPN 1 Kampar Timur

Besides that, there were some students who answered teacher's question unseriously, lack enthusiastic in learning, and disregarded teacher's responds so that teacher's stimuli did not exist. Meanwhile, the other students just listened and noted teacher's explanation without expressing their ideas or opinion about learning material they were studying. It caused lack of interaction between teacher and students in learning natural science (IPA) in the VII grade SMPN 1 Kampar Timur. Consequently, when teacher asked question about the learning materials, students just answered it shortly like what teacher had explained without further developing or exploring the materials.

Moreover, to get clear information about how implementation of learning natural science (IPA) in the classroom is, interview was conducted to Natural Science (IPA) teachers in grade VII SMPN 1 Kampar Timur. Teachers said that in teaching learning process, they do not only use lecturing method, but also apply discussion method to train students' skill in giving a piece of their mind. Yet, the result is beyond expectation, especially for students who have low ability. It can be caused by students are lack enthusiastic to participate in discussion. They are afraid to be laughed by other students when they say something wrong in answering or responding questions.

Results of the previous research about the effect of discovery learning model conducted by Eriza (2015) showed that discovery learning model was able to improve students' competences in cognitive, affective, and psychomotor aspects. Therefore, the purpose of the current research is to know the effects of discovery learning model towards learning competence of VII grade students in SMPN 1 Kampar Timur in learning natural science.

## II. RESEARCH METHOD

The design of this research was a quasi experimental research. According to Lufri (2005), quasi experimental research is a research design that not uses random assignment and involves two or more groups of subject without pretest. It uses two classes, which are control class (without treatment) and experimental class (with treatment by using discovery learning model). The sample of the research was chosen by using random sampling technique. Design of the research can be seen in table 2.

Table 2. Research Design

| Class | Treatment | Post-test |
|---|---|---|
| Experiment | X | $T_2$ |
| Control | - | $T_2$ |

Explanation:

$X_1$ : the given treatment (discovery learning model nuanced science literacy)

$T_2$ : post-test at the end of research to both experiment and control class.

## A. Technique of Data Analysis

### a. Normality Test

Normality test used in the research is *Kolmogrof Smirnov* test. In this research, normality test was done by using SPSS software. Criteria of the test were if sig. value > 0.05, $H_0$ is accepted; yet, if sig. value < 0.05, $H_0$ is rejected.

### b. Homogeneity Test

Variance homogeneity test used *Levene's* test. It was done to know whether the population has homogeneous variance or not. In this research, homogeneity test was done by using SPSS software. Criteria of the test were if sig. value > 0.05, $H_0$ is accepted; yet, if sig. value < 0.05, $H_0$ is rejected.

### c. Hypothesis Test

#### 1. First Hypothesis Test

Statistical test used for first hypothesis was T-test. Criteria of the test were if sig. value > 0.05, $H_0$ is accepted and $H_1$ is rejected. On the contrary, if sig. value < 0.05, $H_1$ is accepted and $H_0$ is rejected.

#### 2. Second and Third Hypothesis Test

Statistical test used for second and third hypothesis is *Man Whitney U* Test. Criteria of the test was if sig. value > 0.05, $H_0$ is accepted and $H_1$ is rejected. On the contrary, if sig. value < 0.05, $H_1$ is accepted and $H_0$ is rejected.

Briefly, teaching and learning process in experimental class followed some stages like below.

**Introduction**

a. Teacher greeted the students.
b. Teacher asked chairman to lead for praying before class started.
c. Teacher checked students' presence.
d. Teacher conveyed the basic competencies and learning objectives to students.

**Core Activities**

**Stimulation**

a. Teacher showed video/ observed the environment
b. Teacher asked students about what they had watched in the video.
c. Teacher asked students to answer or respond the questions given

**Problem Statement**

a. Students were given chances to identify some problems based on the existed learning sources and chose one problem.
b. The chosen problems should be formulated into question form.
c. Teacher guided students to solve the problem.
d. Teachers guided students to formulate hypothesis.
e. Teacher motivated students to express their ideas ad opinion through proposed questions. (**Cause-Effect)**

**Data Collection**

To answer the questions or to prove whether the hypothesis is right or wrong, teacher asked students to note some information about the question, answer, and text summary.

**Data processing**

a. Students collected data by doing library research, experiment, observation, etc.
b. Students write the obtained result in table of observation or worksheet (LKPD), in which the worksheet (LKPD) was given some nuances of science literacy, as follow:

*1)* **Cycle/Schema** in which students were asked to put a cycle/ phenomenon in the right order.

*2)* **Think-Pair-Share,** in which students were asked to think about a question or phenomenon, to cooperate each other, and to share what they had discussed to others.

*3)* **Cause-Effect,** in which students were asked to determine cause and effect of a phenomenon or a problem.

*4)* **SQ3R,** in which students noted important information, make questions and answers, and make summary from the obtained information

**Verification**

Students analyzed what they got and they were asked to summarize the result whether it is appropriate to the hypothesis or not.

**Generalization**

Students further analyzed the result of experiment whether it is appropriate to the hypothesis or not. Then, they were asked to give appropriate reasons and presented it to others.

## III. Results And Discussion

### A. Results

The research was conducted in SMPN 1 Kampar Timur. Data analysis was done to show learning competence in domain of cognitive, affective, and psychomotor. Learning process in experimental class used discovery learning model nuanced science literacy; whereas, learning process in control class used direct instruction nuanced science literacy.

#### a. Data Description of Cognitive Domain Competence

In this research, data of cognitive domain competence were obtained from post-test. The test was a written test in form of multiple choices. The post-test was done by both classes, experiment and control class, given at the end of this research. The data of cognitive domain competence are presented in table 3.

Table 3. Average, Maximum, and Minimum Score of Experimental and Control Class in Cognitive Domain Competence

| Class | N | Average | $X_{max}$ | $X_{min}$ |
|---|---|---|---|---|
| Experiment | 28 | **84,50** | 96,00 | 70,00 |
| Control | 28 | **72,86** | 90,00 | 62,00 |

From table 3 above, it is known that students' cognitive domain competence in learning natural science (IPA) by using discovery learning model nuanced science literacy got higher average, maximum, and minimum scores than students who studied by using direct instruction nuanced science literacy. The average score of students' cognitive domain competence in learning natural science (IPA) by using discovery learning model nuanced science literacy was 84.50. The maximum score was 96.00 and the minimum score was 70.00. Meanwhile, the average score of students' cognitive domain competence in learning natural science (IPA) by using direct instruction model nuanced science literacy was 72.86. The maximum score was 90.00 and the minimum score was 62.00.

#### b. Data Description of Affective Domain Competence

Data of affective domain competence were obtained from observation conducted by natural science (IPA) teacher by using students' affective domain assessment format while teaching learning process was going on. Data analysis in affective domain was done by using non-parameter test, that is *mann Whitney U*. Data of affective domain competence is presented in table 4.

Table 4. Average, Maximum, and Minimum Score of Experimental and Control Class in Affective Domain Competence

| Class | N | Average | $X_{max}$ | $X_{min}$ |
|---|---|---|---|---|
| Experiment | 28 | 92,13 | 99 | 86 |
| Control | 28 | 81,14 | 87 | 74 |

Based on table 4 above, it is known that average score of experimental class using discovery learning model nuanced science literacy was higher than control class using direct instruction model nuanced science literacy. The average score of experimental class was 92.13. The maximum score was 99 and the minimum score was 86. In contrary, average score of control class was 81.14. The maximum score was 87 and the minimum score was 74.

#### c. Data Description of Psychomotor Domain Competence

Data of psychomotor domain competence were obtained from observation done after teaching learning process had finished. The data were in form of average score. The observation was conducted by 2 natural science (IPA) teachers by using students' psychomotor assessment format. Average score of this domain competence can be seen in table 5 below.

Tabel 5. Average, Maximum, and Minimum Score of Experimental and Control Class in psychomotor Domain Competence

| Class | N | Average | $X_{max}$ | $X_{min}$ |
|---|---|---|---|---|
| Experiment | 28 | 91,87 | 100,00 | 87,00 |
| Control | 28 | 80,35 | 90,00 | 75,00 |

Based on table 5 above, it is known that average score of experimental class using discovery learning model nuanced science literacy was higher than control class using direct instruction model nuanced science literacy. The average score in experimental class was 91.87. The maximum score was 100 and the minimum score was 87.00. On the other hand, the average score of control class was 80.35. The maximum score was 90.00 and the minimum score was 75.00.

**1. Test of Analysis Conditioning**

Test of Analysis Conditioning is a test conducted before doing hypothesis testing. It includes normality test by using *Kolmogro –Sminorv* and variance homogeneity test by using *Levene* test in SPSS software. If the data distribution is normal and homogeneous, hypothesis testing uses T-test. Yet, if data distribution is not normal, homogeneity test is not necessary to be done and hypothesis test uses *Mann Whithney U* test.

**a. Normality Test**

Normality test is done to students' post-test. Normality test of students' cognitive domain competence was conducted to students' average score of basic competences (KD) 3.7 and 3.8 of both experimental and control class. Normality test for KD 3.7 in experimental class was 0.014 and in control class was 0.003, in which the data of KD 3.7 was not normally distributed. Meanwhile, normality test for KD 3.8 in experimental class was 0.049 and in control class was 0.000, in which the data of KD 3.8 was not normally distributed either. Cause of data not normally distributed in both sample classes is they have no variant score. Next, normality test for both KDs in experimental class was 0.171 and control class was 0.113, which means that data in both experimental and control classes have normal distribution. It is caused by the average score of both classes have variant score.

The result of normality test is presented in table 6 below.

Table 6. Normality Test Result of Students' Learning Competence

| KD | Class | Students' Cognitive Domain Competence | |
|---|---|---|---|
| | | Sig | Keterangan |
| 3.7 | Experiment | 0,014 | Not normal |
| | Control | 0,003 | Not normal |
| 3.8 | Experiment | 0,049 | Not normal |
| | Control | 0,000 | Not normal |
| **Both KD 3.7 and 3.8** | **Experiment** | **0,171** | **Normal** |
| | **Control** | **0,113** | **Normal** |

**b. Homogeneity Test**

Criteria of $H_0$ testing is accepted if Sig. value > 0.05 and $H_0$ is rejected if Sig. value < 0.05. The result of homogeneity test of both classes had Sig. value 0.416, so that the data were homogeneous. It is presented in table 7 below.

Table 7. Homogeneity Test Result of Students' Learning Competence

| Class | Cognitive Domain Competence | |
|---|---|---|
| | Sig | Explanation |
| Experiment | 0,416 | Homogeneous Variance |
| Control | | |

**2. Hypothesis Test**

Table 8. The Result of Hypothesis Testing in This Research

| Hypothesis | Class | Sig | A | Conclusion |
|---|---|---|---|---|
| 1 | Experiment | 0.000 | 0.05 | $H_0$ is rejected |
| | Control | | | |
| 2 | Experiment | 0.000 | 0.05 | $H_0$ is rejected |
| | Control | | | |
| 3 | Experiment | 0.000 | 0.05 | $H_0$ is rejected |
| | Control | | | |

**a. First Hypothesis**

First hypothesis was formulated to know whether cognitive domain competence in learning IPA using discovery learning model nuanced science literacy is better than cognitive domain competence in learning IPA using direct instruction model nuanced science literacy. The result shows that cognitive domain competence has Sig. value 0.000 with $\alpha = 0.05$. It means that Sig. value < 0.05, so $H_0$ is rejected. It can be concluded that there is a significant effect of discovery learning model nuanced science literacy towards students' cognitive domain competence in learning IPA.

**b. Second Hypothesis**

Second hypothesis was formulated to know whether affective domain competence in learning IPA using discovery learning model nuanced science literacy is better than affective domain competence in learning IPA using

direct instruction model nuanced science literacy. The result shows that affective domain competence has Sig. value 0.000 with $\alpha = 0.05$. It means that Sig. value < 0.05, so $H_0$ is rejected. It can be concluded that there is a significant effect of discovery learning model nuanced science literacy towards students' affective domain competence in learning IPA.

**c. Third Hypothesis**

Third hypothesis was formulated to know whether psychomotor domain competence in learning IPA using discovery learning model nuanced science literacy is better than psychomotor domain competence in learning IPA using direct instruction model nuanced science literacy. The result shows that psychomotor domain competence has Sig. value 0.000 with $\alpha = 0.05$. It means that Sig. value < 0.05, so $H_0$ is rejected. It can be concluded that there is a significant effect of discovery learning model nuanced science literacy towards students' psychomotor domain competence in learning IPA.

## B. Discussion

### 1. Cognitive Domain Competence Achievement

Finding of the research shows that students' cognitive domain competence can improve by using discovery learning model nuanced science literacy applied in form of group discussion. Discovery learning model nuanced science literacy is able to give effect to students' cognitive domain competence, in which the average score of experimental class was 84.50 and control class was 72.86. From the score, there is a difference between both experimental and control classes.

Based on data analysis, experimental class treated by using discovery learning model nuanced science literacy has better result than control class using direct instruction model nuanced science literacy. It is caused by the synthesis of discovery learning model and science literacy that gives positive effect for students' thinking activity, especially in cognitive aspect. The discovery learning model demands students to be active, creative, innovative; to involve science process skills in constructing concepts, laws or principles; and to involve potential cognitive process in stimuli intellectual development, especially students' high level thinking. Moreover, science literacy also makes students more active and teaches how the learning content can be applied. It is in line with Astuti's research (2016), which stated that science literacy means knowledge and comprehension about scientific concepts and process needed to make a private decision, participation, and economic productivity.

Teaching learning process in discovery learning model nuanced science literacy assisted by worksheets (LKPD) is one of autonomous exercises given, that can be used to attract students' attention in order to think more critical and understand the concepts. In the experimental class, LKPD was given to students in form of group discussion. LKPD used is appropriate to applied learning model, which is discovery learning model nuanced science literacy. On the other hand, control class which used direct instruction model nuanced science literacy was also given LKPD. The LKPD given to both experimental and control class contains questions related to learning materials in order to facilitate students in doing group discussion and make students more active in the classroom.

Learning will be more active when students use their mind during learning process. (Mukherjee, 2015). Students learn through active involvement with concepts and principles. In addition, teacher encourages them to have learning experiences through doing activities that enable them to discover the concepts and principles by themselves (Slavin, 1994). In the discovery learning model, students are encouraged to learn autonomously, as stated by Ilahi (2012).

In implementing of learning process in the experimental class, teacher prepared students to accept learning materials and link them to students' daily experiences or to previous materials. It is known from implementing stages of discovery learning model nuanced science literacy in the classroom. Teacher initiated by stimulation in order to provide learning interaction conditions that might enable students to develop the exploratory activities. One of teacher's activities in this stage is giving questions that raise students' curiosity to find answers of the questions. Based on research done by Tran (2014), in learning process, stimulation to discover new knowledge is formed when teacher gives questions.

When the research went on, one material learned was the interaction of organisms with their environment. At that time, teacher gave questions to students about "where do they live?" and "what things are around their environment?" Then, one student answered by mentioning biotic components, like human being, animals, and plants, then, abiotic components, like soil, air, and water. Teacher responded "yes, great answer". After that, teacher asked one more question about "what is relation of human being and

air?" Through this question, students' curiosity became stronger. So, teacher could continue to the next stage (problem identification).

Problem identification. After stimulating, the next stage is teacher gives chance to students to identify as many possible as relevant problems about learning materials. After that, the problems are formulated in form of question. Then, hypothesis is also formulated as temporary answer of the question. Giving chance to students to identify and analyze the problem they face is a technique to habituate them to find solution of the problem. There are various answers given by students, such as the relation of human and air being is to breathe. Human can breath by using air because the air contains $O_2$.

Data collection. While exploration is going on, teacher gives chance for students to collect as much possible as relevant information to prove whether the hypothesis is right or not. In this stage, students are given opportunity to collect some relevant information by reading literatures and observing an object provided by teacher. For instance, in the interaction of organisms and their environments, teacher gives opportunity for students to observe biotic and abiotic components around school. Each group does data and information processing obtained through observation. By doing observation, students will remember it longer because they involve in learning process. It is in line with research done by Muna, Sukisno, dan Yulianto (in Widiadnyana, 2014), which stated that by doing observation, it can improve learning outcomes. Strong interaction between students and object in experiment activities can attract students' attention to understand the object more.

Data collection stage done by observation or experiment can train students to use scientific model in overcoming problems, so that they are not easy to believe anything without proving it (Roestiyah, 2001). Beside that, observation can also train cooperate among students in groups so that they need to minimize their egoism.

Next stage is verification. In this stage, students are suggested to do examination accurately to prove whether alternatively defined hypothesis is right or not and linked to data processing. Based on result of existed data processing, the prior formulated hypothesis is rechecked whether it is proven or not, so that, students can answer questions in LKPD nuanced science literacy. It is in line with the research done by In'am (2017), which stated that this activity is done by students after they finish doing problem-solving. Verification means rechecking what have been done by using existed theories. The rechecking is done through rereading the problems, and discussing it back. The verification is also done before presentation in front of other groups. The groups should pay attention to what other groups are presenting. Last stage is generalization. It is a process to draw a conclusion about general and valid principles of mutual phenomena or problems. It is done after students present the result of their discussion in front of classroom through paying attention to the verification results.

The stages of data collection, data processing, verification, and generalization in discovery learning model nuanced science literacy done by observation or experiment can train students to be active in discovering something related to problems they face. Thereby, unintentionally, students link the problems to their background knowledge so that the learning becomes more meaningful.

Learning process in the experimental class shows that students were active in learning activities because they were given chance to think and use their abilities to find final result. Furthermore, they can understand learning materials because they go through process to find it and they will remember it longer. Then, students who get knowledge through discovery model will be easier to transfer the knowledge to various contexts. In conclusion, learning through implementing this model can improve students' intellectual activity and train their ability to find and solve the problems.

On the other hand, in the control class, students learned by using direct instruction model. They were less active in learning although this model is also given treatment of science literacy in provided LKPD. Besides, students were less motivated in learning. Most of them did not participate in group discussion. In doing LKPD, only 2-3 students from each group wanted to discuss, the other group members just waited the answer from their peers. In learning process, most of them did something out of learning context. They talked to their friends or disturb other students. It was proven when teacher asked a group to present the result of their discussion. There were some groups that did not want to present their discussion because they had not finished doing exercise in LKPD, so that teacher called another group to do presentation. While presenting the result of discussion, they tended to rely on their capable friend to present it; whereas, other group members just kept silent. At the heart of matter, learning process in the direct instruction model class is teacher explains learning materials more;

students just listen, take a note and memorize learning materials provided by teacher. Students' chance to involve actively in learning process is limited, so that students' ability to understand the concept of learning materials is low. Consequently, students' cognitive competence is also low.

**2. Affective Domain Competence Achievement**

From the result of observation about students' affective domain competence, students in experimental class have better affective competence than students in control class. This competence was observed by two observers by using provided affective assessment sheets and scoring rubric during learning process was going on. According to Sudijono (2008), affective domain is a domain related to attitudes and values. The affective domain includes character, feeling, interest, attitudes, emotion, and values. Next, Tosun (2013) stated that students' attitudes are related to motivation and success.

Students in experiment class participated actively in learning process because discovery learning model demands them to share ideas and opinion to other group members. Beside that, they have to respond their peer's opinion. It is in line with Senel (2015), who stated that students are important element in education. Their attitudes towards teacher's strategies in the classroom can play an important role to make learning process goes effectively. Because of Students' curiosity, they have more spirit to study and search for new insight and motivate them to find answer of question they face. In other words, students' motivation depends on their curiosity and willingness to find solution of the problems they face.

The obtained data showed that students' affective competence in experimental class is significantly better than students' affective competence in control class. Criteria of students' affective domain competence in experimental class is "very good". Most of them listened teacher's explanation seriously and did individual task well. Moreover, they were responsible to group task provided by teacher, enthusiastic to do presentation in front of classroom, ask and answer questions, respond other friends' opinion, give opinion actively based on appropriate argument. Arinawati in Dahlia (2018) stated that one of the advantages of discovery learning that can be achieved is students' scientific attitudes, such as objectivity, curiosity to solve problems, and critical thinking, can rise. Lie (2008) asserted that discovery learning can encourage students to cooperate in their group maximally.

Meanwhile, criteria of students' affective domain competence in control class is "good", however, some of them are "enough". It is caused by most of them still has less interest in reading so that they are confused and not confident to ask and answer the questions when teacher asked them to do so. They tended to keep silent. Besides, it was found that some problems in control class, like students made noise, did not pay attention to teacher's explanation, left classroom without permission, disturbed other friends, and did attention seeking from teacher and other students. Usually, teacher solve the problems by giving direct caution, like come to the students to give caution or called their parents if they do not want to listen teacher's advices and do the same mistake next time. According to Dahlia (2018), students in control class do not get stimulus to make their curiosity increases so that they are not motivated to ask questions.

In fact, strong cautions given by teacher to students do not give wary effect for them. In the next meeting, the student still repeated his act, so caution is considered not effective. According to Almasitoh (2012), the warning will be effective if: 1) firm and clear to student, 2) avoid rough and painful warning, 3) avoid twaddle, 4) there is an agreement between teacher and students.

Based on the explanation above, it can be concluded that students' affective domain competence in learning IPA by using discovery model nuanced science literacy is significantly better than students' affective domain competence in learning IPA by using direct instruction model nuanced science literacy.

**3. Psychomotor Domain Competence Achievement**

The implementation of discovery learning model nuanced science literacy give positive effect towards students' psychomotor domain competence in learning IPA. Similar with cognitive and affective learning outcome, students' psychomotor domain learning outcomes also changes to be much better. Students in experimental class were more active in learning and practical work because every members of group in experimental class were demanded to cooperate each other to overcome the problems so students become more active during learning process. It is in line with Lord (2001), who stated that group discussion make students more active to speak, ask, and involve directly in learning process, comparing to teacher-center learning.

Based on observation result of psychomotor domain competence, students' psychomotor competence in experimental class, using discovery learning model nuanced science literacy, is significantly better than in control class. Criteria of psychomotor domain competence in experimental class was "very good". It is caused by most students were able to prepare tools and materials completely, correctly, and orderly, do observation using right procedures and outcomes, do discussion until finish correctly, present the result of group discussion fluently, write the result of discussion clearly, orderly and readable. When students are taught problem solving skill and provided it to train their skill, they will study by more meaningful way (Cohen, 2008).

It is in line with Yong (2009), who stated that students' small group discussion can improve students' activeness so that it will motivate them to increase their learning outcomes. Suryono and Haryanto (2011) formulated that in accuracy category, psychomotor aspect that is scored is the skill to adapt at the time of group discussion is going on, whereas, in manipulation level category, psychomotor aspect that is score is the skill to write the discussion result.

On the contrary, criteria of students' psychomotor domain competence in control class was "good", but range of the score almost approached "enough" criteria. It is caused by students prepared tools and materials for practice work incompletely, do the wrong procedures even do not do observation, do presentation about discussion result in front of classroom less fluently even some students was not serious in presenting their observation result.

Psychomotor domain competence cannot be separated from cognitive domain competence and affective domain competence that is owned by students. Wahyuningsih, Harlita and Ariyanto (2011) asserted that psychomotor domain learning outcomes are related to skills and ability to do something after the students accept the specified learning experience. Barell (2010) also stated that educational system should be able to prepare students to be a questioner, problem-solver, critical-thinker and creative person. Psychomotor competence is advanced stage of cognitive competence and affective competence.

## IV. CONCLUSION

Based on the result and discussion of the research, there are some conclusions that can be drawn as follow.

1. Discovery learning model nuanced science literacy has significant effect towards cognitive domain competence of students in grade VII SMPN 1 Kampar Timur.

2. Discovery learning model nuanced science literacy has significant effect towards affective domain competence of students in grade VII SMPN 1 Kampar Timur.

3. Discovery learning model nuanced science literacy has significant effect towards psychomotor domain competence of students in grade VII SMPN 1 Kampar Timur.

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