The Effect Of Problem Based Learning Model With Mind Mapping Technique On Biology Learning Achievement

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ABSTRACT

Indonesia is a country that continues to improve and develop its education system. The development of learners abilities that are needed nowadays not only develop cognitive ability alone will be much more than that, it needs an attitude awareness in the learning process. The purpose of this research is to know the effect of the problem-based learning model with mind mapping technique. Biological material used in this study is the subject of the virus. The first research result is learning the model of learning for student cognitive learning result. Based on the results of ANAKOV A analysis shows the significance level less than 0.05, then this shows the significant effect of the difference between the learning class and control class on the learning achievement of cognitive aspects. The second research result is to test the difference of learning the result of the affective domain between problem-based learning model with mind mapping technique and conventional learning model. The result of learning effective sphere which is assessed based on direct observation covering 5 indicators namely; Discipline, daring opinion, responsibility, cooperation and tolerance, Based on the analysis One sample t-test 2 indicator shows the level of significance less than 0.05, then this shows there are significant differences 2 indicators of effective learning achievement. 2 indicators are daring opinion and cooperation.

INTRODUCTION

Indonesia is a country that continually strives to improve and improve its education
This is done so that education can really become an agent of renewal and progress for the nation and state (Wiyanti, 2012). The purpose of education based on the law is proclaimed by the government to prepare competent human resources and have global competitiveness in realizing social welfare. The purpose of education can be achieved one of them with the implementation of the curriculum 2013 (Kemendikbud, 2014). The 2013 curriculum has the function to shape and develop students’ patterns and ways of thinking so that they are expected to develop their potential to respond to and solve problems in life (Hamalik, 2001).

Development of patterns and ways of thinking above can be trained intensively one of them through problem-based learning model (Jahidin, 2008). Problem-based learning models can enhance students’ self-knowledge and educational potential (Husnidar, 2014). The problem-based learning model has the disadvantage of allowing a material misconception of what has already been discussed. So it is necessary to strengthen in writing, one of them using mind mapping technique (Aprilianingsih, 2007). Mind mapping is applied to instill and improve the understanding of the biology concept so that students are easier in remembering the material that has been taught, with the mind mapping students able to reconstruct the information that has been obtained. Mind mapping is a creative and effective way of recording for students to put information into the brain and retrieve information from outside (Buzan, 2007).

Based on Lisnawati’s research (2015) that there is an increase in biological learning outcomes through a constructivism approach with mind mapping techniques. From the description, it is necessary to do research to determine the effect of Problem Based Learning Model with Mind Mapping Technique of Learning Result of Biology of Cognitive and Affective Aspects.

METHODS

The research design used was quasi experiment with Pretest method - PostestNon equivalent Control Group Design. This study used two classes of samples, with details of one treatment class to be learned by using a problem-based learning model with mind mapping techniques and a control class that would use conventional learning. The population in this study is all students of class X MIPA MAN 1 Jember Sample taken by cluster random sampling with no attention to strata in the population. Samples taken in this research are class X MIPA 2 as experiment class and class X MIPA 3 as control class.

The cognitive learning achievement were measured and assessed on the basis of pre test and post test scores. Data analysis technique used is the analysis of covariance (ANACOVA) to see difference of cognitive learning result of student of problem-based learning model with mind mapping technique. Analysis of the effect of cognitive aspects learning outcomes assisted with SPSS 17 for Windows. While the results of affective learning using One Sample T-Test analysis to determine the difference treatment of affective learning outcomes that includes 5 indicators.

RESULTS AND DISCUSSION

a. Cognitive Student Learning Achievement

Cognitive learning achievement in viral subjects using problem-based learning models with mind mapping techniques were measured using assessment instruments in the form of pre-test and post-test. Differences in cognitive learning outcomes of
students in the form of pre-test and post-test between the experimental class and control classes presented in Table 1 below.

| Class   | Pre-test Mean ± SD | Post-test Mean ± SD |
|---------|--------------------|---------------------|
| Experiment | 28.93±10.48   | 79.58±8.76        |
| Control   | 25.41±12.44   | 72.47±9.32        |

Based on Table 1 it can be seen that the average number of pre-test values between the experimental class and control class is not very high that is 3.52. It is also proved by homogeneity test result which shows that both data have the same variant (homogeneous), whereas after the treatment of learning model based on mind mapping technique the difference of the mean post-test value between the experimental class and the control class occurs a considerable increase with the difference of 6.41. Anakova test was conducted to determine the effect of learning model with character mapping technique to cognitive, with pre test covariate

| Source  | Type III Sum of Squares | Df     | Mean Square | F      | Sig. |
|---------|-------------------------|--------|-------------|--------|------|
| Model Cor. | 1832.666\(^a\)  | 2      | 916,333     | 13,289 | 0.000|
| Intercept | 32970.535   | 1      | 32970,535   | 478,149| 0.000|
| Pretest  | 1040.235    | 1      | 1040,235    | 15,086 | 0.000|
| Class    | 485.637     | 1      | 485,637     | 7,043  | 0.010|
| Error    | 4137.270    | 60     | 68,955      |        |      |
| Amount   | 367430.000  | 63     |              |        |      |
| Total    | 5969.937    | 62     |              |        |      |

Based on Table 2. Anakova test results on students' cognitive learning outcomes show that there is a significant influence between the experimental class and the control class with a significance level of 0.01 (<0.05) with the understanding that the use of problem-based learning model with mind mapping technique provides a significant influence on students' cognitive learning outcomes ($F = 83.24$; df = 1; $p = 0.01$).

### b. Affective Student Learning Outcomes

The students' affective learning outcomes were measured using instruments of affective observation sheet. The difference in students' affective learning outcomes between the control and experimental classes is presented in Table 3.

| Source  | Type III Sum of Squares | Df     | Mean Square | F      | Sig. |
|---------|-------------------------|--------|-------------|--------|------|
| Model Cor. | 1832.666\(^a\)  | 2      | 916,333     | 13,289 | 0.000|
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| Error    | 4137.270    | 60     | 68,955      |        |      |
| Amount   | 367430.000  | 63     |              |        |      |
| Total    | 5969.937    | 62     |              |        |      |

Table 3. Differences in affective learning outcomes of experimental class students and control class
Affective values are derived from observational observations based on an affective judgment column. Affective indicators assessed include 5 things: discipline, daring opinion, responsibility, cooperation and tolerance. Based on Table 5 it can be seen that the analysis of One sample t-test shows the affective value between the experimental class and the control class that has significant influence that is the indicator of daring opinion and cooperation. This is indicated by the significance value of 0.03 and 0.02 (<0.05) with the understanding that the use of problem-based learning model with mind mapping technique gives significant difference to 2 indicators of students' affective learning outcomes (F = 4.24; df = 1 ; P = 0.03, 0.02).

Problem-based learning model with mind mapping technique applied to experimental class, while for control class with scientific approach applying lecture, discussion, question and answer method and presentation. The application of conventional learning in the control class in this study is simpler using only a scientific approach. Another case with the application of problem-based learning model with mind mapping techniques that have certain stages of syntax between the combination of model-based learning problems with mind mapping techniques.

### Table 5

| No | Affective Indicator | Mean of Exsperimen Class | Mean of ControlClass | Sig. Analys One sample t-test |
|----|---------------------|--------------------------|----------------------|------------------------------|
| 1  | Discipline          | 71.84                    | 70.34                | 0.07                         |
| 2  | Dare to argue       | 74.68                    | 70.76                | 0.03                         |
| 3  | Responsible         | 68.26                    | 69.54                | 0.15                         |
| 4  | Cooperation         | 75.32                    | 70.43                | 0.02                         |
| 5  | Tolerance           | 69.76                    | 69.47                | 0.09                         |

*Note:
A. : ≥ 80
B. : < 80 and ≥ 70
C. :< 70 and ≥ 60
D. : < 60

### a. The effect of problem-based learning model with mind mapping technique to student cognitive learning outcomes

Learning outcomes are the level of student mastery of the subject matter as a result of behavior change after following the learning process based on the learning objectives to be achieved (Arifin, 2009). The results of ANAKOVA's covariance analysis showed that the effect of problem-based learning model with mind mapping technique has a significant effect on the improvement of students' cognitive learning outcomes. With this mind mapping technique can help the students to reconstruct the important knowledge that must be mastered in the form of written works in a succinct with interesting pictures. Problem-based learning model with mind mapping technique has five main activities: problem orientation, student organizing for learning, guiding data analysis, making work in the form of mind mapping, and evaluating problem solving of group work result (Restika, 2011). Through the five main activities are expected students can actively develop the potential and creativity during the learning so that the role of students here become very dominant. Through problem orientation activities, students are required to actively read as well as understand the subject matter
and solve problems in groups. Through the analytical work of solving problems, students are more flexible in expressing their opinions or problems in understanding the subject matter with their partner without shame. Through the problem-solving evaluation activities, students can exchange ideas with all members of their group about their work results and their understanding of the subject matter and here students can also learn to cooperate with each other to complete the task of the group and present it in the form of mind mapping work. A person's learning achievement are determined by factors that can influence him. One of the factors that exist outside the individual is the method of learning. The unfavorable method results in less than optimal learning (Purwanto, 2010). For that required a teacher's ability to choose the appropriate learning method, so as to produce good and maximal learning outcomes. The quality of student learning outcomes can be determined by the effectiveness of the learning model used by teachers in learning in the classroom. One of the learning models that can be used to improve student learning outcomes is the problem-based learning model (Ramli, 2011). It is used because it can encourage students to think critically so that they not only answer questions but much more than that, they can seek information from relevant sources so that their knowledge becomes increased. The final step of learning is also done by mind mapping technique, it becomes necessary to instill and improve the understanding of biology concept so that students are easier in remembering the taught material (Lisnawati, 2015). So with the combination of problem-based learning model combined with mind mapping techniques can improve student learning outcomes. In accordance with the above discussion can be seen that the problem-based learning model with mind mapping techniques significantly influence student cognitive learning outcomes.

b. The difference of problem-based learning model with mind mapping technique to student affective learning result

There are two things related to the affective judgment that must begin. First, the affective indicators to be achieved in learning include the level of response, appreciation, assessment and internalization. The second is the attitude and interest of students to the subjects and learning process. Student learning outcomes are obtained from each affective domain indicator. But before the prerequisite test was first done. The prerequisite test begins with the normality test, followed by homogeneity test. After the data is declared normal and homogeneous distribution, then followed by One sample t-test to know the difference of each indicator in experiment class and control class. The results of learning affective sphere observed include 5 indicators of discipline, daring opinion, responsibility, cooperation, and tolerance.

Affective values are derived from observational observations based on an affective judgment column. The indicators of the affective domain that are assessed include 5 things: discipline, daring opinion, responsibility, cooperation and tolerance. Based on Table 5 it can be seen that One sample t-test analysis shows the value of affective learning result between experiment class and control class that has significant influence that is brave indicator and cooperation. This is indicated by the significance value of 0.03 and 0.02 (<0.05) with the understanding that the use of problem-based learning model with mind mapping technique gives a significant effect on the 2 indicators of student affective learning outcomes. In the bold indicator indicates the student will show its activity through questions and discussions. How often the student is of opinion
and how the weight of the proposed opinion. Problem-based learning process with mind mapping techniques in sharpening social skills in particular argue to be able to provide solutions to a problem faced. The next affective indicator that influences is cooperation. The assessment of cooperation indicators in the affective domain is to train students to be able to socialize, able to appreciate the diversity and able to organize themselves in a learning group. The statement is supported by the expert opinion which states that theoretically the team work is the ability to work towards a common vision and mission in achieving the goal.

The study of problem-based learning model with mind mapping technique is categorized as successful in improving cognitive and affective learning achievement. So that problem-based learning model with mind mapping technique can be applied as one of alternative in biology learning.

CONCLUSION

Based on the results of research that has been done, it can be concluded that the model of problem-based learning with mind mapping technique significantly influence biology learning outcomes ($p = 0.00 < 0.00$) with a mean difference of 5.00 and significantly influence student learning outcomes Class X MIPA MAN 1 Jember ($p = 0.046 < 0.01$) with mean of learning result in experimental class equal to 78.94 and control class equal to 71.100. Problem-based learning model with mind mapping technique has several complex stages that require a lot of time allocation. Suggestions that can be given in this research is best done learning plan as possible and exercise before research so that learning objectives to be achieved student can be fulfilled well.

REFERENCES

Apriliyaningsih, Nurul. 2007. Penerapan Remedial Teaching pada Model KUASAI untuk mencapai Ketuntasan Belajar Biologi Siswa SMP Negeri 6 Jember. Skripsi tidak diterbitkan. Jember: UniversitasJember.

Arifin, Zainal. 2009. Evaluasi Pembelajaran Afektif. Bandung: PT Remaja Rosdakarya.

Buzan, Tony. 2010. Buku Pintar Mind Map. Jakarta: Gramedia Pustaka Utama.

Faruqi, Muhammad Iqbal. Penggunaan Graf dalam Mind-Mapping serta Kegunaannya dalam Kehidupan Sehari-hari. Tersedia di www.informatika.org/~rinaldi/Matdis/2008/Makalah0809_031.pdf. Diakses pada [23 Juni 2016].

Hamalik, Oemar. 2001. Proses BelajarMengajar. Jakarta: BumiAksara. Hasbullah, Thabrany.1995. RahasiaSuksesBelajar. Jakarta: GrafindoPersada.

Husnidar, Ikhsan, M., Rizal, S. 2014. Penerapan Model Pembelajaran Berbasis Masalah untuk Meningkatkan Kemampuan Berpikir Kritis dan Disposisi Matematis Siswa. Jurnal Didaktik Matematika 1(1):71–82.

Jahidin. 2008. Pemahaman Guru-guru Biologi SMAN Bau Bau tentang Keterampilan Metakognitif dan Strategi Kooperatif STAD & CIRC. Jurnal Bioedukasi Vol. VI No.2 Oktober 2008. Jember. Program Studi Pendidikan Biologi FKIP UniversitasJember.
Kemendikbud. 2014. *Penerapan kurikulum 2013 Mata Pelajaran Biologi*. Jakarta: Kemendikbud.

Lisnawati. 2015. *Pengaruh Pendekatan Konstruktivisme dengan Teknik Mind Mapping terhadap Hasil belajar Biologi Siswa*. Jakarta: UIN Jakarta.

Pujianti, Reni. 2015. *Pengaruh Penggunaan Model PBL (Problem based Learning) terhadap Kemampuan metakognitif Siswa*. Jakarta: UIN Jakarta.

Purwanto. 2010. *Evaluasi Hasil Belajar*. Yogyakarta: Pusat Belajar.

Ramli, K. 2011. *Mengukur Ranah Afektif*. Https://kamiantiramli.wordpress.com/tag/mengukur-ranah-afektif/ [30 Mei 2016].

Restika, Oktavina. 2011. *Penerapan Model K.U.A.S.A.I (Kerangka Pikiran, Uraikan Faktanya, Apa Maknanya, Sentakkan Ingatan, Ajukan yang Diketahui, Introspeksi) untuk Meningkatkan Aktivitas dan Hasil Belajar Siswa Kelas V SD Negeri Kebonsari 01 Lumajang dalam Pembelajaran IPA*. Skripsi tidak diterbitkan. Jember: Universitas Jember.

Sanjaya, W. 2008. *Strategi Pembelajaran Berorientasi Standar Proses Pendidikan*. Jakarta: Kencana Pernada Media Group.

Sastrawati, Eka., Rusdi M., & Syamsurizal. 2011. *Problem Based Learning, Strategi Metakognisi dan Ketrampilan Berfikir Tingkat Tinggi Siswa Tekno. Pedagogi. 2*

Trianto. 2009. *Mendesain Model Pembelajaran Inovatif-Progresif. Konsep ,Landasan, dan Implementasinya pada KTSP*. Jakarta: Kencana Press.

Wiyanti, Novan. 2012. *Pendidikan Karakter berbasis Iman dan Taqwa*. Yogyakarta: Teras media.
