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ERCoRe Learning Model Potential for Enhancing Student Retention among Different Academic Ability

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ABSTRACT

Purpose: This research was conducted to investigate the potential of the ERCoRe learning model in empowering the retention of students' of different academic ability. **Research Methods:** This was a quasi-experimental research using pre-test and post-test non-equivalent control group design of 2x2. There were two independent variables. The first variable was the learning model consisting of the ERCoRe model and conventional learning, and the second variable was academic ability, consisting of upper and lower levels of academic ability. The dependent variable was the students' retention. The samples for this research were the students of class X in Pangkep District, Indonesia. The data from this research were analysed by using ANCOVA, followed by Least Significant Different (LSD). **Findings:** The ERCoRe learning model was shown to have more potential for improving the students' retention than conventional learning (11.58%). The interaction between the ERCoRe learning model and academic ability did not have an effect on students' retention, but it was seen from the combination groups that the retention of the higher academic ability students who experienced ERCoRe learning was higher (significantly different) than that of the other combination groups. **Implications for Research and Practice:** Teachers need to implement the ERCoRe learning model because this learning model can improve the level of students' retention.

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Introduction

Retention is one indicator of success in learning. Based on retention, teachers can find out how much information is learned and stored by students over a long period of time, which can also be retrieved at any time (Driscoll, 2000; Sukmawati, Ramadani, Fauzi, & Corebima, 2015, p. 662). According to Chakuchichi (2011, p. 91), retention represents whether or not learning could be absorbed well. The higher the students' retention is, the more information can be understood and remembered well.

Retention is a common problem rarely noticed by teachers, because the learning activities tend to aim at mastering the concept, which is more likely to vanish (Sukmawati et al., 2015, p. 663). In fact, retention is an important aspect that must be pursued in learning. The quality of concept "mastery measured as retention having an important role" is related to the dimension of memorization. The retention also related to the dimension of critical thinking learning, connecting, remembering, and using all the knowledge and abilities ever obtained (Banikowski, 1999, p. 1).

Retention is the result of cognitive learning that can be measured in relation with the level of students' academic ability. Academic ability is a description of the level of students' knowledge or ability toward a subject matter that will be used as an asset to obtain a broader and more complex knowledge (Sukmawati et al., 2015, p. 664). Students with higher academic ability have a broader initial knowledge. A broader initial knowledge makes it easier for students to store more new information in their long-term memory. This condition makes the upper academic students have more retention toward the biology material than those of the lower academic ability. This is shown in research results of Jamaluddin (2014, p. 252) which revealed that there was a difference in retention between upper academic ability students and those with lower academic ability.

The empowerment of retention in biology learning at the senior high school level is very limited. The learning activities implemented are only limited to memorization without paying attention to the students' understanding, and evaluations are based only on the students' memorization; teachers are only completing the learning process (Adegoke, 2011, p. 538; Umar, 2011, p. 120). The quality of concept understanding measured as retention that plays a role for the formation of attitudes as well as the other skills is what is needed for life. Retention involves the process of coding, storing, and retrieving information stored in the memory (Santrock, 2004). Retention is also better than tests conducted immediately or with a delay of a few seconds or minutes (Carpenter, Pashler, & Cepeda, 2009, p. 762). The complexity of the process involved in retention and its positive influence on learning results have made research regarding retention to never be seen as outdated.

Retention is important for empowerment because it is a concept that is well understood by students and can be stored in memory and called upon when needed. However, in reality there are many things that have been stored in our memory, but cannot be retrieved which is known as forgetting. Related to this, Sanjaya (2008) expressed that retention can be taught through the use of certain strategies from specific learning models. Because every student has a different level of retention, the use of the appropriate learning models for individual students is necessary. Research results related to retention has shown that the implementation of learning models can have an effect on the retention of students' learning results (Korkmaz Toklucu & Tay, 2016, p. 327). The abundant option of learning models makes it difficult to choose the best model that can support learning retention. The selection of the appropriate learning model should be done with great care.

One of the learning models considered to have an effect on students' retention is the ERCoRe learning model. The ERCoRe learning model has several advantages over conventional learning: 1) students construct knowledge from existing phenomena, dig up their initial ideas by reading at the stage of Eliciting, 2) students are active in the learning process by making mind mapping as a group through Restructuring, 3) the learning model generates discussion between students with different academic ability, and between students and teachers through Confirming, 4) through the activity of Reflecting, remaking mind mapping independently can foster motivation and high levels of learning creativity. Those advantages are categorized based on the activities involved in the ERCoRe learning model and they are closely related to the concept that underlies this learning model.

The philosophical concept of the ERCoRe learning model is constructivist which is clearly evident from the characteristics of the ERCoRe learning model, such as, the teacher facilitating the students' learning process by providing the needed information, suggesting learning resources, encouraging exploration, and learning together with the students Constructivist learning considers the importance of students' active involvement in the learning process rather than a teacher-centred approach (Akinoglu & Tandogan, 2007 p. 72). Furthermore, students' engagement in every learning stage can help them to build their knowledge, since they are actively involved in a process of meaningful knowledge construction. This is in line with the constructivist approach that emphases the importance of students' independent knowledge construction through the learning experience that they get from their pre-existing knowledge or from collaborative activities they do with other students. The classroom atmosphere will form an active learning environment, because constructivism sees knowledge as something that needs to be achieved by the students themselves based on their initial knowledge related to the lesson or from having experiences from collaborative learning experiments with their peers (Qarareh, 2016 p. 186; Kalpana, 2014 p. 28).

Based on Folasade & Akinbobola (2009, p. 46), the constructivist approach was developed based on cognitive theory. This makes the ERCoRe learning model have great potential to empower the students' cogition which can ultimately affect their retention. It will be easier to empower the cognitive aspects of the higher achieving students because they have more initial knowledge or skills related to the subject matter than the lower achieving students, and as a result, the higher achieving students are able to gain a wider variety and more complex knowledge more easily. So, Seah & Heng (2010, p. 479) revealed that the upper academic ability students can perform tasks well, but lower academic ability students require direct instruction.

Hence, the implementation of the ERCoRe learning model is indivisible from the students' cognitive levels.

The ERCoRe learning provides an opportunity for scaffolding between the upper academic ability students and those in the lower academic ability. The scaffolding process in cooperative groups provides benefits for both the lower academic ability students and those in the upper academic ability when performing academic tasks together (Uduafemhe, 2015). Lower academic ability students will gain special assistance from those with upper academic ability through tutorials (Yusnaeni, Corebima, Susilo, & Zubaidah, 2017, p. 247). Consequently, the academic ability of the upper academic ability students will increase because they provide services as tutors to the lower achieving students. Ahangari, Hejazi, & Razmjou (2014, p. 88) supported this fact by stating that the use of scaffolding in learning has a positive effect on students' retention. It is strengthened by the fact that the cognitive theory which underlies constructivism precedes the concept of retention.

Additionally, according to the research results of Kim (2005, p. 7), constructivist learning strategy is more effective than the conventional strategy in obtaining academic achievement. Constructivist learning has a positive effect on retention and academic ability (Karaduman & Gultekin, 2007; Semerci & Batdi, 2015, p. 171). Constructivist approach can also lead students to understand that acquiring knowledge is done directly, so that it is easier for them to understand it. According to Duyilemi & Bolajoko (2014, p. 628), constructivist learning provides real knowledge that helps students remember more easily.

Besides encouraging real-experience learning, ERCoRe learning also implements cooperative learning. Cooperative learning is crucial because it can improve students' retention, so that it can affect students' academic ability (Korkmaz et al, 2016, p. 316). Heterogeneous groups, in terms of the intelligence variation, in ERCoRe learning make students help each other, so that the low academic ability students can improve and equalize themselves with those of higher academic ability (Chambers & Abrami, 1991, p. 140). Another important aspect of cooperative learning is that it stimulates cognitive activity, promotes higher levels of achievement and higher retention of knowledge (Tran, 2014). The results of other research conducted by Huss (2006, p. 20), and Chianson, Kurumeh, & Obida (2010, p. 35), as well as, Tran & Lewis (2012) supported this statement by finding that the implementation of cooperative learning significantly improved students' retention which ultimately had a positive effect on their academic achievement.

Further, the continual use of the ERCoRe model is able to provide positive feedback and develop student centred learning. A student-centred learning strategy can help students to learn better as well as develop their ability and confidence to evaluate their knowledge. In addition, this learning strategy encourages students to be more active in interacting with their learning groups and in constructing their own knowledge (Kolari, Ranne, & Tiili 2005, p. 16). Through this learning model, students can communicate with each other to discuss opinions and conflicts, to make predictions, interpretations and explanations in constructing their knowledge, and to be able to correct their misconceptions through discussion (Kolari & Ranne, 2003, p. 190). Those activities will result in an increase of retention.

Based on those facts explained above, this current research aimed to determine the effect of the ERCoRe Learning Model in enhancing retention of students of differing academic abilities. Therefore, the following hypotheses were tested:

1: There was an effect of the ERCoRe learning model on student retention.

2: There was an effect of different academic ability on student retention.

3: There was an effect of interaction between the ERCoRe learning model and different academic abilities on student retention.

Method

Research Design

The design of this research was a 2 x 2 factorial design which can be seen in Table 1. The research design used was a Pre-test/Post-test non-equivalent control group design as seen in Table 2. This research involved variables that consisted of independent variables (learning model and academic ability), and the dependent variable (students' retention).

Table 1

Quasi-Experimental Design of 2 X 2 Factorial

Academic ability (A)	*Learning model (X)*	
	Conventional Learning	*ERCoRe Learning*
Upper (A1)	*X1 A1*	*X2 A1*
Lower (A2)	*X1 A2*	*X2 A2*

Information:
X1 A1 = conventional learning upper academic ability
X1 A2 = conventional learning lower academic ability
X2 A1 = ERCoRe learning upper academic ability
X2 A2 = ERCoRe learning lower academic ability

Table 2

Pre-Test – Post-Test Non-Equivalent Control Group Design

Pre-test	Treatment	Post-test
O1	X1 A1	O2
O3	X1 A2	O4
O5	X2 A1	O6
O7	X2 A2	O8

Information:

O1, O3, O5, O7 = Pre-test score of retention

O2, O4, O6 O8 = Post-test score of retention

X1 A1 = Conventional learning upper academic ability

X1 A2 = Conventional learning lower academic ability

X2 A1 = ERCoRe learning upper academic ability

X2 A2 = ERCoRe learning lower academic ability

Research Samples

The sample collection procedure in this research had two stages; school determining and class determining. Firstly, the school selection process began with gathering the students' National Exam scores from nine State Senior High Schools in the Pangkep district, South Sulawesi, Indonesia. The data were then analysed using Anova and followed by a LSD test. Based on the LSD test, the schools were categorized into high academic achiever and low academic achiever schools. Then, one school from each category was selected for further sampling.

The second stage was the selection through a placement test of the experimental and control class from both high academic achiever and low academic achiever schools. The results of the placement test led to the selection of two homologous classes. The classes were randomly selected as the experimental class and the control class. The ERCoRe was implemented with the experimental group while the control group was taught using conventional learning.

The sample size from each school totalled 66 students with both the experimental and control groups having 33 students. In the classroom there were, 10 male students and 23 female students. The samples were from 10th grade students aged 15-16 years old.

Research Instruments and Procedures

The instruments used in this research consisted of a syllabus, lesson plans, student worksheet and retention measurement instrument (essay test). The syllabus, lesson plans, and student worksheet were validated before they are used. The validation was done by two experts, one university lecturer and one high school teacher. The average score of the validity process was considered valid when it showed 94.16 for the syllabus, 97.39 for lesson plans, and 96.47 for student worksheet.

The retention measurement instrument was tried out with students from grade 11 who successfully passed the grade 10 biology lessons. The data were then analysed using the Pearson Correlation Test and from the 25 items tested, 15 essay test items were found to be valid. The test was developed by referring to the C3 to C6 cognitive levels of Bloom's taxonomy revised by Anderson & Krathwohl.

The reliability of the retention measurement instrument (essay test) was also done to ensure that the questions consistently reflected the measured variables. The reliability was measured using Cronbach's Alpha. The results were then categorized based on the reliability categories as seen in Table 3. It was clear that all the items of retention test were valid and the Cronbach's Alpha internal consistency coefficient was 0.753.

Table 3

Reliability Category

Cronbach's Alpha Score	Description
≥0.9	Excellent
0.8 – 0.89	Good
0.7 – 0.79	Acceptable
0.6 – 0.69	Questionable
≤0.59	Poor

(Source: George & Mallery, 2003, p. 231)

This research involved 12 classroom meetings where the ERCoRe learning model was implemented to the experimental group as displayed in Table 4.

Table 4

ERCoRe Learning Model Syntax

Syntax	Activities
Eliciting	• Teacher gives articles or book contents that are related to the lesson as reading texts for students • Students collect important information from the reading • This activity is done at home
Restructuring	• From the reading process, students work in pairs to create mind maps • This activity is done at home
Confirming	• Students confirm the information that has been collected in the form of a mind map through classroom discussion and presentation • This activity is done in class
Reflecting	• Students evaluate and revise the information individually by creating a new mind map • This activity is done in class

(Source: (Ismirawati, Corebima, Zubaidah, & Syamsuri, 2015, p. 231).

The conventional learning for the control group was done through classroom discussion, lecturing, and homework. In this study, the researcher behaved too as the teacher in the experimental and control classes. Furthermore, students' retention was measured by using a retention test conducted two weeks after the post-test. The essays tests were used in the pre-test, post-test and retention test.

Data Analysis

The pre-requisite tests were performed on the collected data by using the normality test (Kolmogorov-Smirnov test) and homogeneity test (Levene - test) with p>0.05. The normality test result showed 0.200 significance level score. These results indicated that the data were normally distributed. Besides, the results of the homogeneity test showed that the significance value was 0.072, indicating that the data had the same variance (homogeneous). Furthermore, a hypothesis test was done using ANCOVA test to know the effect of the ERCoRe learning model and the different academic abilities on students' retention.

Result

The results of hypothesis testing between learning model, academic ability, and interaction between learning model and academic ability can be seen in Table 5.

Table 5

The Results of ANCOVA Hypothesis Testing of Student Retention

Source	Type III Sum of Squares	Df	Mean Square	F	Sig
Corrected Model	14762.728a	4	3690.681	78.957	.000
Intercept	35.301	1	35.301	.755	.388
XRET	5179.918	1	5179.918	110.881	.000
MODEL	230.237	1	230.237	4.926	.030
Academic Ability (AA)	273.210	1	273.210	5.845	.019
Model*AA	51.959	1	51.959	1.112	.296
Error	2851.306	61	46.743		
Total	161124.385	66			
Corrected Total	17614.031	65			

R Squared = .838 (Adjusted R Squared = .828)

The results of the hypothesis testing related to the learning model and academic ability showed that the p-level was smaller than alpha 0.05 (p<0.05) with significance of 0.030 and 0.019 respectively. This means that the learning model and academic ability had an effect on students' retention. The retention of students undergoing the ERCoRe learning model was 11.58% higher than that of students undergoing conventional learning. The retention of the upper academic students was 9.66% higher than that of the lower academic ability students.

The results of hypothesis testing of the interaction between the learning model and academic ability showed that the p-level was bigger than alpha 0.05 with the significance of 0.296. This means that the interaction between the learning model and academic ability did not have any effect on students' retention. Thus, it was concluded that learning model and academic ability had a significant effect on students' retention, but the interaction between the learning model and academic ability did not have any significant effect on students' retention.

Although the interaction between learning model and academic ability do not have significant effect on retention, the post-hoc analysis (LSD) was conducted to see the position of the combination groups. The results of LSD test are presented in Table 6.

Table 6

LSD Test of The Interaction Effect Between Learning Model and Academic Ability Towards Students' Retention

Type of Learning/ Learning Model	Academic Ability	Post-test	Retention	Difference	Decrease (%)	Corrected mean	LSD Notation
Conventional	Low	42.861	32.918	-9.943	30.205	42.850	a
Conventional	High	47.288	38.842	-8.446	21.744	45.356	a
ERCoRe	Low	60.872	50.140	-10.732	21.404	46.165	a
ERCoRe	High	72.080	64.888	-7.192	11.087	52.260	b

The results of the LSD test showed that the corrected mean score of retention related to the combination of ERCoRe learning model and upper academic ability was significantly different from those of the other combination model groups. The corrected mean score of combination group of the ERCoRe learning model and lower academic ability was not significantly different from those of the conventional learning and upper academic ability, or the conventional learning and lower academic ability. The effect size value 3.7 %.

Discussion, Conclusion and Recommendations

The results of the ANCOVA test in Table 5 show that the ERCoRe learning model had a significant effect on learning retention. In ERCoRe learning activities, students actively focused their attention on finding important concepts from the literature for making mind mapping and for conducting discussions. Thus, students' attention needed to be established through the use of learning models. Research results revealed that learning models have a positive effect on students' ability to remember (retention), such as, the research results of Kvam (2000, p.136) and Tran (2012, p. 86).

Students may forget their previous information when they did not pay close enough attention. According to Santrock (2004); Wei, Wang, & Klausner (2012, p. 185), attention is closely related to retention. There are two factors that can cause students to be unable to remember what they have learned, namely the process of forgetting and the fact that the information was not yet processed in the brain, so that the knowledge is ultimately lost. The process of forgetting causes the students to not remember the material that has been previously learned. Forgetting shows the act of having difficulties to retrieve information that has been received, processed, and saved into long-term memory (Winkel, 2005).

Based on the results of the LSD test in Table 6 related to the interaction between learning model and academic ability toward students' retention, it can be concluded that ERCoRe learning model has higher potential for increasing students' retention than conventional learning. In the constructivist-based ERCoRe learning model, the students are directed to be actively involved in learning and building knowledge through real-life experiences as cognitive activity rather than simply learning from abstract concepts (Buttler, Miller, Lee, 2001, p. 21). The results of research conducted by Karaduman & Gültekin (2007); Semerci & Batdi (2017, p. 172) revealed further that the constructivist approach helped students to improve their academic success and retention. This was in contrast to conventional learning, in which the teachers used teacher centred learning methods, so that it did does not have any contribution to the students' retention improvement.

The results of this research proved that the level of retention of the upper academic ability students in ERCoRe learning model was better than that of the lower academic ability students. From the corrected mean score, it was seen that there was a significant difference between the results of the ERCoRe upper academic students and ERCoRe lower academic students. These findings indicated that the upper academic ability group has higher retention than the lower academic ability group. The difference in retention between upper academic ability students and those of lower academic ability was related to the response difference produced by students. This was in line with the opinion of Cheng (2011, p. 2) stating that students who have different academic abilities experience the same learning, they would have different learning results. The difference of retention between upper and lower academic ability students was related to the factor of intelligence. This was also in accordance with the opinion of Merdinger, Hines, Osterling, & Wyatt (2005) stating that the intelligence factor was one of the factors that effectively affected learning success.

Related to the retention difference of upper and lower academic ability students, Anderson & Pearson (1984) stated that students having high initial ability would be better at reconstructing knowledge, so that they obtained good learning results. Santrock, (2004) also revealed that high-achieving students monitored their learning more systematically and independently, and evaluated their progress better than the low-achieving students. Identically, the research results of Lei (2002, p. 7) showed that high-achieving students were higher self-regulated learners, compared to the low-achieving students.

Table 6 of the LSD test shows that there was no significant difference between lower academic students undergoing ERCoRe learning model and the upper and lower academic students undergoing conventional learning. As for the low retention of the lower academic students in the ERCoRe learning model, it was related to intelligence factor. Shaw (2001) also stated that students of low academic ability may have low retention. The characteristic of these students were that they preferred learning by using interesting media where the teacher gave explanations and the students took notes. These findings can explain the factors that affected some students who did not complete their study due to the lack of students' attention, interest and motivation toward learning activities. Based on the data, it can be said that the characteristics of students who were not proactive, tended to be passive and prefer conventional learning where the teachers who gave explanation and students took notes. This is because the lower academic ability students had difficulties in making mind mapping for several reasons: (1) students had a lack of initial knowledge about the concepts contained in the reading; (2) students did not pay attention when teachers explained the learning material; (3) students were not accustomed to make mind mapping.

A number of research investigations have been conducted to determine the effectiveness of various learning models at every level in various subjects, and the findings have revealed that the use of different learning models has had a positive effect on students' achievement compared to conventional learning. In addition, this has also proved that conventional learning is not effective (Agboghorom, 2014, p. 80; Adeyemo & Babajide, 2014, p. 918; Udo & Udofia, 2014, p. 34). This is a result of the cognitive ability of the students taught by using conventional learning is not empowered, thus their retention does not increase (Gambari, Yuki, Gana, & Ughovwa, 2014, p. 80). Conventional learning has often been described as the talk and chalk method for presenting information to students who are only listening (Duyilemi & Bolajoko, 2014, p. 628).

Although there is not any significant difference in retention among the combination groups between ERCoRe learning model and lower academic ability, conventional learning and upper academic ability, as well as, the conventional learning and lower academic ability, based on the difference in the corrected mean score of retention, it was seen that the retention of the lower academic ability students in the ERCoRe learning model was higher (1.78%) than that of the upper academic ability students from the conventional learning. Therefore, it can be expected that the ERCoRe learning model can be expected to improve the retention of lower academic ability students higher than that of the upper academic ability students in conventional learning.

Although this research has supported the findings of previous studies of retention, this research was seen to have some limitations: 1) the treatment was only given in 12 meetings during biology lessons which made it hard for the students to get familiar with creating a mind map, and 2) the retention measurement was done two weeks after the post-test.

Conclusion and Suggestion

Based on the results of this research, it can be concluded that the ERCoRe learning model has a significant effect on the increase of students' retention. The retention of the upper academic group using the ERCoRe learning model was higher (significantly different) compared to those of other combination groups. The ERCoRe learning model can be used as one of learning models which, when taught continuously, can increase students' retention. That is why the ERCoRe learning model is expected to be implemented for teaching students to better manage their memory, so that what they learn can be stored in their long-term memory.

Future research will be needed to study retention at other school levels such as elementary school, junior high school, and/or university. The test for retention measurement can also be done longer, for example, one month after the post-test. Furthermore, other variables can be added, like high order thinking skills and gender. Hopefully, this research can be useful for future studies that want to explore more about students' retention since it is closely related to learning success. Further research studies are required to better confirm if the ERCoRe learning model has more potential for improving the retention levels of the lower academic ability students.

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