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Research Article

Reading, Mind Mapping, and Sharing(RMS): Innovation of New Learning Model on Science Lecture to Improve Understanding Concepts

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Abstract

The course of science is considered to boring and difficult course to be understood by students of science education program. The aims of this research are examine the effect of RMS learning model in mastering the students concepts; 2) examine the effect of difference academic ability in mastering students concept; 3) examine the effect of interaction between RMS learning model and different academic abilities on mastering students concepts. The method of this research is using quasi experimental design method with pretest and postest of non equivalent group design with factorial 2x2. The instrument of this study was essay test with high level of reliability 0.712. The Essay Test was developed based on Bloom's taxonomy i.e. remember, understand, apply, analyze, evaluate, and create. The data analysis used ANCOVA. The result showed that the average score for posttest in RMS learning model with high and low academic level are higher than posttest in conventional class with high and low academic level. The result of mastery of students concepts are higher, 16.233 compared to conventional learning models.

Keywords:
Basic Concepts of Science, RMS Learning Model, Understanding Concepts

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Introduction

Human resources are important asset of a nation to be able to maintain its existence towards various countries. The quality of human resources is a challenge that must be faced in this 21st century and in the next centuries. This challenge has no boundaries of time and does not see the origin of a country. The nation having the superior and high quality human resources and will win the global competition. Therefore, the paradigm of quality education system needs to be a priority in order to support the development of the resources of a nation.

The improvement/evaluation of the education system continues to be pursued in order to achieve maximum learning objectives. The success of education is influenced by the level of professionalism of lecturers in teaching, the assessment process (Morrison, 2012), quality of teaching showed with teaching techniques (Nor & Mahamod, 2014), and the readiness of the students in following the learning activities (Uzaimi, 2012). The indicators of learning success can be seen from the level of students' concept understanding once they finish the learning process (Muhlisin *et al.,* 2016b).

Concept understanding is the ability to grasp the meaning of the material being learned or the results of the learning process. The ability is described as the ability to make outline the main idea of a reading passage, to change the data presented in a particular form into another form, to make an estimation of the trend in the specific data like charts (Hadi et al*.,* 2013). The ability is reflected from the ability to master the subject content, as determined for a particular subject.

Concept understanding is associated with the cognitive processes of person. The levels of cognitive processes in the bloom taxonomic revised version include remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5), and creating (C6) (Krathwohl, 2002: 215). Concept understanding of each student varies. Some students can understand the material thoroughly, and some others cannot understand anything of what they have learned, so that their achievement is only limited to recognizing and experiencing learning it (Muhlisin *et al.,* 2016b).

Concept understanding has an important and strategic position in the learning activities because it is not only a reconstruction the meaning of relationships, but also a process of assimilation of knowledge that has been previously owned. Students should have an understanding of the concept because the concepts are the basis for higher mental processes in the formulation of principles and generalizations to solve a problem (Mauke, 2013). The objective of concept understanding is students can remember the concepts which are already taught longer (Smarabawa et al*.,* 2013). The efforts to make the learning outcomes lead to understanding are that the learning process should emphasize on the significance,

and the activeness of learners in learning activities (Muhlisin, 2012), and involves thinking processes (Rohana, 2009).

Learning success is generally measured by the degree of students' ability in mastering the concepts or as a reference in determining the students' achievement. It is a fact that the concept understanding of the students who take the basic concept of science course in the undergraduate program of Elementary School Teacher Education at University of PGRI Semarang in the academic year 2014/2015 has not fully reached high and very high qualification. Moreover there are 29.5% of students who are in the low category (Muhlisin et al*.,* 2016b). These facts indicate that the learning results are not achieved optimally. Therefore, it is necessary to improve the students' concept understanding in order to raise the students' ability.

The factors affecting the lack of the concept understanding are that the students are less prepared to follow the learning process that includes methods, strategies, and the learning models do not facilitate the students to be involved actively in learning process. Learning models and learning strategies are for learning outcomes (Muhlisin et al., 2016). The 71.4% of dominant learning methods or models used in the learning process of the basic concepts of science courses are student presentations, question and answer, and discussion. Learning activities are dominated by some of the students in each group who were active in discussions and asking questions, and the lack of concept understanding among group members in the presentation of material in front of the class (Muhlisin et al*.,* 2015). The learning model has an effect on the achievement of the learning objectives (Muhlisin, 2012).

The success of person's learning can also be affected by the academic ability. Academic ability can categorized into three categories, i.e. high academic ability, medium academic ability, and low academic ability. Each category has a difference of length of time in understanding the concept of a particular material. In the learning the basic concepts of science class, it showed that the lecturer did not pay much attention of the students' various academic ability in the learning process. The effect of the learning strategy or model and learning media to the variety of academic ability got less attention from the lecturer, so that the students' academic abilities are unlikely to improve despite the implementation of innovative learning (Muhlisin et al*.,* 2018). This idea is similar to the Bahri et al. (2012) stating that academic abilities have received less attention from educators. This is shown that some educators tend to pay attention to the class as a whole, not as individual or group, so that the differences of each individual received little attention. Students having low academic ability will succeed in achieving a particular cognitive target similar to the students having high academic ability if they are given more time (Mumpuniet al*.,* 2012).

Related to problems which explained above, concept understanding and academic ability require more attention in the learning process, so that learning objectives can be fully achieved. The learning process is associated with learning model used in the teaching and learning process. The learning model functions as a guide for teachers and educators in implementing the learning process in order to achieve the learning objectives (Komalasari, 2011). The learning model pays attention on rationale of theoretical, objectives, and outcomes to be achieved. The learning model has five basic elements according to Joyce et al. (2011), namely 1) syntax, the operational steps of learning, 2) social system, the atmosphere and norms in learning, 3) principles of reaction, depicting how educators should view, treat, and respond to learners, 4) support system, all the facilities, materials, tools, or a learning environment that supports learning, and 5) instructional and nurturant effects, the learning results obtained directly based on the targeted objectives (instructional effects) and the learning results beyond the targeted objectives (nurturant effects).

Based on the ideal conditions/expectations, the empirical phenomenon, and theory above, it can be said there has been a gap between expectation and the reality in the field. Therefore, it is necessary to develop a creative and innovative learning model that can improve students' concept understanding and able to equalize the concept understanding between students having high academic ability and the students having low academic ability in the basic concepts of science course.

RMS Learning Model

One of the attempts to improve the quality of human resources in order to be able to compete in the 21st century is through a learning innovation by applying the RMS learning model. The RMS learning model is based on the principles of 21st century learning suggested by UNESCO, constructivism, collaborative, and connectivity learning theories. The steps of the RMS learning model are: 1) reading: students read critically related to certain topics obtained through various information or learning resources; 2) mind map: students create mind maps related to topics that have been read individually and in collaborative groups; 3) sharing: students share mind maps to all students.

Many previous educational research results related to the steps in the RMS learning model indicate that RMS learning model can improve the mastery of the concepts of students with different academic abilities. Through reading activities, the students are expected to have readiness in learning. The students are required to read critically and understand the concepts in their reading material through various learning or information sources. The research conducted by Sofiya (2014)

states that critical reading will form a comprehensive understanding so that it will be stored longer in the brain, rather than just memorizing facts.

After reading activities, the next step is then creating mind map of individuals and groups with collaborative principles. A study by Wigiani et al. (2012) shows that mind map activities are able to increase mastery of concepts and learning achievements. The results of the study by Sutami et al., (2013), show that collaboration is able to foster a sense of responsibility in learning in understanding the concept of material. The results of a study by Suparno (2012) state that collaboration with the peer tutorial is able to improve upper and lower academic abilities.

The last step is sharing by presenting the results of their collaborative groups' mind map in front of the class. Social interaction reflected in the feedback is needed at this stage because each other will carry out the evaluation and reflection process. The process of evaluation and reflection is a process of social interaction that will cause a very effective effect in a short time in understanding a concept, both in aspects of academic learning and aspects of skills (Joyce et al., 2011).

RMS learning model includes learning phases, lecturer's activities, and students' activities, as shown by the table 1 below:

Table 1.
Activities based on RMS Learning Model

Learning Phase	Lecturer's Activities	Students' Activities
Pre-Activity	➢ Greet and pray. ➢ Check students' presence. ➢ Communicate or explain learning outcomes, learning objectives, and learning rules. ➢ Motivate and encourage students' curiosity related to the topic given. ➢ Distribute and explain instructions of student's activity sheet and assign them to work based on the instructions.	➢ Respond greeting and pray. ➢ Respond the presence honestly and with responsibility. ➢ Listen to the explanation on learning outcomes, and learning rules. ➢ Focus on the learning process, dig and evaluate what they want to know. ➢ Focus on student's activity sheet given.
Main Activity		
Reading	➢ Guide students in critical reading related to a specific topic or material.	➢ Read critically related to specific topic/ material.

Mind map	➢ Assign students to create mind map individually related to the information they have read before. ➢ Associate students in heterogeneous groups. ➢ Assign students to create mind map colaboratively based on the information they have read before and their individual mind map. ➢ Facilitate students to conduct a collaborative discussion in creating mind map with their group.	➢ Create mind map individually related to the information they have read before. ➢ Create a heteregenous group consisting of 4-6 students. ➢ Create mind map colaboratively based on the information they have read before and their individual mind map. ➢ Communicate their ideas on mind map in a collaborative discussion .
Sharing	➢ Facilitate each group to present their group work (mind map) infront of the class in discussion. ➢ Give motivation to students to give feedback by responding the group who is presenting their work. ➢ Give feedback, reinforcement, and confirmation towards the material/ topic given through various learning sources.	➢ Present their group work (mind map) infront of the class in discussion. ➢ Give a feedback/ suggestion/ question to the group who is doing the presentation. ➢ Focus on the feedback, reinforcement, and confirmation given by the lecturer.
Post-Activity	➢ Lead students to pray and say greeting.	➢ Pray before the learning is over and respond to the greeting.

Method

Research Design

The research was conducted in the Undergraduate program on the basic concept of science course. The research design used quasi-experimental design with pretest and postest non-equivalent group research design with 2x2 factorial design. The procedure of the Quasi-experimental is shown in Table 2.

Table 2.

The Implementation Procedures of the Experimental Research

Pretest	Treatment	Posttest
O1	A1BI	O2
O3	A1B2	O4
O5	A2B1	O6
O7	A2B2	O8

Note:

O1, O3, O5, O7: pretest scores

O2, O4, O6, O8: posttest scores

A1: Lecture with RMS learning model

A2: Lecture with conventional learning model

B1: A group of students having high academic ability

B2: A group of students having low academic ability

Sampling

The study groups were determined according to academic ability which was based on students' Grade Point of odd semester of academic year 2014/2015 that divided into three items, namely high ability (HA), moderate ability (MA), and low ability (LA). The students in high ability and low ability groups were examined in this research. The high ability student group was considered as 33.3% of the students on the top of the list based on the Grade Point (GP). The low ability student group was considered as 33.3% of the students on bottom of the list based on the Grade Point (GP). The participants of this study were students who receive the basic concepts of science subject. There were 418 students which divided into 9 classes. Cluster random sampling technique was applied and chosen two classes at random as participants: 2A class (class control/conventional class) consisted of 45 students where 15 students were at high academic ability (HA) and 15 students were at low academic ability (LA), and2C class (experimental class/classroom learning using RMS model) consisted of 48 students where 16 students were at high academic ability (HA) and 16 students were at low academic ability (LA).

Instrumentation

The test are in the form of essay and developed based on Bloom's taxonomy which refer to Krathwohl (2001:215), that is remember (C1), understand (C2), apply (C3), analyze (C4), evaluate (C5), and create (C6). The research instruments were sheet. A concept understanding test in the form of essay is consisting of 18 test items. The concept understanding test was assessed based on a scale score of 0-4. The reliability level of the concept understanding test was quite high 0.712.

Data Analysis

The data were analyzed using descriptive statistics technique and inferential statistical parametric techniques. Descriptive analysis technique was to describe the data about the students' concept understanding. The parametric inferential statistical analysis in this experimental research used Analisys of covariance (ANACOVA) with the analysis program SPSS 20 for Windows.

Results

The data of mastery students' concept in detail can be seen in Figure 1.

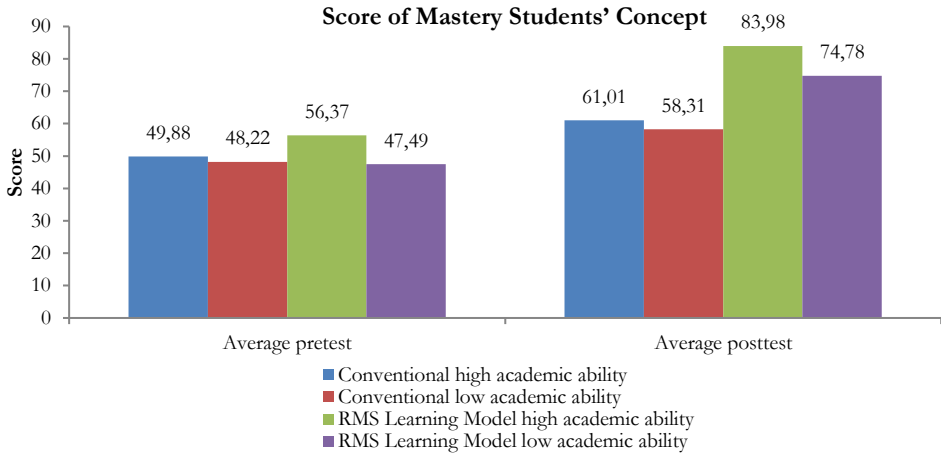

Figure 1.

The Average Score of Pretest and Posttest of Mastery Students Concept.

The data above then is analyzed by using ANCOVA test. The data is previously analyzed by using normality and homogeneity of variances test. The test of normality and homogeneity of variances can be seen in table 3 as followed

Table 3.
The Result of Test Normality and Homogeneity of Variance of Score of Mastery Concept.

Test	***df***	***sig.***	**Criteria**	**Result**
Test of Normality	62	0,200	$\varrho \geq 0,05$	Normal
Test of Homogeneity of Variances	60	0,094	$\varrho \geq 0,05$	Homogen

Based on the result in table 3, in test of normality, there is signigficane more than 0,05, which is 0,200, which means the data was distributed normally. In homogeneity variances, the significance score is greater than 0,05, which is 0,094, which means that the data is homogenous. It showed that the data of the research can be continued to ANACOVA test. The summary of ANACOVA test of the effect of treatment on mastery students' concept can be seen in Table 4.

Table 4.
The Result of Anacova Test of Effect of Treatment on Mastery Students' Concept.

Data Source	**Sum of Squares**	**df**	**Average of square**	**F**	**Sig.**
Pretest	793.128	1	793.128	17.323	.000
Learning model	4199.444	1	4199.444	91.719	.000
Academic	117.712	1	117.712	2.571	.114
Learning model * academic	12.420	1	12.420	.271	.605
error	2609.797	57	45.786		
∑	**310348.250**	**62**			

On the data source of the learning model, the alpha level is 0.05 with dfl = l and df2 = 57 obtained F_{table} of 4.01. From Table 4, the score of $F_{arithmetic} > F_{table}$ is 91.719> 4.01 and the sig. score is 0,000 <0,05. This means that H_0 is rejected or states that there is a significant difference in the score of mastery of concepts between students who are taught by using RMS learning model and conventional learning models. Furthermore, the analysis which held to find out which learning is better between the two learning models applied, is conducted the Parameter Estimates test. The test results can be seen in Table 5.

Table 5.
The ResultofEstimates Parameter of Posttest Mastery Concept

Parameter	B	Std. error	t	sig	t-table
Constanta	55.697	4.768	11.682	.000	1,67
Pretest	.391	.094	4.162	.000	1,67
(Model=1)	-16.223	2.433	-6.668	.000	1,67
(Model=2)	0[a]	.	.	.	

Based on table 5 in column B, the score for model 1 is -16,223. It means that if students are taught by using model 2 (RMS learning model), then the result of mastery of students concept will be more than 16,233 compared with those who are taught with model 1 (conventional model learning). It is also proven with sig. score 0,000<0,05 or $t_{arithmetic} > t_{table}$ are 6,668 > 1,67. The difference can be seen from the average mastery of concept and the result of calculation of gain, as stated in Figure 1 which showed that the average score of posttest of RMS learning model for low and high academic ability is higher than average score of posttest conventional class for low and high academic ability. It is also supported with the result of normalized gain analysis which can be seen in Table 6.

Table 6.
The Comparison of Normalized Gain Analysis of Score of Mastery

Class	Average		N Gain	Category
	Pretest	Postest		
Conventional high academic ability	49,88	61,01	0,21	Low
Conventional low academic ability	48,22	58,31	0,18	Low
RMS Learning Model high academic ability	56,37	83,98	0,63	Average
RMS Learning Model low academic ability	47,49	74,78	0,51	Average
Conventional	49,05	59,66	0,20	Low
RMS Learning Model	51,93	79,38	0,57	Average

Based on Table 6, the top normalized gain is shown in the RMS Learning Model high academic ability and the lowest is shown in the Conventional Learning Model low academic ability. Overall, RMS Learning model showed greater normalized gain score than conventional learning model. It shows that the RMS learning model has potential to improve the mastery of students concept in which the improvement score of RMS learning model is higher than conventional learning model.

The test to determine the influence of academic ability on mastery of student concepts can be seen in Table 6. At the source of academic ability, alpha level 0.05 with df1=1 and df2 = 57, the F_{table} is 4,01. The value of $F_{arithmetic} < F_{tab1e}$ is 2,571 < 4,01, and the value of sig. is 0,114 > 0,05. It means that H_0 is accepted or stated that there is no effect of academic ability on mastery students concept so that the students who have high academic ability are not always get better mastery concept than low academic ability.

While the test to determine the interaction of learning model with academic ability can be seen in table 3. In the source of learning model*academic ability, alpha level 0.05 with df1=1 and df2 = 57, the F_{table} is 4,01. The value of $F_{arithmetic} < F_{tab1e}$ is 0,271 < 4,01, and the value of sig. is 0,271 > 0,05. It means that H_0 is accepted or stated that there is no interaction effect of learning models and academic ability on the mastery of students concepts so that RMS learning model can be applied in all academic level both high and low level.

Discussion

The development of RMS Learning model based on the principles of constructivism learning theory, so that the learners as independent learners can be realized. The learning implementation in accordance with the concept (Joyce et al., 2011) of constructivism is that in the learning process the brain stores informations, processes it, and changes previous conceptions. Knowledge is obtained from the experience and interaction. People must actively build or create their own understanding by synthesizing knowledge from various sources (Zaibon & Shiratuddin, 2010).

Learning is not just a process of absorbing information, ideas, and skills because new materials will be constructed by the brain. Knowledge is not only transmitted by the teachers or parents, but learners must build and construct their own knowledge, so that they respond to the existing information (Joyce et al., 2011: 14). This is in line with Marzano (1992: 106) that the learning process should be designed and managed to improve learners' ability in organizing their own experience to be a meaningful new knowledge. Related to constructivism, it is clearly observable that the learner must build their own knowledge based on their experience and manage their own thinking processes, not just passively receive any information.

The social aspect is the basis for RMS learning model which refers to the social cognition theory by Vygotsky that interpersonal interaction helps develop individual knowledge. Having a social interaction with others can bring new ideas and improve the intelligence of individuals (Joyce et al., 2011). It is in line with Fraser & Walberg (1995) that any development of new concepts was not

conducted in an empty space but in a social context, in which the learners can experience interactions with others to develop their ideas.

In the reading phase, the students are facilitated to prepare themselves to follow the learning activity by critically reading the learning material from a variety of learning resources. Reading activities aim at understanding new ideas in a written form. This information is consistent with the research by Kirmizi (2015) that the readiness to learn has a positive effect on motivation and learning success. Similarly, the research results by Fu et al. (2014) found that the reading strategies can improve understanding of a concept or a topic.

After the students get the information from a variety of learning resources, the students make a mind map individually and collaboratively in groups. Mind mapping activities either individually or in groups require the students to be able to understand and remember the material they read, and then express it in writing. Umar & Ahmad (2010) mention that the communication in group discussions could encourage problem solving and able to improve the thinking process. This idea was supported by the research results by Gan & Hong (2010) that learning with peer tutors could improve achievement compared to the conventional learning.

The mind mapping activity either individually or collaboratively focus the students on organizing meaningful information and provide an opportunity to review the information obtained. It allows the students to understand the basic idea of the content and connect it with the other ideas, so that students understand a concept well. This idea was supported by the research results by Long & Carlson (2011) that mind mapping can help in achieving a greater understanding of the learners than the traditional note-taking and can control in forming a meaningful connection of the content, so that students can understand a concept well. Similarly, according to Tungprapa (2015), the implementation of mind maps makes the learners understand the content more easily, understand the connection among content and memorize the overall concept.

The final phase of RMS learning model is sharing. This activity facilitates the interaction with each other in presenting the results of their mind maps. This phase allows the process to better understand a concept and connect it with one another that is not yet understood. The final part of sharing phase is the confirmation process by the lecturers. This step aims at clarifying concepts that the students do not understand, or they misunderstand. This confirmation process enables the students to better understand the concepts and to straighten any miscconceptions the students previously had. This is in line with Ismawati et al. (2014) that the activities of communication, interaction, and confirmation from the teacher to the learners can make learning much more focused and help to improve students' concept understanding.

The social interaction in RMS learning model phase, such as group mind mapping, and the social interaction defined in sharing phase which facilitates the students to be able to understand a material comprehensively because it gives the students opportunity to give feedback to each other, ask questions, answer questions, express opinions among group members in the discussion. Thus, it facilitates in understanding a particular concept that is not yet understood.

An important finding of this research is that the increase of the students' concept understanding was also influenced by their intrinsic motivation in the form of pleasure, or students' response of the implementation of the learning model which was relatively new to them, so that their concept understanding increased. These results are supported with the results of observations conducted by the observer during the research. It was observed that the students felt happy, did not get bored and looked excited during the learning process because in mind mapping consist of color, symbols and short words, so that it made easier for the students to understand, memorize, and recall. This is in line with Imad & Utomo (2012) stating that drawing with symbols and colors is able to make learners feel happier, so that the learners can understand a particular material better. According to Oren & Meric (2014), learning taught by describing concepts can make the students feel happy and motivated in learning that allows them to integrate the topic of science in everyday life. Lee & Pang (2013) states that motivation can improve learning achievement.

The ANCOVA test is to know whether there is any significant effect of academic ability on students' concept understanding. The test results in Table 4 on the source of academic skills showed that the F value was 1.637 with a p-value nigger than α 0:05 ($p \geq 0.05$) which was sig. 0.206. It means that there is not any significant effect of students' academic ability on their concept understanding The division of the collaborative group of the mind mapping was done by dividing a heterogeneous group members based on their academic ability consisting of the high academic ability, medium academic ability, and low academic ability, and the leader of the group was from the high academic ability students.

The heterogeneous group division was intended to prevent domination by the high academic students over the others, and so that there would be the interaction between the high academic students and the low academic students so that the group members cooperate to achieve their common goal. The research results by Ajaja & Eravwoke (2010) state that the cooperative learning requires the social interaction in the form of cooperation between one another, and encourages a discussion on a certain learning material so that it can enhance the concept understanding among the students having high academic ability and low academic ability. Similarly, Murdani (2015) states that the peer tutorials make the learners feel actively involved in the learning process, and they do not feel embarrassed in

expressing their opinions or ideas to group members, so that an equal distribution of knowledge in the learning process in the classroom activities would be achieved.

The test is to see whether the interaction of learning model and academic ability has any effect on the students' concept understanding. The test results in Table 4 on the source of the interaction of the learning model and academic ability showed that the F value was 0.083 with a p-value bigger than α 0:05 ($p \geq 0.05$) with sig. 0.775. It means that the interaction of learning model and academic ability does not have any effect on students' concept understanding. Thus, there is no significant effect of the interaction of the learning model and academic ability on the students' concept understanding.

The test results of the effect of the interaction between the learning model and the academic ability on concept understanding show that there is not any effect of the interaction. The results of this research are consistent with the research results by Bahri et al. (2012) that there is not any effect of the interaction between learning strategies and different academic abilities on learning results. The findings of the research reveal that the RMS learning model is able to minimize the distance of the concept understanding between the students having high academic ability and the students having low academic ability. RMS learning model is designed with a mix between individual responsibility and social interaction that aims at equalizing between the high academic ability and the low academic ability.

RMS learning model facilitates and requires the students to be actively involved in preparing the study, searching, understanding the concept, and reviewing the information that has been obtained. These stages describe that students should be able to understand independently the material or concepts that they have learned, so that each student has the responsibility of their own concept understanding, so that each individual can be improved. This consistent with the research by Kolloffel et al. (2011) that the activities of the mind mapping individually or independently are able to improve the concept understanding of the individuals in understanding a particular material.

The equality of students' concept understanding was also influenced by the activity of a collaborative discussion process in making mind mapping in a group because the collaboration among group members can enhance the responsibility of individuals and groups on the achievemens they get. This is in line with the idea of Forte (2015) that the collaborative activity can improve the responsibility of individuals or groups of the information obtained.

Conclusion and Recommendation

The conclusions which are gained from data analysis, result and discussion, are:

- There is significance effect in applying RMS learning model toward mastery student concept;

- There is no effect of difference academic ability toward mastery student concept;
- There is no interaction effect between RMS model learning and different academic ability toward student mastery concept.

It is suggested that RMS learning model needs to be implemented the RMS learning model at both the elementary school and higher education, with other the basic concepts of science course, and the implementation of the learning syntax is both online as well as offline in the implementation of learning.

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References

Ajaja, O., & Eravwoke, O. (2010). Effects of Cooperative Learning Strategy on Junior Secondary School Students Achievement in Integrated Science. *Electronic Journal of Science Education*, *14*(1), 1-18.

Bahri.A., Azis, A., & Amin, N. (2012). Penerapan Strategi Pembelajaran Question Student Have dan Academic Skills on the Cognitive Learning Results of the Class VIII Junior High School Camba (the Implementation of Learning Strategies Have Question Student and Academic ability Against Cognitive Learning Outcomes Grade SMPN 2 Camba). *Journal Sainmat*, *1*(1), 41-51.

Fraser, B.J. & Walberg, H.J. (1995). *Improving Science Education*. Chicago: The National Society for Study of Education.

Fu, Y., Chen, S., Wey, S., & Chen, S. (2014). The Effects of Reading Strategy Instruction via Electronic Storybooks on EFL Young Readers' Reading Performance. *International Journal of Contemporary Education Research*, *1*(1), 9-20.

Gan, S & Hong, K. (2010).The Effectiveness of Peer Tutoring in the Teaching of Mathematics. *Malaysian Journal of Learning and Instruction*, *7* , 113-132.

Hadi, A., Corebima, A., & Saptasari, M. (2013). Pengaruh Pembelajaran *Problem Based Learning* (PBL) Terhadap Kemampuan Berpikir Kritis dan Pemahaman Konsep Biologi Siswa SMA Negeri di Kota Malang (the Effect of *Problem Based Learning* (PBL) Learning Model on the Critical Thinking Ability and Understand Biology for Senior High School in Malang). *Journal Online UM*, 1-11.

Imaduddin, M., & Utomo, U. (2012). Efektifitas Metode *Mapping* untuk Meningkatkan Prestasi Belajar Fisika pada Siswa Kelas VIII (the Effect of Mind Mapping on Increasing Physics Learning Achievement in Class 8. *Humanitas*, *9*(1), 62-75.

Ismawati, F., Nugroho, S., & Dwijananti, P. (2014). Application of Conceptual Understanding Procedures for Improving Student Curiosity and Understanding Concepts. *Jurnal Pendidikan Fisika*, *10*, 22-27.

Joyce, B., Weil, M., & Calhoun, E. (2011). *Model of Teaching Model-Model Pengajaran*. Edisi Kedelapan (*Model of Teaching Models of Teaching*. Eighth Edition. Yogyakarta: PustakaPelajar.

Kirmizi, O. (2015). The Influence of Learner Readiness on Student Satisfaction and Academic Achievement in an Online Program at Higher Education. *The Turkish Online Journal of Educational Technology*, *14*(1), 133-142.

Kolloffel, B., Eysink, T., & Jong, T. (2011). Comparing the Effects of Representational Tools in Collaborative and Individual Inquiry Learning. *Computer Supported Collaborative learning*, *6*(1), 223-251.

Komalasari, K. (2011). *Pembelajaran Kontekstual Konsep dan Aplikasi*. Bandung: PT. Refika Aditama.

Krathwohl, D. (2002). A Revision of Bloom's Taxonomy: An Overview. *Theory into Practice*, *41*(4), 212-218.

Lee, P & Pang, V. (2015). Motivational Factors in Continuing Education an Academic Achievement of Adult Learners. *Malaysian Journal of Learning and Instruction*, *10*(2015), 55-77.

Long, D & Carlson, D. (2011). Mind the Map: How Thinking Maps Affect Student Achievement. *Networks*, *13*(2), 1-7.

Marzano, R.J. (1992). *A Different Kind of Classrooms: Teaching with Dimension of Learning. Alexandria*: Association for Supervision and Curriculum Development.

Mauke, M. (2013). Pengaruh Model Contextual Teaching and learning terhadap Pemahaman Konsep dan Kemampuan Pemecahan Masalah dalam Pembelajaran IPA Fisika di MTs Negeri Negara. *E-Journal Program pascasarjana Universitas Pendidikan Ganesha Program Studi IPA*, 3, 1-12.

Morrison, A. (2012). *Professional Standards for Lecturers in Scotland's Colleges. Initial Teacher Training/Education Standards for Lecturers in Scotland's Colleges*. Edinburgh: The Scottish Goverment by APS Group Scotland.

Muhlisin, A. (2012). Pengembangan Perangkat Pembelajaran IPA Terpadu Berbasis Contextual Teaching And learning (CTL) dengan Model Pembelajaran Kooperatif Tipe Student Achievement Division (STAD) Tema Polusi Udara. *Journal of Educational Research and Evaluation*, *2*(2012), 139-145.

Muhlisin, A., Susilo, H., Amin, M., & Rohman, F. (2015). Analysis of Method or Learning Model and Skill Qualification of Students' Critical Thinking in The Natural Science Basic Concept Lecture. *8th International Conference on Science, Mathematics&Technology Education (SMTE)* UNJ. Jakarta, November 21-24, 2015.

Muhlisin, A., Susilo, H., Amin, M., & Rohman, F. (2016a). Analisis Keterampilan Metakognitif Ditinjau dari Kemampuan Akademik Berbeda pada Perkuliahan Konsep Dasar IPA. *Seminar NasionalBiologi FMIPA Unesa*. Surabaya, 20 Februari 2016.

Muhlisin, A., Susilo, H., Amin, M., & Rohman, F. (2016b). An Analysis of University Students' Conceptual Understanding and Retention on Science Basic Concepts. *Conference Proceedings 7th International Conference on Educational Technology (ICETA7)* of Adi Buana. Graduate Program University of PGRI Adi Buana. Surabaya. 13 March 2016.

Muhlisin, A., Susilo, H., Amin, M., & Rohman, F. (2016). Improving Critical Thinking Skills of College Students Through RMS Model for Learning Basic Concepts in Science. *Asia-Pacific Forum on Science Learning and Teaching*, *17*, (1), Article 12.

Muhlisin, A., Susilo, H., Amin, M., & Rohman, F. (2018). The Effectiveness of RMS Learning Model in Improving Metacognitive Skills on Science Basic Concepts. *Journal of Turkish Science Education*, *15*(4), 1-14.

Mumpuni, K., Prayitno, B., Karyanto, P., & Sugiharto, B. (2012). Pemberdayaan Hasil Belajar Kognitif Biologi Melalui Strategi Pembelajaran INSTAD pada Kemampuan Akademik Berbeda. *Seminar Nasional IX Pendidikan Biologi FKIP UNS*, 281-285.

Murdani, S. (2015). Model Pembelajaran Kolaboratif dengan Tutor Sebaya pada Pokok Bahasan Rangkaian Seri Paralel Hambatan Listrik. *JRKPF UAD*, *1*(2), 42-46.

Nor, M & Mahamod, Z. (2014). Pengetahuan Pedagogi Kandungan Guru Bahasa IBAN yang Baharu dengan yang Berpengalaman di Sekolah-Sekolah Menengah di Sarawak. *Malaysian Journal of Learning and Instruction*, *11*, 2017-236.

Oren, F. & Meric, G. (2014). Seventh Grade Students' Perceptions of Using Concept Cartoons in Science and Technology Course. *International Journal of Education in Mathematics, Science and Technology*, *2*(2), 116-137.

Rohana. (2009). Penggunaan Peta Konsep dalam Pembelajaran Statistika Dasar di Program Studi Pendidikan Matematika FKIP Universitas PGRI Palembang. *Jurnal Pendidikan Matematika*, *3*(2), 92-102.

Siemens, G. (2005). Learning Development Cycle: Bridging Learning Design and Modern Knowledge Needs. *(www.cedma-europe.org),* diakses pada 29 Desember 2014.

Smarabawa, I., Arnyana, IB., Igan., & Setiawan. (2013). Pengaruh Model Pembelajaran Sains Teknologi Masyarakat terhadap Pemahaman Konsep Biologi dan Keterampilan Berpikir Kreatif Siswa SMA.*E-Journal Program Pascasarjana Universitas Pendidikan Ganesha Program Studi IPA*, *3*(1), 1-11.

Sofiya, N. (2014). Pengaruh Motivasi Belajar, Membaca Kritis dan Belajar terhadap Berpikir Kritis Siswa Jurusan Administrasi Perkantoran SMK Widya Praja Ungaran. *Economic Education Analysis Journal*, *3*(3), 570-575.

Sutami, N., Suharsono, N., & Warpala, I. (2013). Pengaruh Pembelajaran *Scaffolding* terhadap Keterampilan Menulis Teks Recount Berbahasa Inggris dan Kreativitas Siswa Kelas VIII SMP Negeri 3 Manggis. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha Program Studi Teknologi Pembelajaran*, *3*(1), 1-9.

Tungprapa, T. (2015). Effect of Using the Electronic Mind Map in the Education Research Methodology Course for Master Degree Students in the Faculty of Education. *International Journal of Information and Education Technology*, *5*(11), 803-807.

Umar, I & Ahmad, N. (2010). Trainee Teachers' Critical Thinking in an Online Discussion Forum: A Content Analysis. *Malaysian Journal of Learning and Instruction*, *7* , 75-91.

Uzaimi, A. (2012). Ekspektasi, Motivasi, dan Kesiapan Mahasiswa untuk Belajar Studi pada Mahasiswa Akuntansi Universitas Maritim Raja Ali Haji Tanjung pinang (Studi Komparatif Mahasiswa Pendatang dan Tempatan). *JEMI*, *3*(1), 23-32.

Wigiani, A., Ashadi., & Hastuti, B. (2012). Studi Komparasi Metode Pembelajaran *Problem Posing* dan *Mind Mapping* terhadap Prestasi Belajar dengan Memperhatikan Kreativitas Siswa pada Materi Pokok Reaksi Redoks Kelas X Semester 2 SMA Negeri 1 Sukoharjo Tahun Pelajaran 2011/2012. *Jurnal Pendidikan Kimia*, *1*(1), 1-7.

Zaibon, S & Shiratuddin, N. (2010). Mobile Game-Based Learning (mGBL): Application Developmen and Heuristics Evaluation Strategy. *Malaysian Journal of Learning and Instruction*, *7*, 37-73.