Improving critical thinking skills of college students through RMS model for learning basic concepts in science

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Contents

Abstract

The purposes of this study were to: 1) Examine the effect of RMS learning model towards critical thinking skills. 2) Examine the effect of different academic abilities against critical thinking skills. 3) Examine the effect of the interaction between RMS learning model and different academic abilities against critical thinking skills. The research method used was quasi experimental with 2x2 factorial pretest posttest non equivalent group design.The critical thinking skills instrument used was essay test

with the high level of reliability is 0.712. The data analysis used descriptive analysis and ANACOVA statistical analysis. The results showed that RMS learning model effectively improved students' critical thinking skills and was able to align students critical thinking skills in different academic abilities. The impact of RMS learning model is higher 55,6% than conventional model on critical thinking skills. The basic concepts of science and biology lecturer were recommended to apply RMS learning model to apply them in high schools, middle schools, and elementary schools.

Keywords: RMS Learning Model, Critical Thinking, Academic Ability, Science Basic Concepts

Introduction

An important treasure of a nation lies on its human resources. A nation can grow and prosper if the human resources support it, both in terms of quality and quantity. The human resource is an absolute requirement, so that the improvement of the quality should be the main focus of it, especially in facing the 21st century.

Human resources, in order to compete nationally and internationally in the 21st century, require skills that used to compete including: 1) thinking skills that includes critical thinking, problem solving, creativity, and metacognition; 2) communication and collaboration skills that is able to communicate and collaborate effectively with the various parties; 3) creativity and innovation skills that is able to develop its creativity to generate innovative breakthroughs; 4) information and communications technology literacy that is able to utilize information and communication technologies to improve the performance and activities of daily life; 5) contextual learning skills that is capable of undergoing self-contextual learning activities as part of personal development; and 6) information and media literacy skills that is able to understand and use a variety of communication media to convey ideas, implement collaborative activities, and interaction with various parties (Greenstein, 2012).

The improvement of human resources such as critical thinking skill can be learnt and developed through basic concept learning of science which is compulsory for students of S1 PGSD of University of PGRI Semarang. The learning process relies heavily on learning method used since the learning method impacts the learning objectives (Muhlisin, 2012).

The dominant method or learning model used in the basic concepts of science courses learning process are student presentations, question and answer, and discussion in the percentage of 71.4%. This learning model or learning methodis integratedin each meeting with particular stage activities: the lecture gives task to the students in each meeting to discuss in groupsto make a paper, to present in groups about material determined at the beginning of the lecturing contract and to do question and answer. The learning activities is dominated by most of the students in each group who were active in discussions and less students dared to ask questions and answer questions either from lectureror friends in a discussion during a presentation (Muhlisin et al., 2015).

Learning models and methods used have an impact on students' critical thinking skills who have low optimal critical thinking skills. The fact of students' critical thinking skills as a whole at low critical thinking criteria is 80.9%. In details,the indicator of the highest critical thinking skills in the indicator of formulating the problem is 65.9%, the indicator of the lowest critical thinking skills in the indicatorof making deductions is 54.6%. The lack of students' critical thinking can also be seen on the students' argument where their reasons are not appropriate, provides less logical assumptions, and providesless evaluation based on facts (Muhlisin et al., 2015). It shows that the learning method or learning model used is less able to develop critical thinking skills. Where as in the basic concepts of science courses, students are expected to empower their thinking skill in order to achieve the expected learning goals. Critical thinking skills are essential for supporting life full of challenges in a globalized world of the 21st century accordance with the opinion of Marin & Halpern, (2010); Fahim & Pezeshk (2012) that the critical thinking skills is an active reasoning and deliberation to be used to decide or evaluate something of the issues facing the complexities of modern life.

Another factor that affects the learning outcomes is students' academic achievement. The academic ability is divided into three categories, namely high, moderate, and low academic ability. High academic ability is definitely different from the low academic ability in terms of technique and time of learning a particular concept or material. Joyce et al. (2009) states that each academic achievement takes different time of learning. Low academic ability might hinder the teaching and learning process if it is not facilitated properly. The learning of basic concept on science shows that most lecturers do not consider the academic achievement variation in learning process so students' academic achievement does not improve (Muhlisin et

al., 2016a). Therefore, an appropriate learning model is needed to improve the low academic achievement to high academic ability.

The gap between expectation and reality field, it is necessary to innovate learning model creative and innovative that can improve students' critical thinking skills and is able to align critical thinking skills among students of academic ability above and below the academic course on basic concepts of science. Solutions offered by appliying RMS model of learning. The steps of RMS learning model are: 1) reading: students critical reading related to specific topics to be studied from a variety of learning resources; 2) Mind Mapping: students create mind maps related to the topics that have been read individually and collaborative groups; 3) sharing: students sharing mind maps to all students through a presentation to the class (Muhlisin et al., 2016b).

RMS learning model with learning syntax short and easy to remember by lecturers and students on the principles of constructivism learning theory in order to make the students independent in mengkonstruks knowledge in the learning process. The learning model has been proved to increase the understanding of the concept, academic ability, and enhance student motivation (Muhlisin et al., 2016b).

RMS learning model potentially improve thinking skills for mengakomudir reading critical information required in the learning process so that students are ready to follow the lesson and were able to identify the problem. The process of identifying the problem, understand, and seek information can improve critical thinking skills (Facione, 2013). Mind mapping activities of individual and collaborative group is concrete activities using creative visual arts in exploring ideas and connect information that exists in the mind so as to stimulate the thinking process (Kalelioglu & Gulbahar, 2013). Activities mind mapping stimulate students in meidentifikasi reasons, assumptions, alternatives, and conclusions (Jones et al., 2012); (Nilson et al., 2014). Cooperation in collaborative groups and exchange ideas through sharing involves the participation of individuals and groups as well as improving learning activities such as frequently asked questions, exchange ideas, and evaluate what has made people so as to improve learning achievement and critical thinking (Ibraheem, 2011); (Peter, 2012).

Critical Thinking

Living in the 21st century requires higher thinking skills such as critical thinking, creative thinking, problem solving (Kalelioglu & Gulbahar, 2013). Higher-level thinking than thinking critically, among others, problem solving, analytical thinking and evaluation (assess possible alternatives, assessing the arguments, weigh the evidence, awareness of different opinions, finding the cause/connection results, evaluate the possibilities, using the information in the process of critical thinking to solve the problem, creativity, innovation, and capable of producing new ideas from old ideas) (Riechman & Simon, 2013). Thinking is an activity someone in search of a proper answer, filtering out various kinds of data or information, solve problems, and decided something (Colley et al., 2012); (Tolinggi et al., 2013).

Critical thinking is a skill that must be mastered and taught for critical thinking is a way of thinking about something that makes sense is focused on deciding what to believe or do (Ennis, 2010; Ennis, 2011; Facione, 2013). Critical thinking is used to pass judgment on any information, explain the reasons, and able to solve the problem of the unknown (Thomas, 2011), so that each individual is able to understand any content or information on a particular thing (Zane, 2013). Critical thinking includes skills in conceptualizing, applying, analyzing, synthesizing, and / or evaluating information gathered from, or generated by observation, experience, reflection, reasoning, or communication as a guide to belief and action, evaluating information to reach an answer or conclusion (Peter 2012; Almubaid, 2014).

The essence of critical thinking is the interpretation, analysis, inference, evaluation, explanation, self regulation (Zane, 2013; Facione, 2015). Description of core critical thinking can be seen in Table 1.

Table 1. Description of Core Critical Thinking

No	Skill	Description
1.	Interpretation	The primary definition of interpretation is the act of making sense of various inputs. Interpretation requires that we clarify the purpose, issue, problem/question, meaning, etc.
2.	Analysis	Analysis means to break down, examine, or otherwise explore the issues, available information, arguments, etc. With analysis, we must manipulate, process, or otherwise make active changes to the inputs to make better sense of them.

3.	Evaluation	To evaluate means to determine the merit, value, efficacy, advantages, worth, authenticity, validity, impact, or significance, of something (e.g., the evidence, claims, assumptions, biases, perspectives, etc.)
4.	Inference	This broad term covers reasoning coupled with the use of evidence and standards that together are necessary for synthesizing, coming to a conclusion, making decisions, identifying alternatives, generalizing, planning, predicting, etc.
5.	Explanation (Communication)	Communicate the outcomes of thinking such as stating results, justifying procedures, explaining meaning, presenting arguments, etc. This is considered critical thinking because of the mental processes involved in designing a well written (or spoken) message.
6.	Self-regulation (Metacognition)	During all of the above (and sometimes following the thinking as well), reflect, self examine, pose questions about thinking, self correct, etc

Source: Facione (1990)

RMS Learning Model

RMS learning model with major steps: 1) reading: students critical reading related to specific topics; 2) Mind Mapping: students create mind maps related to the topics that have been read individually and students formed a collaborative mind maps in groups; 3) sharing: students sharing mind maps to all students in the class. Learning implementation in accordance with the concept of constructivism, that learning is not just a process of absorbing information, ideas, and skills for new materials will be constructed by the brain and the knowledge is not only transmitted by teachers or parents, but must be built and raised himself by learners in order for them can respond to the information there (Joyce et al., 2011: 14). The learning process should be designed and managed to improve learners in organizing their own experience to be a meaningful new knowledge (Marzano, 1992: 106)

The social aspect of RMS learning model refers to social cognition theories developed by Vygotsky that interpersonal interaction helps develop individual knowledge. Social interaction with others can bring new ideas and improving intellectual individuals (Joyce et al., 2011). This is consistent with Fraser & Walberg (1995) that any development of new concepts not conducted in empty space but in a social context, in which the learner can undergo interactions with others to develop their ideas. Description of measures RMS learning model can be seen in Table 2.

Table 2. Description of Main Step in RMS Learning Model

First Stage: ***Reading***	**Second Stage:** ***Mind mapping***
• Lecturer guides students in the implementation of critical reading related to the topic or specific material. • Students docritical reading activities related topic or specific material.	• Lecturer assigns students in making mind map individually related to the results of the information that has been read. • Lecturer organizes students in heterogeneous groups • Lecturer asks and facilitates students in groups creating collaborative mind mapping related to the information results that have been read and the results of the individual mind mapping. • Students make a mind map related to the results of a critical reading of topics / materials individually. • Students communicate the results of his thought and mind mapping in collaborative groups.
Third Stage: ***Sharing***	
• Students present the results of the collaborative groupwork (mind mapping) in front of the class in a questioning and answering discussion. • Lecturers provides feedback, reinforcement, and confirmation toward the content / topic that has been studied through a variety of learning resources.	

Source: Muhlisin et al., (2016b).

Aim of this Study

This study aim to examine the effect of RMS learning model towards students' critical thinking of different academic ability. The hypothesis of the study are stated as follow:

1. There is an effect of RMS learning towards students' critical thinking skill.
2. There is an effect of the academic ability towards students' critical thinking.
3. There is an interaction effect between RMS learning model and academic ability towards students' critical thinking.

Methodology

This research was quasi experimental research conducted in November 2014 to August 2015. The research was conducted on basic concepts in science in PGRI Semarang University.

Research Design

The method used was quasi-experimental research design with 2x2 factorial version non equivalent group design. Quasi experimental Nonequivalent Pretest-Posttest Control Group Design procedure is further shown in Table 3.

Table 3. The Procedure of Experimental Research Implementation

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

Source: Sugiyono (2010: 107)

O1, O3, O5, O7: pretest scores

O2, O4, O6, O8: posttest scores

A1: lecturing using RMS learning model

A2: lecturing using conventional learning model

B1: a group of students with higher academic ability

B2: A group of students with lower academic ability

The determination of academic ability is based on students' Grade Point of odd semester academic year 2014/2015, which is divided into three, namely high ability (HA), moderate ability (MA), and low ability (LA). This research examined the high ability and low ability. Students who are considered as high achievers are 33.3% of top listed students who achieve better than other students based on the Grade Point (GP). Students who are considered as low achievers are 33.3% of bottom listed students who achieve lower than other students based on the Grade Point (GP). The detail information of students' academic ability is presented in Table 4.

Table 4. The Procedure of Experimental Research Implementation

No	Class	Academic Ability	Grade Point (GP)		Students
			Lowest	Highest	
1.	2A (Conventional)	HA	3,43	3,86	15
2.		MA	3,21	3,4	15
3.		LA	2,72	3,2	15
4.	2C (RMS Learning Model)	HA	3,43	3,83	16
5.		MA	3,21	3,4	16

Keterangan:
HA : High Academic Ability
MA : Moderate Academic Ability
LA : Low Academic Ability

Sampling

The study population was all students who receive the basic concepts inScience consisted of 418 students spread in 9 classes. Sampling usedcluster random sampling technique gained from 2 classes as treatment classes:

1. 2A class (control class/conventional class) consisted of 45 students where 15 studentshaving high academic ability (HA) and 15 studentshaving low academic ability (LA), and
2. 2C class (experimental class/classroom using RMS learning model) consisted of 48 students where 16 studentshaving high academic ability (HA) and 16 students having low academic ability (LA).

Instrumentation

Observation Sheet

The observation sheet was used to measure if thelearning process or the intended-operational (IO) ran well or not. The researcher scored 1-5 for each learning aspect. The learning aspects cover introduction, main activity, closing, and classroom management. The average scores were referred to the intervals $1 < IO < 2$ (very low), $2 < IO < 3$ (low), $3 < IO < 4$ (moderate), $4 < IO < 5$ (high), dan 5 $IO = 5$ (very high). The minimum IO for good learning activity is score that is considered as high.

Student Observation Sheet

The observation sheet is used to observe the students' activity. The researcher took note the students' activity on the observation sheet. This sheet is used to examine the students' learning activity.

Critical Thinking Test

The researcher constructed a critical thinking-integrated essay test consisted of 18 items which was adapted from Facione (2013:5) covers interpretation, analysis, evaluation, inference, explanation, and self-regulation. The essay test was scored 0-4 and has a high reliability, that is 0.712.The closer look of the critical thinking test can be seen in Appendix A.

Teaching Process

RMS learning model was tried out before being implemented. The try out was conducted twice in the research class, hence the researcher did not find any difficulties during the experimentation and learning process.

The credit point of Basic concept of Science is 3. The intervention learning model was conducted 10 times each was done in 3x50 minutes. The material delivered in both classes were: 1) The classification of plants, 2) vertebrate animals, 3) invertebrates, 4) Ecosystem, 5) the human respiratory parts and system, 6) the human digestive system, 7) the relationship between the living and the environment, and 8) biotechnology of plants.

The condition in each meeting was noted and scored by the observer using learning observation sheet and students' activity sheet. The average score of the learning in conventional class was 4.91 (categorized as high) and in RMS class was 4.9 (categorized as high). Based on the average score and the learning process in both classes, it showed that the learning ran well.

Data Analysis

The data analysis technique used was descriptive statistics and parametric inferential statistics techniques. Descriptive analysis was used to describe the data of students' critical thinking skills. Besides, parametric inferential statistics analysis techniques used to examine the data ofstudents' critical thinking skills using anacova (covariance analysis) with analysis program SPSS 20 for Windows.

Results

Data values of critical thinking skills obtained from the pretest and posttest using essay tests consisting of 18 items in the control class employed conventional learning models and in the experimental class employed RMS learning modelof high student academic ability and low academic ability. The test results were corrected by rubric of critical thinking skills with a score from 0 to 4. The critical thinking skills can be seen in Figure 1.

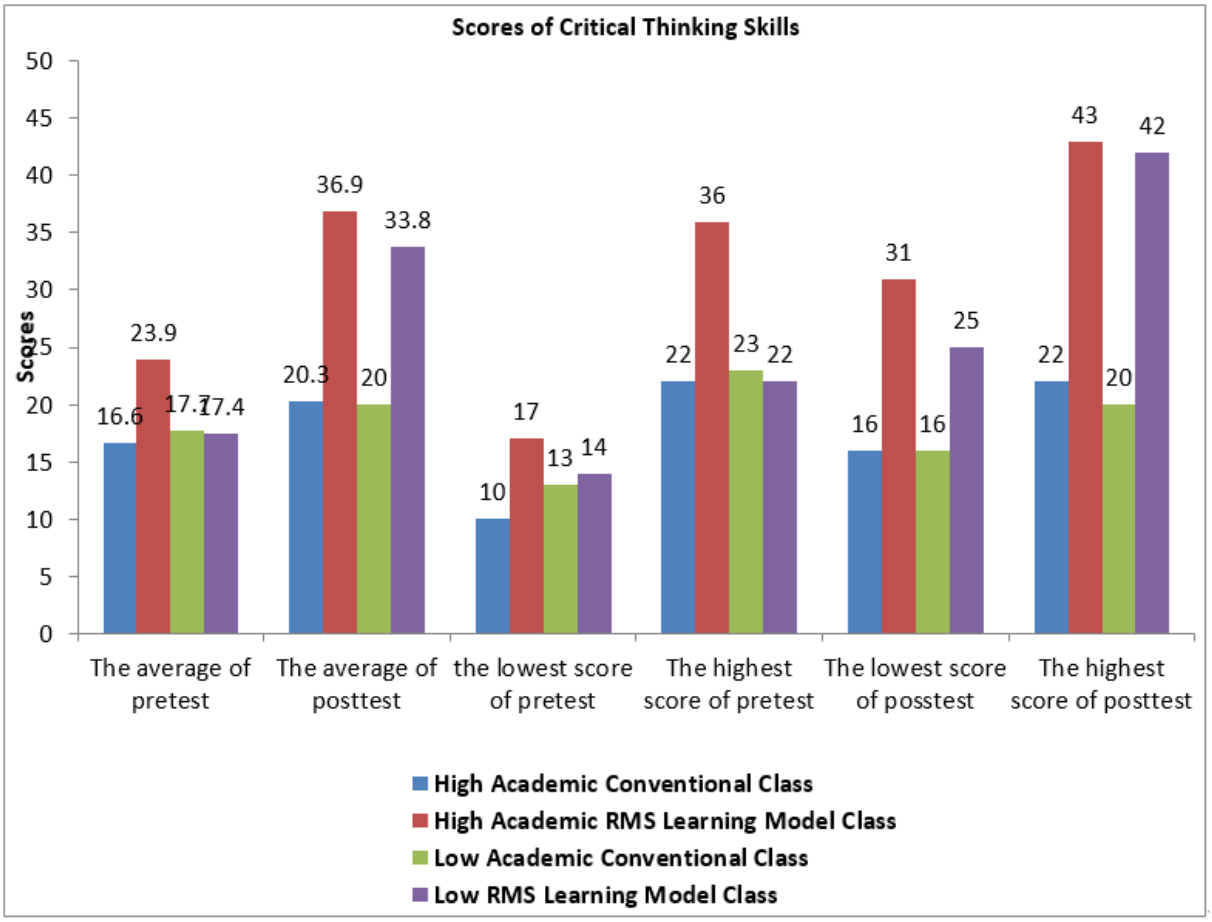

Figure 1. Summary of Critical Thinking Skills Scores

Summary of the data critical thinking skills description based on Figure 1 obtained that the average postestvalue of RMS learning model classon both high and low academic abilities was higher than the average postest value of the conventional class on both high and low academic abilities. Then, the value of critical thinking

skills are categorized in accordance with the guidelines specified. The datavalue summary of critical thinking skills both in pretest and posttest can be seen in Table 5.

Table 5. Summary of Critical Thinking Skills Scores Based on Categorization

No	Type of Class	S	Scores	Category (%)				
				Very critical	Critical	Enough Critical	Less Critical	Very Less Critical
1.	Conventional	HA	Pretest	0	0	46.7	53.5	0
			Posttest	0	0	93.3	6.7	0
		LA	Pretest	0	0	53.5	46.7	0
			Posttest	0	0	86.7	13.3	0
2.	RMS Learning Model	HA	Pretest	6.2	6.2	81.4	6.2	0
			Posttest	66.7	33.3	0	0	0
		LA	Pretest	0	0	33.3	66.7	0
			Posttest	27.1	66.7	6.2	0	0

Notes:
S : Skills
HA : High Academic Ability
LA : Low Academic Ability

Based on Table 5, it was obtained information that the percentage value category and class pretest conventional classroom using RMS learning model both the high and low academic abilities dominated the enough critical and less critical. Posttest value of critical thinking skills in a conventional classroom and classroom RMS learning model has increased, but the conventional class still dominated on the criteria of enough and less critical. Unlike classroom RMS learning model at top academic dominated very critical and academic criteria under predominantly critical criterion. Such information can be said that RMS learning model better able to increase critical thinking skills compared with conventional classroom.

Analysis of data on critical thinking skills with Anacova preceded by the assumption that, 1) the data normality test conducted by test One Sample Kolmogorov-Smirnov and 2) test of homogeneity of variance with the Levene test. The results showed that the normal distribution of data where the data values critical thinking skills and data

conventional classroom critical thinking skills class RMS learning model gained both greater than 0.05 is equal to (0.200 and 0.200). As for the homogeneity test result of analysis by Levene test showed that the data of conventional classroom critical thinking skills and critical thinking skills of data class RMS learning model has a value greater than 0.05 is equal to 0.247 so that the data are homogeneous.

The next test done is Anacova test at significance level of 5% with a pretest as kovariant. Anacova test summary treatment effect on students' critical thinking skills can be seen in Table 6.

Table 6. Summary of Anacova Test Results on the Effect of Treatment Toward Critical Thinking Skills

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3705.253a	4	926.313	94.331	.000
Intercept	977.058	1	977.058	99.498	.000
Pretest	77.123	1	77.123	7.854	.007
Learning Model	2551.888	1	2551.888	259.871	.000
AA	12.513	1	12.513	1.274	.264
Learning Model * AA	.142	1	.142	.014	.905
Error	559.731	57	9.820		
Total	52929.000	62			
Corrected Total	4264.984	61			

The test results in Table 6 on the source of the learning model obtained F value of 259.871 with a p-value less than α 0:05 ($p \leq 0.05$) which sig. 0,000. This means there is a significant influence on RMS learning model students' critical thinking skills.

The next test to see whether there is any effect on the academic ability of students' critical thinking skills. Test results Table 6 on the source of academic skills obtained F value of 1.274 with a p-value greater than α 0:05 ($p \geq 0.05$) which sig. 0.264. This means that there is no significant influence on the academic ability of students' critical thinking skills.

Test to see whether there is any effect of the interaction model of learning and academic ability of the students' critical thinking skills. Test results Table 6 on the source of the interaction model of learning and academic ability of the F value of 0.014 with a p-value greater than α 0:05 ($p \geq 0.05$) with sig. 0.905. This means that there is no significant effect of interaction model of learning and academic ability of the students' critical thinking skills. The mean value of corrected and improved critical thinking skills that are in Table 7. Class RMS learning model and class conventional obtain corrected values critical thinking skills and different upgrade. The impact of RMS learning model is higher 55,6% than conventional model on critical thinking skills.

Table 7. The Mean Value Corrected Critical Thinking Skills

Learning Model	Mean Corrected		Enhancement (%)
	Pretest	Posttest	
Conventional	17,2	20,2	17,4
RMS Learning Model	20,4	35,3	73

Discussion

Based on the above analysis revealed that students' critical thinking skills that are facilitated with RMS learning model is better than the students who facilitated with conventional learning models. At this stage of reading, deliberately facilitated students to read critically the material to be studied with a variety of learning resources. Critical reading activities students are expected to seek as much information about a material or concept that is being studied. Activities undertaken in the critical reading namely, understood these works by recognizing the facts and interpret what has been read, it means: to understand the idea anyway, knowing the facts and detail the importance, can make conclusions and interpretations of the idea, to distinguish the material presented as opinion or fact, comparing the learning resources with one another, and give conclusions and why. The process is able to facilitate their students to develop critical thinking skills. Read the topic from a variety of sources can improve thinking skills because it requires reasoning and evaluation in selecting appropriate information (Facione, 1990). This is supported by studies White et al (2009) that gave the example, give a reason, looking for

similarities and differences, determining the main idea, and draw conclusions able to improve critical thinking skills.

Early information possessed by students subsequently used to perform at the next stage of learning, mind mapping mind mapping individual and collaborative group. The process that facilitates students in exploring ideas in written form of mind maps. Activity mind mapping is a useful conceptual metaphor to facilitate the development of critical thinking skills because it allows to analyze the linguistic fragments (Tsirkunova, 2013). This is supported by studies Thomas (2011) that the work for the student to be able to explore ideas is a step to develop critical thinking. According Sarhangi et al., 2011; Ristiasari et al., 2012) in his research menyebuttkan that mind mapping activities can improve students' critical thinking.

Mind mapping collaborative activities aimed at facilitating the discussions, asked questions, exchange ideas or thoughts, seek information, analyze, mengevalausi, and draw the conclusion that students' critical thinking skills can be improved. It fits Kalelioglu & Gulbahar study (2013) that the discussion group that emphasizes collaborative brainstorming, evaluating the results of the work, and draw conclusions able to improve critical thinking. Making a mind map as a collaborative group was also able to reduce the anxiety of learning, capable of making the meaningfulness of learning so that students are able to develop the thinking, and able to increase participation in connecting something along with the reasons, assumptions and conclusions. Results of research Jena (2012); Nilson et al., (2014) that create a mind map as a collaborative group makes learning more meaningful, reduce anxiety oneself, and improve learning partsisipasi being able to identify the reason, alternative, and conclusions.

The final step in RMS learning model that is sharing the results of the collaborative mind mapping groups by exposing these results to the class. Sharing activities trigger their mind of every student exchange will help the critical thinking skills of each student. It fits research Nezami et al (2013) that the sharing activity by presenting the results of the working group were able to improve critical thinking skills. Cooperative learning activities such as problem solving, social interaction involving a variety of sources, diversity of viewpoints, and an opportunity to critique among one another is a thing that can improve critical thinking skills.

The last part of the activities of their interaction and the sharing of evaluation or confirmation of lecturers related matter or topic that has been studied students were

able to improve students' critical thinking skills. The process of evaluation or confirmation facilitate students in training evaluation to something useful in making decisions in everyday life. The results of the study Thomas (2011) explains that the feedback in the learning process can improve critical thinking skills. It fits research Geng (2014) mentions that take decisions in an information can improve critical thinking skills.

Analysis of statistical data related to the influence of academic ability of critical thinking skills showed that no significant influence on the academic ability of students' critical thinking skills. It provides information that RMS learning model is able to bridge the gap between academic groups below and above the academic learning process that affects the critical thinking skills. RMS learning model demanding activities of individuals in seeking further information on preliminary information is used as a discussion of making a mind map as a collaborative group between members heterogeneous group. Their cooperation with one another in group activities can improve critical thinking skills and shorten the time each member of the group in developing the thinking process. This is according to the results of research Valdes et al (2015) that collaboration in group work can improve critical thinking skills and reducing their time in developing his thinking process.

The process of group discussions undertaken collaboratively requires interaction in discussing a particular topic, pouring in writing, and draw conclusions together, so that experience and knowledge reorganized to be mastered and understood. It fits the opinion Dwijananti & Yulianti (2010) that the process of collaborative discussion helps students to compare the differences and similarities with the new knowledge on the receipt, so that the critical thinking skills of each student can be increased. Al Sharadgah research results (2014) that the critical thinking skills can be enhanced through looking for information about a given topic, collaboration, and rewriting the topics that have been studied. Likewise, the results of research Yen Ju et al (2014) that the collaborative process is a factor that contributes to critical thinking skills, find a real learning environment, and relevant to their learning process.

Results of testing the effect of the interaction between the learning model with the academic ability of critical thinking skills, show that there is no interaction effect of both. RMS learning model mengakomudir individual work steps, collaborative groups at this stage of mind mapping, and sharing as a group capable of creating individual responsibility in improving the thinking process. It is seen from the

observer field notes related student activities. Field notes indicate start of the third meeting onwards the student's low academic has begun to show an increase in critical thinking skills seen a few indications that, the quality of questions that have been able to connect the problems that occur in the field or experience in the field that requires a response analysis and evaluation; the quality of the answers the students were able to show evidence of an answer which he supports; and conclusions expressed have demonstrated a conclusion that the comprehensive. This is consistent with research Almubaid (2014); Styron (2014) that the increase in critical thinking skills can be seen from the quality of the link something in understanding, addressing, evaluating, and draw correct conclusions.

Activity learning process that demands personal responsibility in each learning progress at each step of RMS learning model proven effective in improving critical thinking skills of each student both academic ability and academic on low. Results of research D'Antoni et al (2010) that mind mapping can be used to improve critical thinking at all academic levels for each individual is required to organize, store information, and record their thought process on paper, thus increasing the skills of critical berpkir every student can improved.

Social interaction in group activities both collaborative and sharing is also able to increase the responsibility of the individual in his thinking process so as to increase critical thinking skills of each student. This is according to the results of research Ryu et al (2014) that the collaborative is more challenging every individual to help develop critical thinking skills of each member of the group for the learners to understand a variety of different perspectives on a given situation resulting in equalization critical thinking skills of each student.

Conclusion and recommendation

Based on the analysis of data and discussion presented, it can be concluded as follows:

1) There is effect between RMS learning modeland students' critical thinking skills.

2) There is no significant effect between students’ academic ability and students' critical thinking skills.

3) There is no effect of interaction between RMS learning model and different academic abilities toward the students' critical thinking skills.

The results indicates that RMS learning model is an effectivelearning model to enhance students' critical thinking skills and is able to align students' critical thinking skills with different academic abilities. Thus, the researcher recommends lecturer to use RMS learning model in basic concept of science course, biology course, and suggests another research to apply it in senior high school, junior high school, and elementary school.

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Appendix A

TEST
BASIC CONCEPT IN SCIENCE

Department: Education of Elementary School Teacher (PGSD)
Subject : Basic Concept in Science
Code/Credit : -/3SKS
Time Allotment : 100 Minutes
Day/Date : Tuesday, 11thAugust 2015

DIRECTION:

1. Write in you identity on the answer sheet (Name, ID number, Class).
2. Read the questions given carefully. Consider the critical thinking skill in doing the test.
3. The test participants are not allowed to ask/discuss with others and/or open sources.

GOOD LUCK

Do the test carefully.

1. Plantation that is classified as*regnum plantae*. **There are many plants in the world which have various colours, shapes, and sizes. The organism**s include trees, shrubs, grass, and moss.

a) Mention the main parts of high level of plant and its function completely.

b) Why is moss categorized as low level of plant?

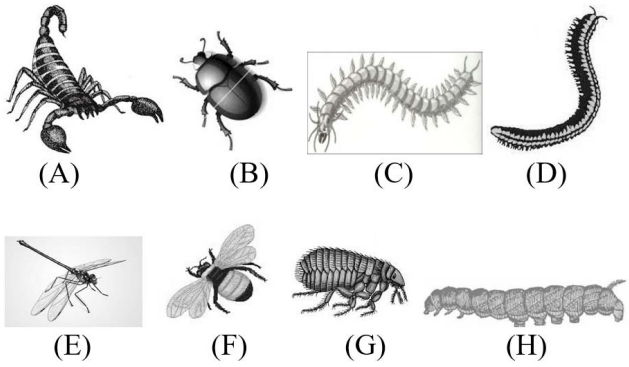
c) What is your opinion of traditional ointment which is made without standardized procedure, yet people consume it?

2. Vertebrae is spine-possessed animals. Vertebrae consists of: reptiles, aves, amphibi, pisces, and mammals.

a) Mention 3 characteristics of reptiles, aves, and mammalsand give the examples.

b) Why does each aves have different beaks? Give some examples of beaks and their function.

3. Look at these pictures:



a) Based on those pictures. Classified animals that belong to insect and provide the explanation.

b) What can you see from the life of organism F in relation to human being? Mention 4.

4. Snake is an organism which harms human due to its poison. In rice field ecosystem, snake has an important role to keep the ecosystem in balance.

a) Mention the biotic and abiotic components of rice field. Provide an example of the relation between rice field biotic and abiotic component.

b) Make a food-chain of rice field ecosystem.

c) Explain the role of snake in rice field ecosystem and if there is a persistence snake-hunt, what will happen to the balance of rice field ecosystem?

5. Human respiration system is a process of inhaling oxygen and exhaling carbon dioxide. Oxygen is the main component neeed in respiration system which can be obtained from air. Breathing organs are used to breathe air endowed with oxygen in and breathe deprived oxygen air out.

a) Explain human respiration process.

b) During eating, we should not talk because it might cause the food goes to breathing nasal. Explain why can this happen? Make a relation between this phenomenon and the material.

c) Smoking can cause breathing perturbation. What can you suggest to active smokers? What strategy can you use to suggest them?

6. Digestion system is a process of food convertion and nutrition absorbtion needed by body. Digestion system also breaks food molecules down through enzymes so that the body can dissolve it.

a) Explain the convertion process of carbohydrate complex molecule into the simplest molecules.

b) Provide examples of digestion system disruption as well as the organs. How can you solve the problem?

7. Provide some examples of environment adulteration. Analyse the cause and effect of the adulteration and provide the problem solving.

8. The number of human population cause the increasing need of food, so it cannot be denied that biotechnology contributes to the supply of food.

a) Explain and provide the examples of the difference between conventional and modern biotechnology.

b) Provide an example of plantation biotechnology and the analysis of the strengths and the weaknesses.