International Journal of Research and Review
www.ijrrjournal.com E-ISSN: 2349-9788; P-ISSN: 2454-2237

Original Research Article

Improving the Biology Learning Results of Low Academic Ability Students by using Jigsaw and Guided Inquiry Learning

Mursito S. Bialangi[1], Siti Zubaidah[2], Mohamad Amin[2], Abdul Gofur[2]

[1]Doctoral Program Student, Universitas Negeri Malang; Lecturer at Tadulako University, Palu, Indonesia.
[2]Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Negeri Malang, Indonesia.

Corresponding Author: Siti Zubaidah

Received: 13/11/2016 *Revised: 18/11/2016* *Accepted: 18/11/2016*

ABSTRACT

Low academic ability students should be facilitated so that their learning results do not differ too much from those of the high academic ability students. Cooperative learning model has many advantages in learning. This research aimed at investigating the potential of the jigsaw and guided inquiry in improving biology learning results of low academic ability students in Madrasah Aliyah (MA) in Palu, Indonesia. MA is Islamic senior high school. This is a descriptive research using quasi-experimental design. The population of this research was all the students of MA in Palu with the total number of participants of 140 students. The students were selected by using random sampling techniques. The results of this research showed that the jigsaw model and guided inquiry had an effect on students' learning results. Jigsaw model is more potential in improving the Biology learning results of low academic ability students, while the guided inquiry is more potential in improve the Biology learning results of high academic ability students.

Keywords: Jigsaw, guided inquiry, academic skills, Biology learning results.

INTRODUCTION

Students' characteristics are generally different from one another, one of which is in terms of academic ability. Academic ability is an overview of the level of students' knowledge or ability of a learning material that has been learned and can be used as an asset or capital to gain a greater knowledge and more complex knowledge. [(1)] In general, students' academic ability can be classified into high, medium, and low academic abilities.

Academic ability may have an effect on many aspects of students. The students' academic ability had an effect on their achievement which could be seen from their learning results. [(1-3)] The learning results achieved are determined by the students' ability to search for information related to the learning material and how they understand it. Winkel (1999) [(4)] suggested that information about a student's academic ability is an important thing to note in learning, because the students' academic ability will have an effect on their ability in participating in the learning activities, which will also determine their learning results.

Over the years, the Indonesian education system has used the national examination as a measurement of students' learning results. By using a similar test, the academic achievement of each student from any schools will be able to be observed. In recent years, there is also a custom in the education system of Indonesia in the recruitment of new students at the high school level. The system follows the pattern of the minimum passing level, which means

that every school has a minimum standard of score that should be met by the student candidates to be able to study at a particular school.

The pattern of new student admissions seems to be not very good, because along with time, the differences between the high standard schools and low standard schools become more apparent. The high standard schools and those which become the favorite schools are dominated by high academic ability students. Meanwhile, the low standard schools are less in demand, and in fact those are dominated by low academic ability students. It has been explained that the academic ability is one of the critical factors of students' learning results. The gap between high and low academic ability students have been the high academic ability students had better learning achievement and mastery of high order thinking skills such as metacognition. [1,5-9]

In contrast to the high academic ability schools, the learning conditions in low academic ability schools are quite alarming. In addition to various limitations of facilities and resources, the students' learning results in low academic ability schools are still less than expected. The gap between the two academic ability schools demands immediate improvement efforts, especially among the low academic ability students, because the gap is clearly incompatible with the ideals of the Indonesian education and against the rights of children to get fair education.

According to Corebima (2012), basically every student already has the potential or ability that can be developed related to the learning material, but the level of the ability of each student is not the same. Thus there are still some efforts that can be made to equalize the academic achievement of low academic ability students with the high academic ability students. [10] The research results by Corebima (2006) showed that there are some learning strategies that have great potential to empower the thinking skills of high academic ability and significantly improve the low academic ability students. [11] The results of the research showed that variations of learning model are one of the things that can be done to improve the learning results of all levels of academic ability students. The variations of learning model scan also help the students to actively participate in any learning activities through a fun learning environment (Monah, 2014). [12]

In line with that statement, Lakew (2016) states that the selection of learning models a very crucial. [13] Effective learning activities use a variety of teaching and learning methods to meet the students' needs and to achieve the desired learning objectives. At present, the learning paradigm has changed. The learning that allows students to participate actively enables the students to not only receive knowledge, but also gather information, record it systematically, do discussion, compare the data, analyze, and draw conclusions. Active learning allows students to become more confident, become more interactive with peers, and improve teamwork and the ability to share and to make contribution.

Nevertheless, there are still some other problems that occur in Biology learning in Madrasah Aliyah (MA) in Palu, Indonesia, MA is Islamic senior high school. The problems are that there are still a big number of teacher-centered learning practices. The obstacles in implementing active learning based on the research by Lakew (2016) are the large class sizes, passive students, the lack of resources in the form of new books, lack of training and lack of resources.[13] The results of a survey research by Bialangi et al. (2016) showed that teachers' understanding of the constructivist learning is still poor, including a variety of cooperative learning and the learning that emphasizes on students' activities. [14] In fact, the learning which is based on students' activity is one way to empower the students' academic ability (Malahayati, 2011). [15] In line with

the statement, Warouw (2009) also states that the empowerment of the academic ability can be done through cooperative learning. [16] One of the cooperative learning that can be selected is jigsaw and guided inquiry.

According to Hamalik (2010), Biology learning in high schools is expected to be a tool for students to learn about themselves and the surrounding environment as well as the process of development in its application in everyday life. [17] Biology learning has a learning object, which is not only relating to real world, but also relating with the processes of life. In order that the students can understand it, the learning model used in the learning process should be suitable with the characteristics of the object and the subject of the study. The phenomenon taught through Biology is a natural phenomenon that the students might not have experienced. Therefore, biology cannot be understood if it is only taught by rote learning. Understanding the concepts of Biology is like various simple activities that students can do. [18-19]

At the level of senior high schools, students are also required to have symbolic and abstract thinking. The graduate students of MA are not only expected to meet qualifications of learning results-based on factual knowledge, but also the high levels, namely conceptual, procedural and met a cognitive qualifications. This means that the levels of thinking expected from the students of today is also not limited to the low order of thinking, but the high-order thinking. In this case, Ibrahim (2000) states that the cooperative learning, like Jigsaw, is seen to be able to empower students' thinking skills, although its implementation requires some good planning tasks. [20]

Jigsaw is a cooperative learning model that is done in small groups (Aronson, 2008). [21] In Jigsaw, each student in each group must work together and help each other. Each member of the group becomes "experts" in their own subject, so that every student has important information that can be shared to their classmates. In Jigsaw, there are the home groups and expert groups. The home group is the parent group of students consisting of students with diverse abilities, origins, and family backgrounds. The home group is a combination of several experts. The expert group is the group consisting of the students of different home groups assigned to study and explore the same topic and complete the tasks associated with the topic and later explain the topic to the other members of their home groups (Hia, 2013). [22]

Jigsaw is better to be applied in terms of the improvement of positive inter-dependence among students in group learning activities. In addition, this model is also most suitably implemented to the subject of natural science, in addition to social science and literature (Slavin, 2005). [23] Jigsaw is actually more appropriate to be implemented in the learning that emphasizes the mastery of concepts. However, Biology learning does not only focus on the product (learning results and mastery of concepts) but also the processes and mastery of skills. As a natural science course, biology helps students to develop practical skills through experimental work, e.g. doing practical skills, recording data accurately, making logical reasoning, and manipulate tools effectively (Hussaini et al., 2015). [3]

A learning model that emphasizes on students' activities is very suitable for Biology. In Biology learning, the stages of the scientific method contained in inquiry learning will greatly help students master the concepts being learned and at the same time mastering certain skills. The process of inquiry can even help students develop the skills and abilities needed in the workplace and everyday life (Kuhlthau, et al., 2007). [24] Implementation of inquiry in learning can be divided into free inquiry, guided inquiry, and modified free inquiry.

At the level of senior high schools, teachers' guidance is still often needed in the students' inquiry process. The process of inquiry that still requires teachers' guidance is called as the guided inquiry (Bonnstetter,

2000). [25] The stages of guided inquiry learning model includes presenting problems, formulating hypotheses, designing experiments, conducting experiments to obtain information, collecting and analyzing data, as well as drawing conclusions (Eggen and Kauchak, 1996). [26]

The implementation of a more appropriate learning model is expected to minimize the gap between the high academic ability students and low academic ability students. This research aimed at revealing the potential Jigsaw and guided inquiry in improving the learning results of different academic ability students. The information obtained from this research is expected to be useful for Biology teachers, especially the Biology teachers at MA in Palu to implement a better learning to different academic ability students.

RESEARCH METHODS

Research design

This research was a quasi experiment which aimed at determining the potential of Jigsaw and guided inquiry learning models in improving students' Biology learning results at MA (Islamic Senior High Schools) in Palu, Indonesia. The independent variables in this research were the learning models that included jigsaw and guided inquiry. The dependent variable in this research was learning results. That was measured before and after the implementation of the learning models. The design if this research can be seen in Table 1.

Table 1. Quasi-Experimental Research Design

Pretest	Group	Posttest
O_1	X_1	O_2
O_1	X_2	O_2
O_1	X_3	O_2
O_1	X_4	O_2

Information:
X_1 = Jigsaw Model of high academic ability
X_2 = Guided inquiry model of high academic ability
X_3 = Jigsaw Model of low academic ability
X_4 = guided inquiry model of low academic ability
O_1 = pretest scores
O_2 = posttest scores

Population and Sample

This research was conducted for one Semester in the second semester of the 2013/2014 academic year in MAin Palu, Indonesia. The population of this research was all of the students with high and low academic abilities. The samples of this research were 70 students having high academic ability and 70 students having low academic ability in XIth Science class at MA Palu. The samples were divided into four classes which were taken by using random sampling techniques. Each learning model was represented by two classes, consisting of high academic ability class and low academic ability class. The sample classes had been tested for the equality based on the results of national examination. The data of the equality was analyzed by using t-test with *SPSS 17.0 program for Windows*.

Research Instruments and Procedures

Learning results were measured by using an essay test which was developed by the researcher. The test consisted of 17 question items. The scoring of learning results was done by using a rubric which was valid based on expert validation and empirical validation by 50 students of class XII Natural Science. Based on the results of empirical validation, the rubric used was valid and reliable.

Data analysis

The data of the learning results obtained from the pretest and posttest were statistically analyzed by using *one-way ANCOVA*. Before the analysis was performed, prerequisite tests were performed which included the normality and homogeneity tests. The analysis was assisted with *SPSS 17.0 program for Windows*.

RESEARCH RESULTS

The results of the prerequisite tests which included the normality and homogeneity of the data indicated that the data was normally distributed and had homogeneous variance. The results of the hypothesis testing performed by ANCOVA to determine the effect of learning models,

academic ability, and the interaction between the two factors on students' learning results in MA, Palu can be seen in Table 2.

Table 2 Summary of the Results of ANCOVA on students' learning results

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	695,302(a)	6	115,884	10,360	,000
Intercept	3844,100	1	3844,100	343,664	,000
XKog	83,770	1	83,770	7,489	,007
Learning Model	468,115	2	234,058	20,925	,000
Academic Ability	38,392	1	38,392	3,432	,067
Learning Model * Academic Ability	149,638	2	74,819	6,689	,002
Error	1062,636	95	11,186		
Total	**632191,277**	**102**			
Corrected Total	**1757,938**	**101**			

Table 2 above shows that significance value of the learning model variable is 0,000. This value is smaller than alpha 0.05, so the research hypothesis stating learning model has a significant effect on students' learning results was accepted. The significance value of the academic ability variable was 0,067 and larger than the alpha 0.05. Thus, it can be stated that the academic abilities did not have a significant effect on students' learning results. The interaction between the learning model and academic ability has a significance value of 0.002 which is smaller than the alpha 0.05. Thus, the interaction between learning models and academic ability had a significant effect on students' learning results.

To determine the potential differences of each learning model in improving students' learning results, post hoc test with LSD 5% was performed. Table 2 shows the results of post hoc test on the effect of learning models on students' learning results.

Table 3. The results of post hoc test on the Effect of learning models of students' learning results

Model	XCog	YCog	Difference	Increase	Cogcor	LSD Notation
3 = Conventional	61,30	75,55	14,25	23,24%	75,44	a
2 = Guided Inquiry	62,11	80,15	18,04	29,04%	79,90	b
1 = Jigsaw	58,66	79,90	21,24	36,21%	80,23	b

Table 3 shows that the conventional model has the lowest potential in empowering students' learning results. Meanwhile, the guided inquiry and jigsaw learning models have high potential and significantly different from the conventional model. Based on the differences of the corrected mean, it is known that students learning by using jigsaw have the highest mean score of learning results, with a difference of 6.35% compared to that of the conventional model. While the corrected mean score of the learning results of the guided inquiry model was not significantly different from that of the jigsaw model with a difference of 5.91% compared to the conventional model.

The interaction between the learning model and the academic ability has a significant effect on learning results. After that post hoc using LSD 5% was performed to determine the most suitable learning model to be applied at every level of academic ability. Table 4 shows the results of post hoc test on the interaction between learning models and academic ability on students' learning results.

Table 4. The results of Post Hoc test on the effect on the interaction between learning models and Academic Ability on learning results

Model	Academic Achievement	XCog	YCog	Difference	Increase	CogCor	LSD Notation
3 = Conventional	2 = Low	61,40	73,44	12,04	19,61%	73,31	a
3 = Conventional	1 = High	61,21	77,66	16,45	26,87%	77,57	b
2 = Guided Inquiry	2 = Low	63,15	79,76	16,61	26,30%	79,34	b c
1 = Jigsaw	1 = High	58,82	79,08	20,26	34,44%	79,38	b c
2 = Guided Inquiry	1 = High	61,07	80,53	19,46	31,86%	80,46	c
1 = Jigsaw	2 = Low	58,50	80,72	22,22	37,98%	81,07	c

The results of LSD test in Table 3 show that the lowest corrected mean score of learning results was from the low academic ability students in conventional learning. The corrected mean score of the learning results of high academic ability students at conventional learning class was not significantly different from that of the low academic ability students in the guided inquiry model class or that of the high academic ability students who studied in the jigsaw model class. The results of post hoc test also showed an interesting fact that the low academic ability students who studied with the jigsaw model had the highest corrected score of the learning results and not significantly different from that of the high academic ability students in the jigsaw and guided inquiry models. Thus, it can be stated that the jigsaw model enables the low academic ability students to obtain the learning results similar to that of the high academic ability students.

DISCUSSION

The results of the research showed that learning models had an effect on students' learning results. The differences in the students' learning results in different learning models are in line with the results of research. [27-36] Based on the results of data analysis in this research, the three learning models which were implemented, namely jigsaw, guided inquiry, and conventional model could improve students' learning results. However, based on the percentage increase of the learning results and the corrected mean, the learning which implemented jigsaw and guided inquiry models were more potential in improving students' learning results than the conventional learning model was.

Based on the results of this research, it is known that the jigsaw model can improve students' learning results as much as 36.21%. The improved learning results in the implementation of jigsaw model can be attributed to the stages of the jigsaw learning that the students did. In jigsaw, there are cooperative learning activities that allow students to work in small groups. [20,22] The groups in the jigsaw learning implemented in this research, students were divided into the home group and expert group (Slavin, 2005). [22] Each student of the home group will explore specific topics in the expert group. Then, each student will return to their home groups and share the information learned from the activity in the expert groups.

The students' learning activities in the home groups and expert groups will encourage interaction and positive interdependence among students (Johnson et al., 2004). [37] According to Bodrova and Leong (2000), each student will be able to develop their potential in learning achievement if they get scaffolding from peers. [38] In addition, peer tutorial proves to be effective in empowering students' achievement, because peers usually have the same orientation and language (Prayitno, 2010). [39] The improved learning results in jigsaw model were in line with the results of the research. [39-41]

Guided inquiry model also has the potential in improving students' learning results as much as 29.04%. The improvement of the learning results that occurred in the guided inquiry learning was also related to the activities the students in the learning. On the guided inquiry model, students received guidance from teachers to learn the concepts of biology based on the stages of the scientific method. [25,26] The learning process of scientific method starting from identifying problems, making hypotheses, designing experiments, conducting experiments to obtain information, collecting and analyzing data, and making conclusions allows students to find the concepts by themselves. Through inquiry learning, students can comprehend the concepts better. Kolb (1984) stated that students' experiences during the inquary learning are a source of learning which can be used to develop themselves. [42] The improvement of learning results through guided inquiry learning is in accordance with the results of research. [32,43-50]

Based on the results of post hoc test, it was also revealed that the potential of guided inquiry and Jigsaw in improving learning results was not significantly different. It means that both learning models can improve students' learning results. The potential of both learning models in improving students' learning results is, in fact, significantly different from the potential of traditional learning with an increase percentage of 23.24%. Thus, the conventional learning model can be considered to be less potential to improve students' learning results than the other two models are. The conventional learning models used in this research were the teacher-centered learning which did not involve the students' activities. However, this lecturing model has some disadvantages because the students are not actively involved in the learning process. The lack of students' activity and interaction is believed to decrease the students' thinking activity, thus causing the students' learning results to be less optimum.

Based on the results of this research, it was revealed that academic ability did not have a significant effect on students' learning results. This is quite interesting finding in that, as already known, the student's academic ability is the students prior ability as the base on provision to acquire a broader and more complex knowledge (Winarni, 2006). [1] Some information states that the students' academic ability has an effect on students' ability to seek information, think critically, and also achieve maximum learning results. [1,5-9] This information shows that in general the high academic ability students tend to achieve better learning results.

However, the tendency of high academic ability students to achieve better learning results than the low academic ability students occurs when the two groups are given the same treatment/learning model. Basically, every student has the potential to be developed, including the low academic ability students (Corebima, 2012). [10] Corebima (2006) states that, based on the results of his research, there are several strategies that could potentially empower the thinking skills of high and low academic ability students. [11] In addition, the research by Warouw (2009) and Malahayati (2011) showed that certain learning models can be used to empower the academic abilities of students, including the low academic ability students. [16,15]

Related to the results of this research, the academic abilities of high and low ability students are not different. The results of this research are supported by Caroll (1965) in the Joyce and Weil (2000) stating that learning results should not merely be determined by the student's academic ability. [48] Learning success is also determined by the allocation of time provided for the students to learn. Low academic ability students may have equal learning achievement with the high academic ability students, if they are given adequate time. However, since the time allocation factor is controlled in this research, the similar learning results of both academic abilities in this research are influenced by other factors that were not examined in this research, such as students' motivation. A high motivation to study of the low academic ability students can also support the potential to achieve the learning results as good as the high academic ability students.

The learning model and students' academic ability factor in this research had an interaction which had a significant effect on students' learning results. The results of the analysis showed that jigsaw managed to improve the learning results of low academic ability students high than the high academic ability students who learner by using guided inquiry or conventional model. This shows that the jigsaw model can be used to equalize the learning results between the high and low academic ability students. Thus, the jigsaw model has a great potential in empowering both academic ability students, as stated by Corebima (2006) and Warouw (2009). [11,9]

The results of a post hoc test on the effect of the interaction between learning model and academic ability also showed that the inquiry model tend to be more potential in improving the learning results of high academic ability students. Thus, it can be stated that the stages in the guided inquiry model are more suitable for high academic ability students. This is because the guided inquiry learning requires careful planning, good supervision, ongoing assessment, and targeted interventions undertaken by teachers to train students in independent learning (Kuhlthau et al., 2007). [23] Independent-learning process in guided inquiry model also demands the students to be able to use the tools and resources as well as information provided to learn certain concepts in accordance with the standard. These abilities are not easy to be controlled and more likely to be controlled by high academic ability students.

The implementation of appropriate learning models can reduce the gap between the high academic ability students and the low academic ability students. Based on the results of the analysis, the low academic ability students who learners by using jigsaw models could achieve equal learning results with the high academic ability students. Thus it can be stated that the jigsaw model can reduce the existing gap between high and low academic ability students. The results of this research are expected to be implemented by senior high school teachers, particularly MA (Islamic senior high school) teachers in Palu to improve the quality of learning. With the reduced gap between different academic ability students will support the ideals of the education in Indonesia.

CONCLUSION

Students' biology learning results of the students having different academic abilities can be improved by selecting the appropriate learning models. Jigsaw and guided inquiry learning models have a greater potential to improve students' learning results than the conventional learning model using lecturing method. In this research, it can be concluded that the students' academic ability was not the only factor affecting the students learning results in biology learning in MA in Palu, Indonesia. Jigsaw model is more potential in improving the learning results of students with low academic ability, while the guided inquiry learning is more potential in improving the learning results of the high academic ability students. It is also proven that Jigsaw model enables the low academic ability students to achieve the learning results equal to that of the high academic ability students.

REFERENCES

1. Winarni, E. W. 2006. The Effect of Learning Strategy on Biology Concept gaining, Critical Thinking Skills, and Scientific Attitudes of Class V Students of Elementary schools having Different Levels of Academic Ability in Bengkulu. Unpublished dissertation. Malang: Universitas Negeri Malang.
2. Putri, N.A,Corebima, A.D, Mahanal, S, 2013. The effect of (PBL and RT) Learning Strategies on Metacognitive Skills, Biology Learning results and the Retention of low Academic ability students Class X in different senior high schools. http://jurnal-online.um.ac.id/data/artikel/artikel00BD0CF15523578394F1BAB919539330.pdf, 3-9-2016. Accessed on, 10-10-2016.
3. Hussaini, I., Foong, L. M., dan Kamar,Y. 2015. Attitudes of Secondary School Students towards Biology as a School Subject in Birninkebbi Metropolis, Nigeria. International Journal of Research and Review, Vol. 2 Issue 10: 596-600.
4. Winkel, W. S. Psychology of learning. Jakarta: PT Gramedia; 1999.
5. Corebima, A. D. Empowering students' Thinking in Biology Learning: The promotion of research in the Department of Biology of State University of Malang. Paperpresented at the National Conference ofBiology and the its implementation, Biology Department Mathematics and Natural Science Faculty, Universitas Negeri Malang.. Malang: 3 December 2005.

6. Susantini, 2004. Metacognitive strategies in Cooperative Learning to Improve the Quality of Genetics Learning Process Genetics in senior high schools. Jurnal Ilmu Pendidikan. Issue12 (1):62-73.
7. Tindangen, M. 2006. Implementation of Contextual Learning and Biology Concept Map on different ability students and its effect on learning results and higher order thinking skills of Science in Junior High Schools. Unpublished Dissertation. Malang: Graduate program, Universitas Negeri Malang.
8. Handoko, 2007. The effect of Inquiry Learning and Cooperative Strategy on the learning results, Critical Thinking Skills, and cooperative skill of high and low academic ability students in Metro Lampung. Dissertation. Unpublished. Malang: Universitas Negeri Malang.
9. Warouw, Z.W.M, 2010. Cooperative Script Metacognitive (Csm) Learning Empowering Metacognitive Skills and Learning results. National Conference Education UNS 2010.Accessed on 10-10-2016.
10. Corebima, A. D. 2012. Learning that Empowers Metacognitive Skills, Concept Gaining, and Retention in Biology Learning in Senior High Schools in Malang for Helping the low academic ability Students. Proposal for Graduate Research Grants of Team-HPTP (Graduate Grant). Malang: Universitas Negeri Malang.
11. Corebima, A. D. 2006. Metacognition: A Summary of Study. Paper presented atPelatihan Strategi Metakognitif pada Pembelajaran Biologi untuk Guru-guru Biologi SMA, Lembaga Pengabdian Kepada Masyarakat (LPKM) UNPAR, Palangkaraya. August 23, 2006.
12. Monah, 2014. Improving Learning results Through Jigsaw Learning Strategies In Natural Science in Class II of Muhammadiyah Sriwedari muntilan in the academic year 2013 / 2014. Study Program of Government Elementary School Teachers and Teacher Training Faculty Tarbiyah State Islamic University Sunan Kalijaga.
13. Lakew, S. 2016. Factors that Hinder the Application of Active Learning Methods in Teaching Sport Science Students in the Case of Debre Markos University Sport Science Department. International Journal of Research and Review, Vol. 3 Issue 5, 58-68.
14. Bialangi, M. S., Zubaidah, S., Amin, M., dan Ghofur, A. Profile of Biology Learning at Madrasah Aliyah (MA) in Palu, Central Sulawesi. Paper presented at the National Conference III in Biology. 2016. Department of Biology, Universitas Negeri Malang.
15. Malahayati, E. N. 2011. The Effects of Problem Based Learning Through TPS strategy on Metacognitive Ability, Critical Thinking Skills, Biology Learning results and Retention of Different Academic Ability students. Unpublished thesis. Malang: mathematics and natural science Faculty, Universitas Negeri Malang.
16. Warouw, Z. W. M. 2009. The Effect of Metacognitive Learning in Cooperative Script and Reciprocal Teaching in different levels of Academic Ability on Metacognitive Skills, Critical Thinking, Biology learning results and the retention of Junior high school students in Manado. Unpublished dissertation. Malang: postgraduate Universitas Negeri Malang.
17. Hamalik, O. Proses Belajar Mengajar (Teaching and Learning process). Jakarta: PT Bumi Aksara; 2010.
18. Saptono. Dimensions of Character Education Insights, Strategies and Practical Measures. Jakarta: Esensi Erlangga Group; 2011.
19. Cahyanti, S. N. Karakteristik Pembelajaran Biologi (Characteristics of Biology Learning). 2011. http://www.klikedukasi.com/2010/12/karakteristik-pembelajaranbiologi25. html. Accessed on, 12-10-2016.
20. Ibrahim, Muhsin et al. Pembelajaran Kooperatif. Surabaya: University Press; 2000.
21. Aronson, E.About ElliotAronson andThis Web Site:Jigsaw Clasroom. [internet]. 2008. http://www.jigsaw.org. Accessed on 13-10-2016.
22. Hia,Y. 2013.The implementation of Jigsaw Cooperative Learning Model to Improve the Activities and mathematic Learning results of Class VII students. Jurnal Generasi Kampus. Volume 6, Nomor 2: 51-62.
23. Ibrahim, M. Rachmadiarti, F. Nur, M dan Ismono. 2000. Pembelajaran Kooperatif . Surabaya: University Press.
24. Slavin, R.E. 2005. Cooperative Learning:

Theory. Research and Practice. London: Allymand Bacon.
25. Kuhlthau, C. C., Maniotes, L. K., dan Caspari, A. K. 2007. Guided Inquiry Learning in The 21st Century. Westport: Libraries Unlimited.
26. Bonnstetter, B. J. The DNA of Global Leadership Competencies. Thunderbird International Business Review. 2000; Vol 42 (2): 131-144.
27. Eggen, P.D. and Kauchak. D.P. 1996. Learning and Teaching. 2 nd ed. Needdham Height, Massachussets: Allyn and Bacon.
28. Amnah, S. 2009. The effect of Think Pair Share, Jigsaw, Combined with Metacognitive Strategies and Academic Ability on Metacognitive Awareness and Biology learning results of the students in Pyblic Senior High school in Pekanbaru Riau. Unpublished dissertation. Malang: Universitas Negeri Malang.
29. Kristiani, N. 2009. The effect of Learning Strategies and Academic Ability and the interaction of both on Metacognitive skill and learning results. Jurnal Pendidikan Biologi 1 (1): 61-74.
30. Maasawet, E.T. 2009. The Effect of Cooperative Learning Strategies Snowballing and Numbered Heads Together (NHT) on of multiethnic on Critical Thinking Skills, Learning Results, Cognitive Science and Social Attitudes of Junior High School Students in Samarinda. Unpublished dissertation. Malang: Universitas Negeri Malang.
31. Muhfahroyin, 2009. The effect of the Integration of STAD and TPS learning strategies and academic ability on Biology learning Results, Critical Thinking skill, and Process Skills of Senior High school students iin Metro City. Unpublished dissertation. Malang: Universitas Negeri Malang.
32. Muhiddin. 2012. Effect of Integration Problem Based Learning with Jigsaw Cooperative Learning and Academic Ability to metacognition, Critical Thinking, understanding concepts, and retention of students in the Basic Biology Class. Unpublished dissertation. Malang: Universitas Negeri Malang.
33. Ramdani, A. 2012. Developing learning media of Inquiry Learning through Lesson Study and its Effects on Biology Learning results and Critical Thinking Skills of different Academic ability students in Unior High school in Mataram. Unpublished dissertation. Malang: Universitas Negeri Malang..
34. Tumbel, F.M. 2011. The effect of cooperative Script Learning Strategies integrated with Problem Posing and students 'Academic Ability on Metacognitive Skills, Thinking Skills, and Biology concept gaining in senior high schools in Bitung, North Sulawesi. Unpublished dissertation. Malang: Universitas Negeri Malang.
35. Danial, 2010. The Effect of PBL strategy and Cooperative Learning GI on Metacognition and Concept gaining of the concepts of Chemistryin the Department of Biology, State University of Makassar. Unpublished dissertation. Malang: Universitas Negeri Malang.
36. Suyanik. 2010. The Effect of thinking empowerment by questioning Patterns (TEQ) with Think Pair Share (TPS) Learning model and ARIAS Strategy on Critical Thinking Skills and learning results of Class X students of senior high school Laboratory of UM Malang. Unpublished thesis. Malang: Universitas Negeri Malang.
37. Sepe, F.Y. 2010. Cooperative Learning on cooperative learning Strategy at TAI (Team Assisted Individualization) and Its Effect on Metacognitive Skills, Critical Thinking Skills and learning outcomes in Biological Sciences Private Junior high school students in Kupang. Thesis is not published. Malang: Universitas Negeri Malang.
38. Johnson,D.W., Roger, T.J,. Edythe, J.H. 2004. Colaborative Learning, (Learning strategy to be success together). Translated by Narulita Yusron. 2010. Bandung Ujungberung: Nusa Media.
39. Bodrova, E & Leong, J.D. Scaffolding Emergent Writing in the Zone Proximal Development. Literacy Teaching and Learning. 2000;3 (2): 1-18.
40. Prayitno, B.A. 2010. Potential Combined Cooperative Inquiry Learning Biology in Empowering Thinking Skills and Processes in Student Achievement Under. Proceedings of the National conference on Science. Surabaya. UNESA. Unpublished.
41. Afifuddin, N. 2008. The difference in the effect of Cooperative Learning Model Jigsaw and Group Investigation (GI) on Biology learning results Seen From the students' achievement Motivation.

Unpublished thesis. Education Technology Study Program Graduate Program University of Sebelas Maret Surakarta.

42. Azizah, N. The effect of Jigsaw Learning Method on the learning results of Basic Subjects Vocational Competency in Vocational schools Wongsorejo Gombong. Jurnal Penelitian Program Studi Pendidikan Teknik Mesin Fakultas Teknik Universitas Negeri Yogyakarta. January 2013.
43. Kolb, D.A. 1984. Experiential Learning: Experience as the Source of Learning and Development. Englewood Cliffs, NJ: Prentice Hall.
44. Setiawan, I.G.A. 2005. The effect Contextual in inquiry Strategies and Learning and Based on Problems and Improve Thinking Skills and Biology Learning results of Junior High schoolsin District Buleleng Bali. Unpublished Dissertation. Malang: Universitas Negeri Malang.
45. Santoso, H. 2007. The Effect of Cooperative Learning inquiry and Inquiry learning on learning results, Critical Thinking Skills, and cooperative skill of senior high school students having high and low Metro Lampung. Unpublished dissertation. Malang: Universitas Negeri Malang.
46. Jufri, W. 2009. The role of Inquiry Based Learning materials and its Implementation on the Development of Critical Thinking Skills. Jurnal Pendidikan Biologi jilid 1. No. 1, August Page 81-86.
47. Paidi, 2008. Developing Biology Learning media Implementing PBL and Metacognitive Strategy and the Effectiveness against Metacognitive Ability, Problem Solving, and Biological Concepts of senoess High school students in Yogyakarta Sleman. Unpublished dissertation. Malang: UIN Maulana Malik Ibrahim.
48. Sujarwo, 2011. The effect of Guided Inquiry Learning and Expository) on sociology Learning results of Senior High School Students having different Levels of Achievement Motivation and Creativity. Unpublished Dissertation. Learning Technology Department Graduate Program, Universitas Negeri Malang.
49. Joyce, B.,M. Weil & E. Calhoun. 2000. Models of Teaching. 6th edition. Alyn Bacon. Boston. United State America.
50. Nurhadi, B. Yasin: A.G, Senduk, 2004. Contextual Learning. Malang. Universitas Negeri Malang.

How to cite this article: Bialangi MS, Zubaidah S, Amin M et al. Improving the biology learning results of low academic ability students by using Jigsaw and guided inquiry learning. International Journal of Research and Review. 2016; 3(11):32-42.

******