

## **THE INFLUENCE OF CONSTRUCTIVISM APPROACH IN DIRECT LEARNING TOWARDS STUDENTS' METACOGNITIVE AWARENESS AND LEARNING OUTCOMES IN THE TOPIC OF SOLUBILITY AND SOLUBILITY PRODUCT**

**Muharram<sup>a\*</sup>, St. Hayatun Nur Abu<sup>b</sup>, and Jusniar<sup>c</sup>**

*<sup>a,b,c</sup>Makassar State University, Makasar, 90224, Indonesia*

### **ABSTRACT**

The study was a quasi-experiment research which aimed to know: (i) the influence of constructivism approach in direct learning towards metacognitive awareness (ii) the influence of constructivism approach in direct learning towards student's learning outcomes on solubility and solubility product subject. The results of the study show that (i) there is no influence of constructivism approach in direct learning towards students' metacognitive awareness ( $p = 0.240$ ,  $n = 39$ ); (ii) there is influence of constructivism approach in direct learning towards students' learning outcomes ( $p = 0.000$ ,  $n = 39$ ). After the learning process, the average of learning outcomes value in control class is 72.25 which is smaller than experiment class, of which the average is 79.47. In the experiment class, 84.21% of the students achieved the standard of mastery and the percentage of those who achieve the standard in the control class is 70%. The study also shows that there is correlation between metacognitive awareness and learning outcomes. In the experimental class, metacognitive awareness contributes 27.6% ( $R = 0.526$ ,  $R^2 = 0.276$ ) to the learning outcomes. While in the control class, metacognitive awareness is contributes 5.6% ( $R = 0.237$ ,  $R^2 = 0.056$ ) to the learning outcomes.

*Key words:* Constructivism Approach, Direct Learning, Metacognitive Awareness, Learning Outcomes

### **1. INTRODUCTION**

Learning process is an activity involving teacher and student. Teacher, as an educator, teaches knowledge, skill, and morale to students that are useful to their life. A teacher does not act as the only source of learning, however, he can be a facilitator for students to learn. Teacher plays an important role and task in learning process. An achievement obtained by students is not influenced by teacher's knowledge level of learned subject, but also it is determined by the approach and the model of learning that is used.

The problem of learning process is mainly caused by the incorrectness of the design and the plan of learning process causing the learning achievement becomes low and the objective of the learning is not achieved. The problem also occurred in the learning outcome of students grade XI IPA MAN 1 in Watansoppeng, academic year 2011/2012 in the topic of Solubility and Solubility Product. The students was difficult to apply the concept and to solve problems because they just tend to memorize. The teacher was also difficult to apply approach and model of learning beside conventional (behavioristic) since the students were accustomed to be directly informed without struggling to seek for their knowledge by themselves.

Direct learning is one of learning models that is frequently used by teachers. The learning model helps students to acquire intellectual knowledge and procedural steps. That kind of

learning requires much effort of teacher to teach. In addition the direct learning is teacher-centered so it needs an approach ensuring the involvement of students in learning process. One of the approaches that can be used is constructivism approach. It refers to a learning approach that puts emphasis on the self-experience and involvement of students in a learning process. During learning process, students actively construct their knowledge. Moreover, it requires the role of teacher to help students establish the relationship between what they have known and what they are learning.

Solubility and Solubility product is one of the topics which requires students not to simply memorize formulas but also to fully understand concepts. Furthermore, the topic covers counting related to mathematical skill which is likely to be achieved in several steps of direct learning model, i.e. guided practice, feedback, and individual practice.

Constructivism approach involves the activities of students in asking question seeking for information, and doing an inquiry. It demands students to apply their favorable learning strategies which entails students' metacognitive awareness. Basically, metacognition refers to learning ability about how to apply learning in which it well applies several activities. (Maulana, 2008). Students, with their metacognition, are aware of their strengths and limitations in learning so they can make an improvement. (Susantini, E. dkk in Susana, 2011). Consequently, it is highly necessary to evoke students' metacognitive awareness to manage their own learning to be more self-sufficient. Additionally, constructivism is a process of forming or constructing new knowledge in students' cognitive structure based on their experience (Sanjaya, 2008). Constructivism theory states that students should find and transform complex information by themselves, check new information by comparing it with previously known theories, and even revise the theories when they are not correct (Trianto, 2008).

Constructivism learning emphasizes on active, creative, and productive self-construction of understanding. Knowledge is a sequence of facts, concepts, and rules which are ready to apply. Humans should firstly construct their knowledge and give meaning through empirical experience (Muslich, 2009). During learning process, students construct their own knowledge through active involvement in which students, not teacher, are the centre of activities (Mulyana, 2011).

Learning activities in constructivism learning are directed to the empowerment of students' potency to have some required skills comprehensively (Srini & Lina, 2011). In that, teachers have important task in facilitating the kind of process by (a) making students learn meaningfully and acquire relevant information; (b) leading students to acquire and apply their own ideas; and (c) making students aware of their own strategy application in learning.

There are several characteristics of constructivism learning, namely (1) providing learning experience in taking the advantage of students' own knowledge to create new knowledge construction process, (2) providing several learning experience alternatives, for instance, giving open problem to students to solve with various answers, (3) integrate learning process with realistic and relevant situations involving concrete experience, for example to understand a concept through the reality in everyday life, (4) integrating learning process that allows social transmission of interaction and collaboration between students and teacher, and among students, (5) utilizing some media including oral and written communication so that learning process becomes more effective.

Metacognitive is an adjective of metacognition. Metacognition is often defined as "thinking about thinking". Metacognition can't be defined simply. Metacognition word contains the prefix "meta" and "cognition". Meta comes from Greek, which means after or exceed while cognition means skills related to thinking (Livingstone, 2003). Metacognitive consist of two main components, namely metacognitive knowledge and metacognitive regulation (Flavel in Danial (2010)). Metacognitive knowledge refers to knowledge about cognition as skills knowledge (skills) and work strategies for students and how and when using skills and

strategies. Furthermore, metacognitive regulation refers to the activities that control a person's thinking and learning such as planning, monitoring comprehension, and evaluation (Schraw and Dennison in Danial (2010)). This metacognitive activities comes through four situations, namely (Maulana, 2008): (a) students are required to justify a conclusion or **keep** the objection, (b) cognitive situation in face the opening problem of the opportunities to make questions, (c) students are required to make a conclusion, judgment, and a right decision which requires carefulness in monitoring and regulating the cognitive process, (d) the students' situation in cognitive activities experience difficulty, for example in problem solving.

Metacognitive becomes very important because it is a knowledge derived from cognitive process and their products. Students' metacognitive awareness which develops shows that students are more accurate in controlling and monitoring students learning (Miranda, 2010).

Learning outcome is achieved by students' score after learning. Learning outcomes can be measured by learning outcomes test. Generally, a teacher uses a test as a measuring tool. The results can give an illustration about students' mastery level to the learned lessn (Haling, 2007).

## 2. METHODS

This study was a quasi experiment using pretest-posttest control group design. It is consist of two variables, namely independent variable and dependent variable. The approach in direct learning as independent variable consists of constructivism approach and behaviorism approach. Meanwhile the dependent variables are metacognitive awareness and learning outcomes as dependent variable.

This research uses descriptive statistical analysis in students' learning outcomes description on solubility and solubility product subject for each experimental class, which includes mean, standard deviation, and the highest and the lowest scores. Students' learning outcomes can be categorized into complete and not complete based on minimal completeness criteria at MAN 1 Watansoppeng on solubility and solubility product subject. A student's learning outcome is categorized complete if the student's level of mastery is more than or equal to seventy, while students who have the degree of mastery less than seventy is categorized not complete. The score of students' metacognitive awareness was obtained by MAI questionnaire that convert it to students' score.

$$\text{Students' score} = \frac{\text{students' score}}{\text{total score}} \times 100$$

Total score is obtained from the number of item on questionnaire (52 items) multiplied by the highest score in each item (4). Total score is  $52 \times 4 = 208$ . Furthermore, score is categorized based on the categorization of metacognitive awareness (Green in Susana(2011)) which is shown at Table 1.

Table 1 Categorization of Metacognitive Awareness

Score Interval	Category	Ket
0-20	<b>Very Risk</b>	<b>MsB</b>
21-40	<b>Not developing</b>	<b>Bbb</b>
41-60	<b>Starting to develope</b>	<b>Mb</b>
61-80	<b>Well developing</b>	<b>Bb</b>
81-100	<b>Very well developing</b>	<b>Bsb</b>

Inferential statistic analysis was used in hypothesis test. Normality test and homogeneity test were done before testing the hypothesis, using SPSS 16 for windows. The Normality test of students' learning outcomes and metacognitive awareness was applied using SPSS 16 of *One-Sample-Kolmogorov-Smirnov Test* analysis. The criteria of the test is that if  $(p) < \alpha = 0,05$  then the data is not normally distributed, conversely if  $(p) > \alpha = 0,05$  then the data is normally distributed.

Homogeneity test was conducted to determine whether the data are homogeneous. Homogeneity test of students' learning outcomes variance data and MAI questionnaire use SPSS 16 of *Levene Statistic* analysis. The criteria of test is if  $(p) < \alpha = 0,05$  then variance of data group is not same, conversely if  $(p) > \alpha = 0,05$  then variance of data group is same.

Hypothesis test toward students' learning outcome and students' metacognitive awareness was done using SPSS 16 of *Covariance Analysis*. The formulation of hypothesis  $H_0$  is that there is no difference in students' metacognitive awareness between constructivism approach and behaviorism approach in direct learning. Meanwhile, that of  $H_1$  is that there is difference in students' metacognitive awareness between constructivism approach and behaviorism approach in direct learning. The criteria of test if  $(p) < \alpha = 0,05$  then  $H_0$  is rejected; which means that there is difference in students' metacognitive awareness between constructivism approach and behaviorism approach in direct learning.

This study also used additional analysis to determine the relation between metacognitive awareness and learning outcomes. That relation was analyzed by simple linear regression analysis using SPSS 16. Metacognitive awareness correlated with learning outcomes is based on the significant value  $(p) < \alpha = 0,05$ . R square value indicates the percentage contribution of metacognitive awareness toward learning outcomes.

### 3. RESULT AND DISCUSSION

#### a. The influence of constructivism approach in direct learning toward metacognitive awareness

Based on the result of the students' metacognitive awareness research, the students' metacognitive awareness both in experimental class and control class, before the learning is implemented, is in the category of well developing. After learning using constructivism approach and behaviorism approach is respectively applied in the experimental class and the control class, it shows that there is no significant difference between the two classes in the term of metacognitive awareness improvement. The increase average score of students' metacognitive awareness at experimental class is higher than control class. The average score at experimental class is 3,2326 higher than control class. There is no significant difference in students' metacognitive awareness between experimental and control classes caused by metacognitive awareness will not be presented without stages systematically and to improve metacognitive awareness takes time for students to control their thinking process.

The number of students with increasing metacognitive awareness from the pretest to posttest at experimental class is 23,95 % higher than control class. The improvement of metacognitive awareness is caused by students' knowledge about skill and work strategy, as well as students' ability to control their thinking and learning outcomes, for example planning, monitoring of comprehension, and evaluation. There are 5,26 % of students at the experimental class that have the same score at pretest and posttest. This result accordance to Susanti E., et.al (2004) in Susana (2011) that most of students improve their metacognitive awareness step by step, and the others are not improve. The students metacognitive awareness score decrease of pretest to posttest at control class is 29,21 % higher than experimental class. The decrease of metacognitive awareness is caused by some of students had difficulty in understanding MAI questionnaire, so that the answer of students is less precise with themselves. The students felt bored to read and understand every item because the number of item on MAI is pretty much. Most of students looked apathetic and rush to finish MAI even provided the maximum time in process.

The analysis of Covariance shows that  $p = 0,240 > \alpha$  which implies that there is no difference in students' metacognitive awareness between constructivism approach and behaviorism approach in direct learning. Based on the analysis of difference in metacognitive awareness of students between those who are given treatment of constructivism approach and

those who are given behaviorism approach in direct learning and the hypothesis test, it can be concluded that there is no influence of constructivism approach in direct learning toward students' metacognitive awareness.

Students' metacognitive awareness at each class increases, but it's not significant, which means that the approach is different. In addition the result doesn't change significantly and the statistical test shows there is no influence. Based on the factors that can increase metacognitive awareness, not all students can increase their metacognitive awareness. Constructivism approach is not able to make students think systematically in solving the problem and making conclusion. Moreover, students' initial knowledge is low causing students feel difficult to relate the previous subject with topic of solubility and solubility to find new concept. Besides that, not all students make a question or answer the question from teacher. Another factor is that some of the students judge well themselves without keeping attention and understanding the process during learning which consequently causes their answers are less precise compared to the expected answers. These results are supported by Arifin (2012) which suggested that there is no significant difference in students' metacognitive awareness between PBI group and TPS group.

This research is also accordance to Danial (2010) research's result that there is no influence on learning strategy towards students' metacognitive awareness. The same opinion by Susana (2011) on her research's result, shows that metacognitive learning model is not influence to metacognitive awareness. However, the different opinion by Warouw (2009) in Thahir (2012), said that using learning strategy will influence students' metacognitive awareness.

The result on Miranda research also support the theory of Blake, Spence, dan Sheila (1990) in Miranda (2010), said that metacognitive ability can be improved if the students is allowed manage themselves in learning strategy. Constructivism approach in direct learning is considered can be built students' metacognitive awareness compare with behaviorism approach in direct learning. This approach give an opportunity of students to found and apply their own idea, so needed metacognitive awareness. Constructivism approach provide learning experience, it is make relation between the previous subject with the subject being studied, so that learning is a process of knowledge formation. Each students have a different task, so that they have to apply their own strategy. Besides that, students participate emotionally then interesting in study. Students suggested to make the right conclusion, consideration, and decision. Therefore, it needed learning strategy and the accuracy of students in monitoring and managing cognitive process (Maulana, 2008). Constructivism approach in direct learning shows learning process that related with metacognitive situation compare with behaviorism approach in direct learning. Behaviorism approach doesn't give opportunity to students on improve strategy, idea or thinking process. It is accordance to Anonym (2012) said that behaviorism approach means students expected have the same comprehension. It means what teacher know should be known by students

Based on that statement, it shows that measuring students' metacognitive awareness using MAI questionnaire is not able to record students' metacognitive awareness well. The students tend to hide their weaknesses but also they don't show their abilities, so their answers are less accurate, then there is no significant difference in students' metacognitive awareness between constructivism approach and behaviorism approach in direct learning.

#### **b. The influence of constructivism approach in direct learning toward students' learning outcomes**

Based on the result of the descriptive statistical analysis, there is no significant difference on THB pretest score before learning process between experimental class and control class. The

---

difference result shows after learning process. Constructivism approach in direct learning on experimental class is better than behaviorism approach in direct learning on control class. The increase of the average students' learning outcomes on experimental class is higher than control class. Standard deviation of posttest on experimental class is lower than control class, the ability of students at experimental class are not really different. It's caused learning at experimental class using constructivism approach that require students to found or build their own knowledge by themselves, so the students can remember longer than the students who get knowledge from the teacher.

The result of inferential analysis using *SPSS for Windows of Covariance Analysis*, significance value  $p = 0,000 < \alpha = 0,050$  shows that  $H_0$  is rejected, it means there is difference in students' learning outcomes between constructivism approach and behaviorism approach in direct learning on solubility and solubility product subject in Grade XI Science MAN 1 Watansoppeng. This result also supported by Elvinawati (2011) who concluded that the application of constructivism and maps model concept can improve students' activity and learning outcomes on chemistry separation subject.

The difference in students' learning outcomes between constructivism approach and behaviorism approach in direct learning is caused emphasize on build comprehensive by themselves in constructivism approach in direct learning. Mulyana (2011) also said that during learning process, students build their knowledge by themselves and a center of activity is not a teacher but it is a student. Teachers will not be able give all their knowledge to students. Students should construct their knowledge. Therefore, students have to apply their own learning strategies so that they become independent students. When students have a different task, they can solve the problem by their own ways. The involvement of students in learning process to found knowledge by themselves and become an independent student can increase students' learning outcomes. The difference of learning outcomes shows by students with behaviorism approach, the percentage of completeness and the average of learning outcomes still lower than learning outcomes with constructivism approach. Behaviorism approach doesn't give an opportunity to students on found knowledge by themselves because the subject is inform by teacher directly step by step.

Based on the difference of students' learning outcomes in constructivism approach with behaviorism approach in direct learning and hypothesis test, can be concluded that there is influence constructivism approach in direct learning toward learning outcomes. The number of students in each class at XI Science MAN 1 Watansoppeng only consist of 20 students, it makes teacher easier to explore their knowledge and manage students to found their own knowledge. The knowledge on students with constructivism approach is retained longer than students with behaviorism approach.

Solubility and solubility product subject is a subject that requires comprehension concept not only memorize the formula or material. The comprehension can be achieved if students thinking creative with their strategy to found knowledge or solve the problem. Comprehension concept will make students easy on solving the exercise then increase learning outcomes. It is accordance to Larasati (2007) for two cycles of learning, the result of her research said that learning pythagoras theorem is effective by constructivism approach.

This research also analyzes the relation between metacognitive awareness and learning outcomes. The relation between metacognitive awareness and learning outcomes can be determined by regression test. The result of data analysis shows that there is correlation between metacognitive awareness and learning outcomes at experimental class ( $p = 0,001 < \alpha = 0,05$ ). The correlation coefficient between metacognitive and learning outcomes is 0,526. The percentage contribution of metacognitive awareness toward learning outcomes is 27,6 % or R square 0,276 while the remaining 72,4 % is influenced by other variable which not include on this model. The difference result is showed by control class, i.e. there is no relation between metacognitive awareness and learning outcomes ( $p = 0,141 < \alpha = 0,05$ ). Low correlation

coefficient between metacognitive awareness and learning outcomes is 0,237. The percentage contribution of metacognitive awareness toward learning outcomes is 5,6 % or R square 0,056.

### Conclusion and Suggestion

Based on the research results and the discussion, it can be concluded that: (1) there is no influence of the approach in direct learning toward students' metacognitive awareness, (2) there is influence of the approach in direct learning toward students' learning outcome

Based on the research results, it is suggested that: (1) teacher can consider the use of constructivism approach as one of the alternatives in learning since the approach can increase students' activeness and make students independent implying that their learning outcomes improve (2) further research of the approach is necessary to conduct in aiming of obtaining valuable information of implementing constructivism approach effectively and efficiently. (3) the measurement of metacognitive awareness using MAI shall be supposed to be revised without changing its meaning which consequently be able to memorize the personal behavior of students.

### REFERENCES

- Arifin. 2012. *Perbandingan Kesadaran Metakognitif Dan Hasil Belajar Kognitif Biologi Siswa SMA Yang Diajarkan Menggunakan Model Problem Basedintruduction (PBI) Dengan Kooperatif Tipe Think Pair Share (TPS) (Studi Pada Siswa Kelas X SMA Negeri 1 Sungguminasa)*. Tesis. UNM
- Danial, M. 2010. *Menumbuhkembangkan Kesadaran dan Keterampilan Metakognisi Mahasiswa Jurusan Biologi Melalui Penerapan Strategi PBL dan Kooperatif GI*. Disertasi tidak diterbitkan. Universitas Negeri Malang. Malang.
- Elvinawati, 2011. Optimalisasi Pembelajaran Kimia Pemisahan Melalui Penerapan Pendekatan Konstruktivisme dan Model Peta Konsep. *Jurnal Exacta*, (online). Vol.IX.No.1. (<http://repository.unib.ac.id/503/1/04.%20Elvinawati%20Hal.%2023-28.pdf>, diakses 23 Mei 2013).
- Haling. 2007. *Belajar dan Pembelajaran*. Badan Penerbit UNM: Makassar.
- Lasati. 2007 Penerapan Pendekatan Konstruktivisme pada Pembelajaran Teorema Pythagoras di Kelas 8 SMP. *Jurnal Pendidikan Inovatif*, (online), Vol.23, Nomor 1. (<http://jurnaljpi.files.wordpress.com/2009/09/vol-3-no-1-dwi-lasati.pdf>, diakses 23 Mei 2013).
- Livingstone,J. 2003. *Metakognitive An Overview*. (<http://gse.buffal.cdu/gwell/files/coursesfolder/documents/livingstonemetakognition.pdf>, diakses 23 Mei 2013)
- Maulana. 2008. Pendekatan Metakognitif Sebagai Alternatif Pembelajaran Matematika Untuk Meningkatkan Kemampuan Berpikir Kritis Mahasiswa PGSD. *Jurnal Pendidikan Dasar*, (online). Nomor 10 ([http://file.upi.edu/Direktori/JURNAL/PENDIDIKAN\\_DASAR/Nomor\\_10Oktober\\_2008/Pendekatan\\_Metakognitif\\_Sebagai\\_Alternatif\\_Pembelajaran\\_Matematika\\_Untuk\\_Meningkatkan\\_Kemampuan\\_Berpikir\\_Kritis\\_Mahasiswa\\_PGSD.pdf](http://file.upi.edu/Direktori/JURNAL/PENDIDIKAN_DASAR/Nomor_10Oktober_2008/Pendekatan_Metakognitif_Sebagai_Alternatif_Pembelajaran_Matematika_Untuk_Meningkatkan_Kemampuan_Berpikir_Kritis_Mahasiswa_PGSD.pdf), diakses 24 Desember 2012)

- Miranda. 2010. Dampak Pembelajaran Metakognitif dengan Strategi Kooperatif terhadap Kemampuan Metakognitif Siswa dalam Pelajaran Biologi di SMA Negeri Palangkaraya. *Jurnal Penelitian Kependidikan*. (online) TH.20, NO. 2, Oktober 2010 (<http://www.scribd.com/doc/95515105/96>, diakses 24 Desember 2012).
- Mulyana. 2011. Laporan PTK: Kontribusi Penerapan Model Pembelajaran “Card Sort” Berbasis Pendekatan CTL Terhadap Peningkatan Hasil Belajar Siswa VII. SMPN 1 Cadasari, (online), ([http://4shared.com/document/BnvA57H1/Laporan\\_PTK\\_Kelas-7.html](http://4shared.com/document/BnvA57H1/Laporan_PTK_Kelas-7.html)), diakses 24 Desember 2012)
- Sanjaya, W. 2008. *Strategi Pembelajaran Berorientasi Standar Proses Pendidikan*. Jakarta : Prenada Media Group.
- Siroj, R.A. 2004. *Pemerolehan Pengetahuan Menurut Pandangan Konstruktivistik*. (<http://www.depdiknas.go.id/Jurnal/43/rusdy-a-siroj.htm>, diakses pada tanggal 2 Februari 2013).
- Susana. 2011. *Pengaruh Model Pembelajaran Metakognitif terhadap Kesadaran Metakognitif, Keterampilan Metakognitif, dan Hasil Belajar Kognitif Siswa SMN 1 Palopo*. Tesis. Program Pascasarjana UNM.
- Srini & Lina. 2011. *Peningkatan Kualitas Pendekatan Pembelajaran Kimia (Kma 523) Menggunakan Tugas Strategi Konstruktivis Dan Blended Learning* . Makalah disajikan dalam Seminar Nasional Penelitian, Pendidikan dan Penerapan MIPA, Universitas Negeri Yogyakarta, 2 Juni 2012.
- Thahir. 2012. *Pengaruh Metode Survey, Question, Read, Recite, Review Terhadap Kemampuan Metakognitif Dan Hasil Belajar Materi Ekosistem Siswa SMA*. Tesis. UNM.
- Trianto. 2008. *Mendesain Pembelajaran Kontekstual (Contxtual Teaching and Learning) di Kelas*. Jakarta: Cerdas Pustaka Publisher
- Trianto, 2009. *Model-Model Pembelajaran Pembelajaran Inovatif Berorientasi Konstruktivistik*. Jakarta: Prestasi Pustaka
- Anonim,. 2012. Teori Belajar Behavioristik. ([http://id.wikipedia.org/wiki/Teori\\_Belajar\\_Behavioristik](http://id.wikipedia.org/wiki/Teori_Belajar_Behavioristik), diakses 14 Juli 2013).