International Journal of Academic Research and Development
ISSN: 2455-4197, Impact Factor: RJIF 5.22
www.academicsjournal.com
Volume 1; Issue 10; October 2016; Page No. 01-07

Development of students' social attitudes in biology classroom through jigsaw and guided inquiry

[1] Mursito S Bialangi, [2] Siti Zubaidah, [3] Mohamad Amin, [4] Abdul Gofur

[1] Postgraduate of Universitas Negeri Malang, Malang, Indonesia Biology Education Department, Universitas Tadulako, Palu, Indonesia.

[2, 3, 4] Department of Biology, Universitas Negeri Malang, Malang, Indonesia

Abstract
In generally, teaching and learning processes more focused on improving students' cognitive learning outcomes, while the development of social attitudes tends to be ignored. The development of social attitudes can be done with habituation through the implementation of cooperative learning model. This study was a quasi-experimental to determine differences of social attitudes of students taught by jigsaw and guided inquiry learning model. The research sample was the students of second year of Natural Science class in Senior High School in Palu, Central Sulawesi, Indonesia as many as 70 students. Social attitudes were measured using a questionnaire given at the beginning and at the end of the study. The result showed that there was no differences between the social attitudes of students taught by jigsaw and guided inquiry. This might be caused by these models have the same potency in developing social attitudes. Combination of these models to optimize the potency of both in developing social attitudereveal at further research. Another possibility, the use of a questionnaire to measure social attitude was less accurate. Based on the fact, the future studies should consider an observation sheets to measure students' social attitudes.

Keywords: guided inquiry, jigsaw, observation sheet, questionnaire, social attitudes

1. Introduction

In generally, teaching and learning process in Indonesia was still dominatedby a teacher-centered learning. The survey conducted by the researchers showed that the commonly learning model that used by high-school teacher in Palu, Indonesia was still dominated by teacher-centered learning patterns. Teacher-centered learning patterns do not able to improve students' learning outcomes optimally. The research results of Kurdi (2009) [30] and Ramdhani (2014) [41]: which compares the teacher-centered with student-centered learning showed that teacher-centered learning did not have a significant impact on improving student learning outcomes. Although various efforts have been done to improve the learning patterns, for example with the application of active learning, but the facts have not been able to improve student learning outcomes, both of the cognitive, psychomotor and affective aspect.

Further results of the survey conducted by the researcher showed that the teaching and learning process carried out not to consider the development of students' social attitudes yet. Teaching and learning processes were only focusedon improving the cognitive learning outcome. Mikarsa (2009) [33] stated that education is essentially also aims to develop students' lives, particularly as a member of society can be achieved by efforts to (a) strengthen the awareness to live together; (b) foster a sense of social responsibility; (c) provide basic knowledge and skills needed to play a role in social life.

Social attitudes are part of the learning outcomes besides cognitive and psychomotor. Bloom (1981) [9] which was then revised by Anderson and Krathwohl (2001) [3] states that the purpose of learning, performance or purpose learning goals are classified into three general classifications or domains (domains): namely: (1) cognitive, related to the purpose of learning-oriented on ability to think; (2) the affective domain associated with feelings, emotions, value systems, and attitudes; and (3) the psychomotor, that oriented to motor skills. Social attitudes are part of the affective aspects of students. The attitude is a predisposition or tendency of a relatively stable and continuous to behave or to react a certain way to other person (Chaplin, 2006) [14]. According to Ahmadi (2009) [2] attitude is the readiness to respond positively or negatively on objects or situations consistently. The attitude is a mental predisposition to perform an action. Attitude is a predisposition that learned to respond consistently in a certain way related to the certain objects (Dayakisni, 2009) [16]. Social attitudes will guide the students to perform better interaction between students and students, like wise between students and teachers, to create a harmonious relationship in the school. This suggests that the expected output of the learning process is not only students to own the competences of knowledge and skills, but also expected to have a good attitude.

The attitudes could be learned through a modeling and habituation (Sanjaya, 2013) [44]. One of the characteristics of developing students is the desire to imitate others who became their idol or the respected ones. The process of developing the students' attitude toward an object through a modeling process was originally done by the emulating, but the student shave to know why they doing something. In addition, teachers can embed a certain attitude to the students by the habituation in the learning process through a specific of learning models.

The development of students' social attitude can be done through the implementation of cooperative learning

model. Koc *et al*. (2010) [28] stated that the cooperative learning is an innovative learning that may be associated with affective aspects. This is in line with the statement of Slavin (2000) [47] that the cooperative learning to promote learning innovation that can improve learning outcomes of students' cognitive, social and affective. Further, Slavin (2000) [47] explained that the cooperative learning model contributed an idea that students who learn together and are responsible for their teammates were able to make themselves learn equally well.

Bowen (2000) [11] and Prince (2004) [40] suggested that cooperative learning is described as a learning model where students learn together in small groups and help each other for academic purposes, develop communication skills, improve problem solving and critical thinking skills and take an important part in the learning process students. Cooperative learning may be able to stimulate confidence in thinking ability, to find information, to empower each student to be responsible, and to improve academic achievement (Sanjaya, 2013) [44]. Johnson *et al*. (1998) [26] explained that the cooperative learning involves five basic components i.e. a positive dependency, promotion of face-to-face interactions among students, individual and group accountability, interpersonal skills and small groups, and group process skills.

Jigsaw and guided inquiry are the types of a wide of cooperative learning models to develop students' social attitudes. Jigsaw and guided inquiry are based on constructivist and collaborative learning, which is the knowledge that constructed in the minds of students (Rokhmatika, *et al*. 2012) [43]. Jigsaw is a model of learning where students learn in small groups consisting of 4-6 students heterogeneously and cooperate positive interdependence and is responsible for the completeness of the materials studied (Arends, 2007) [4]. It is one type of cooperative learning that combines reading, writing, listening and speaking in a cooperative atmosphere and mutual help to process information and improve their communication skills through discussion (Lie, 2008) [31]. The discussions step on jigsaw are able to facilitate the scaffolding process through peer tutorial, which is an effort to improve teaching and learning quality, so that students have the ability to understand the concept matter, positive attitudes, and skills (Prayitno, 2010) [38].

The instruction of jigsaw, was designed by teachers through small heterogeneous groups would be more effective for students to understand the subject matter (Gillies, 2006; Ahmad and Mahmood, 2010; Rokhmatika, 2012) [23, 1, 43]. Jigsaw practicable in the classroom because it easier for students to understand the subject matter (Koc *et al*. 2010) [28]. Research of Doymus (2008) [17] and Doymus *et al*. (2012) [18] showed that the students understanding taught by jigsaw higher than non-jigsaw learning. Similarly, the research of Cagatay and Demirciouglu (2013) [12] reported that cooperative learning techniques jigsaw-1 showed better results than the control group.

Inquiry learning consists of two main types as guided inquiry (guided inquiry) and open-ended inquiry. Both kinds of inquiry are different subjects and goal of activities (Prayitno, 2010) [38]. In guided inquiry, students are directed to investigate through learning by doing. Martin (1997) [32] explained that in the guided inquiry, teacher set up the instructions and suggest open-ended activity, in which students are guided to find what they can discover and investigate into what they do not understand. Guided inquiry isa model student-centered and activity-based where teachers use various types of learning materials to help students find the best possible solution in the process of scientific investigation (Nwagbo, 2006) [36].

Various studies have explored the effectiveness of inquiry on the students' performance of (Furtak, 2006) [21]. Research results of Ozdilek and Bulunuz (2009) [37] reported that the inquiry learning was effective in increasing the sense of self-efficacy beliefs in the teaching of science. Inquiry has proven to motivate students with different learning styles (Tuan *et al*., 2005) [51]. Guided inquiry has the force to empower the group to develop and teaching, learning, and understanding (Ferrel *et al*. 1999) [20] and very effective to help teachers to teach science (Plourde, 2002) [39]. The teacher can provide scaffolding to the students through the process of inquiry (Moje, *et al*., 2001 and Yerrick, 2000) [34, 53].

This aim of thisstudy was to compare the effect of jigsaw and guided inquiry practice in developing social attitudes of students. The results of this research expected to be important information for teachers in selecting a learning model for developing students' social attitudes. In addition, teachers are expected to not only focus on the cognitive learning but also on the students' affective ones.

2. Methodology of Research

2.1 General Background of Research

This study was a quasi-experimental research conducted to determine differences in social attitudes of Senior High School students in Palu, Indonesia, taught by jigsaw learning and guided inquiry. In this study, the learning model as independent variables and students' social attitudes as dependent variable. This research was designed by pretest-posttest control group design (Fraenkel & Wallen, 2009) [22] (Table 1). Social attitudes were investigated includes honesty, discipline, responsibility, tolerance, mutual cooperation, and confidence. This research was carried out in one semester on odd semester of 2013/2014.

Table 1: Quasi-experimental research design

Pretest	Group	Posttest
O_1	X_1	O_2
O_1	X_2	O_2

where,
X_1 = Jigsaw
X_2 = Guidedinquiry
O_1 = prettest scores
O_2 = posttest scores

2.2 Sample of Research

The sample of research were represented all the second year students of natural science classes of senior high

school in Palu, Indonesia at academic year 2013/2014. The sample in this study consisted of 70 students that were selected by simple random sampling. The classes were chosen by the lottery method randomly from the population and entirely by chance because each class has the same probability of being chosen for the sample of research. Each model was represented by two classes as jigsaw and guided inquiry class, so that the number of classes used was 4 classes. The classes that used as the research sample were previously tested by the national test scores equity, and then analyzed with t-test by SPSS 17.0 for Windows.

2.3 Instrument and Procedure

The social attitudes of students were measured by social attitude questionnaire developed by the researchers, as many as 36 items. Questionnaire used Likert scale with 4-point scale (strongly agree, agree, disagree and strongly disagree). The data from the questionnaire were collected during the pretest and posttest. These instruments were initially validated by experts and empirical validation. The expert validity of instruments consisted of the content and construction validation. The questionnaire content validity was determined by the extent to which the contents represents all aspects of social attitudes i.e. honesty, discipline, responsibility, tolerance, mutual cooperation, and confidence. The construction validity emphasis on preparation of the item of instruments and the clear definition of detailed operational elements of the variables studied. To test the construct validity, the questionnaire was consulted to the experts to get suggestions for some revisions. The result of the validation of the three experts was valid with 3.54 scores.

Empirical validation carried out by trying out the questionnaire to 50 students for determining the validity and reliability of the instruments. The validity refers to the precision and accuracy of a measuring instrument in the conduct of measurement functions. The validity of an instrument relating to the instrument's ability to measure or reveal the characteristics of the variables that was intended to be measured. Reliability refers to the degree of test scores are free of measurement error or an index that indicates the extent to which a measuring instrument is reliable or unreliable. The empirical validation results showed that the instrument was valid and reliable.

2.4 Data Analysis

The data of students' social attitude was obtained from a questionnaire given at the beginning and end of study. The data were then analyzed by using Analysis of Covariance (ANCOVA): which were previously performed the prerequisite tests namely, the normality test using one-sample Kolmogorov-Smirnov test and homogeneity test using Levene's Test of Equality of ErrorVariances.The data were analyzed using SPSS 17.0 forWindows.

3. Results of Research

The results of normality test of the students' social attitudes data using one-sample Kolmogorov-Smirnov test showed that the data were distributed normally and homogenity testusing Levene's Test of Equality of ErrorVariancesshowedthat the data washomogeny.

ANCOVA test results of social attitude of the students' shown in Table 2. The increase in social attitudes score pretest to posttest on learning jigsaw and guided inquiry shown in Table 3.

Table 2: The summary of analysis of covarianceon social attitudes of students

Source	Type III Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
Corrected Model	1474.282(a)	2	737.141	20.173	.000
Intercept	332.856	1	332.856	9.109	.004
Xsocial	1416.630	1	1416.630	38.768	.000
Model	20.647	1	20.647	.565	.455
Error	2448.283	67	36.542		
Total	545948.007	70			
Corrected Total	3922.565	69			

Table 3: The score of students' social attitude in pretest and postest

Model	Xsocial	Ysocial	Difference	SocialCor	Enhancement (%)
Jigsaw	85.67	87.11	1.45	87.47	1.69
guided inquiry	86.72	88.93	2.21	88.56	2.54

Table 2. shows that there was no difference ($p > 0.05$) between social attitudes of the students' taught by jigsaw and guided inquiry. Table 3 shows that the average score of students' social attitude from pretest to posttest taught by the model jigsaw increased as much as 1.69% and taught by guided inquiry increased as much as 2.54%.

4. Discussion

The results showed that there was no difference in social attitudes of students taught using jigsaw and guided inquiry. There are two possible reasons for the absence of differences in social attitudes of students taught using jigsaw and guided inquiry.

The first possibility is jigsaw and guided inquiry has the same potency in developing students' social attitudes. Jigsaw and guided inquiry are two types of cooperative learning model. According to Kocak (2008) [29] and Boleng (2014) [10]: cooperative learning give the chance for students to develop their social skills, so that students can interact with each other. Besides jigsaw and guided inquiry, Boleng (2014) [10] reported that the cooperative

script and think-pair-share are also cooperative learning modelst hat can significantly affect to social attitudes.

In jigsaw, students are more active both individually and in groups either in the original group, while in the experts group and after returning to the original group. Jigsaw model as a type of learning with students learn in a small heterogeneous groups and work together with positive interdependence and responsible for the mastery learning (Arends, 2007) [4]. The syntax of cooperative jigsaw helped the students could learn each other, discuss, and argue for understanding (Slavin, 2000) [47]. Rochaninigsih and Masruri (2015) [42] reported that jigsaw increased the cooperation and positive impact on students' mastery learning.

Some research on cooperative learning has indicated that the team award (Slavin, 2010) [48] and individual responsibility were essential to improve students' achievement. Students not only learn the learning material, but students should also be ready to teach the group members, so the students would learn cooperatively. Cooperative learning model such as jigsaw could develop inter-group relations, acceptance of classmates who were weak in the academic field, with the lower academic level, and increase self-esteem of students (Slavin, 2010) [48]: so as well as to encourage of awareness of mutual learning among students (Hulten & DeVries, 1975) [25]. Suratno (2009) [49] and Muhiddin (2012) [35] found that jigsaw proven to improve the students' metacognitive skills. Metacognitive skills related to the student's ability to plan, organize and assess their learning honestly. Through these activities, students will be trained to be honest ones.

On guided inquiry, students are conditioned to construct their own knowledge, which was suitable with the constructivism paradigm (Hacieminoglu, *et al*, 2011; Rokhmatika, *et al*, 2012) [24, 43]. Social interactions inthe group discussion are able to construct students' knowledge. Students with the lower academic level would have better understanding onlearning material when they learn together with the students with the higher academic level (Yurdakaban, 2011; Kilic, 2008; Rokhmatika, *et al*, 2012) [54, 27, 43]. Shepardson and Pizzini (1993) [45] reported that the inquiry proven could improve students' attitudes toward science. On this basis, it is ascertained that the guided inquiry also can improve other aspects of attitudes include social attitudes of students. This is supported by research findings by Siegel and Ranney (2003) [46]: Chang and Tsai (2005) [51]: Taraban *et al*. (2007) [50]: and Bilgin (2009) [8] that found the guided inquiry could increase the positive attitude of students. Caliskan and Turan (2010) [13] reported that the inquiry learning proved able to give a more positive effect on the students' attitudes. This shows that guided inquiry has the potency to develop the students' social attitudes. The research findings Widiantara *et al*. (2013) [52] also found that there was a significant difference in social attitudes among students taught by social inquiry and conventional learning.

Based on the findings above, the implications of this study are the further research may investigate about the influence of the learning model that combines jigsaw and guided inquiry, based on the fact that these learning models have the same potency in developing social attitudes of students. Integration of both the learning model is expected can optimize the development of students' social attitudes. Prayitno (2010) [38] reported that the combination ofguided inquiry and jigsaw could facilitate teachers to guide the students to plan and make the inquiry procedure, to conduct scientific investigations, to discuss in groups and communicate the results of discussion. These scientific activities make the students more active to involve during learning than conventional models.

The second possibility of causing the absence of difference in social attitudes among students taught by jigsaw and guided inquiry was the use questionnaire less accurate to measure students' social attitude. It is reinforced by the results of studies showed that the increasing of mean scores social attitudes of pretest to posttest was small. This research result supports the findings of previous studies such Bahri (2010) [6]: Muhiddin (2012) [35]: and Bahri & Corebima (2015) [7] reported that the use of a questionnaire to measure the variables such as awareness, metacognitive skills, and learning motivation was less precise, whether an increasing of the mean score of pretest to posttest were small or decreased. Drew (2008) [19] explained that related to an education study, data were generally obtained by using a set of instrument addressed to the students, so when there was an intervention during the data collection process, the data obtained might also be different from the real condition. It means that the utilization of an inventory for Indonesian population cannot record the respondents' ability accurately.

Based on the fact that a questionnaire to measure the students' social attitudes was less accurate, it would require the teacher creativity to design another alternative measurement tool that able to record accurately the social attitude variables. The form of measurement that possible to be used is observation. So far, observationis more accurately measurement recording the attitude of learners than questionnaire. Azwar (2009) [5] mentioned that it isreasonable to interpret the attitude based on behavior appears. In other words, to determine the person's attitude toward something, it can be noticed through their behavior, because behavior is an indicator of individual attitudes. However, it should be noted that certain behaviors are sometimes deliberately revealed to hide his true colors. Bahri & Corebima (2015) [7] stated that the observed behavior may be able to be the attitudes indicator in particular situational context, but the interpretation of the attitude should be very careful when based solely on the observations of a person revealed. Through direct observation, it is expected that the social attitudes of students can be measured by observing the students' performance and behavior in the learning process, which shows their social attitude in learning.

Further Bahri & Corebima (2015) [7] suggested another possible way to measure the students' social attitudes through a covert measure method. Azwar (2009) [5] explained that this method is actually oriented back to the observation of behavior that has been said above, but the object of observation is no longer visible behavior, consciously or intentionally done by somebody, but the

reactions occurred more out of control the person concerned. To a certain extent, one's attitude can be interpreted through the observation of facial expressions, voice tone, gestures, and others behavioral aspects. However, external behavior observation should be interpreted wisely because there is still possibleto conclude the wrong decision. Bahri & Corebima (2015) [7] said that regardless of what has been stated above, another limitation in the measurement of social attitudes by the direct observation or a covert measurement method is too large number of students in a classroom, making it difficult to observe each student.

5. Conclusions

Based on the findings and the discussions, it can be concluded that there was no differences in social attitudes of students taught by jigsaw and guided inquiry. It means that both the learning models have the same potency to develop students' social attitudes. The further research may investigate the influence of the learning model that combines jigsaw and guided inquiry to social attitudes. Another possibility of this research results were the measurement of students' social attitudes using a questionnaire was less accurate. Based on these facts, the further studies need to design another measurement tool to reinforce the findings of a questionnaire to measure social attitude variable, for example by using observation sheet.

6. References

1. Ahmad Z, Mahmood N. Effects of Cooperative Learning Vs. Traditional Instruction on Prospective Teachers' Learning Experience and Achievement. Journal of Faculty of Educational Sciences, 2010; 43(1):151-164.
2. Ahmadi A. Psikologi Sosial (Social Psychology). Rineka Cipta, Jakarta, Indonesia, 2009.
3. Anderson OW, Krathwohl DR. A Taxonomy for Learning, Teaching, and Assessing (A Revision of Bloom's Taxonomy of Educational Objectives). Addision Wesley Longman, Inc, New York, 2001.
4. Arends RI. Learning to Teach Seventh Edition. Mcgraw Hill Companies, New York, 2007.
5. Azwar S, Sikap Manusia. Teori dan Pengukurannya (Human Attitudes, Theory and Measurements). Pustaka Pelajar, Yogyakarta, Indonesia, 2009.
6. Bahri A. Pengaruh Strategi Pembelajaran RQA pada Perkuliahan Fisiologi Hewan tehadap Kesadaran Metakognitif, Keterampilan Metakognitif dan Hasil Belajarkognitif Mahasiswa Jurusan Biologi FMIPA UNM (Effect of RQA Learning on Metacognitive Awareness and Skill, and Cognitive Learning Outcome of Students in Animal Physiology Lecture at Biology Department, Faculty of Mathematic and Science, State University of Makassar, Indonesia) (Unpublished Master's Thesis). The State University of Malang, Indonesia, 2010.
7. Bahri A, Corebima AD. The Contribution of Learning Motivation and Metacognitive Skill on Cognitive Learning Outcome Of Students Within Different Learning Strategies. Journal of Baltic Science Education. 2015; 14(4):487-500.
8. Bilgin I. The Effects of Guided Inquiry Instruction Incorporating a Cooperative Learning Approach on University Students' Achievement of Acid and Bases Concepts And Attitude Toward Guided Inquiry Instruction. Scientific Research and Essay, 2009; 4(10):1038-1046. Retrieved From http://www.academicjournals.org/sre.
9. Bloom BS. Taxonomy of Educational Objectives. Longman. Inc, New York, 1981.
10. Boleng DT. Pengaruh Model Pembelajaran Cooperative Script dan Thinkpair-Share terhadap Keterampilan Berpikir Kritis, Sikap Sosial, dan Hasil Belajar Kognitif Biologi Siswa SMA Multietnis (The Effect of Cooperative Script and Think-Pair-Share Toward Critical Thinking Skill, Social Attitudes, and Biology Cognitive Learning Outcome of Multietnic Senior High School Students). Online Jurnal Pendidikan Sains, 2014; 2(2):76-84. Retrieved from http://journal.um.ac.id/index.php/jps/.
11. Bowen CW. A Quantitative Literature Review of Cooperative Learning Effects on High School and College Chemistry Achievement. Journal of Chemical Education. 2000; 77(2):116-119.
12. Cagatay G, Demircioglu G. The Effect of Jigsaw-I Cooperative Learning Technique on Students' Understanding about Basic Organic Chemistry Concepts. The International Journal of Educational Researchers. 2013; 4(2):30-37.
13. Çalişkan H, Turan R. The Effect of Inquiry-Based Learning Approach on Attitude in The Course of Social Studies. Ilkogretim Online Journal. 2010; 9(3):1238-1238.
14. Chaplin JP. Dictionary of Psychology. Translated by Kartinikartono. Grafindo, Jakarta, Indonesi, 2006.
15. Chang CY, Tsai CC. The Interplay between Different Forms of CAI and Students' Preferences of Learning Environment in The Secondary Science Class. Science Education, 2005; 89(5):707-724.
16. Dayakisni T. Psikologi Sosial (Social Psychology). UMM Press, Malang, Indonesia, 2009.
17. Doymus K. Teaching Chemical Equilibrium With Jigsaw Technique. Research In Science Education, 2008; (2):249-260.
18. Doymus K, Karacop A, Simsek U. Effect of Jigsaw and Animation Techniques on Students' Understanding of Concepts and Subjects in Electrochemistry, Educational Technology Research and Development, 2012; 58(6):671-691.
19. Drew CJ, Hardman ML, Hosp JL. Designing and Conducting Research in Education. Sage Publication, London, 2008.
20. Ferrel JJ, Moog RS, Spencer JN. A Guided Inquiry General Chemistry Course. Journal of Chemical Education. 1999; 76(4):570-574.
21. Furtak EM. The Problem With Answers: An Exploration of Guided Scientific Inquiry Teaching. Science Education, 2006; 90(3):453-467.
22. Fraenkel JR, Wallen NE. How to Design and Evaluate Research in Education. Seventh Edition. Mcgraw Hill Companies, New York, 2009.
23. Gillies RM. Teachers and Students Verbal Behaviors During Cooperative and Small-Group Learning.

British Journal of Educational Psychology, 2006; 76(2):271-287.
24. Hacieminoglu E, Yilmaz-Tuzun O, Ertepinar H. Middle School Students' Attitude Toward Science In Constructivist Curriculum Environment. International Journal On New Trends In Education And Their Implications, 2006, 2011; 2(3):1-6.
25. Hulten BH, Devries DL. Team Competition And Group Practice: Effects On Student Achievement And Attitudes (Report No. 212). Baltimore, Johns Hopkins University, Center For Social Organization Of Schools, 1975.
26. Johnson RT, Johnson DW, Holubec EJ. Cooperation in the Classroom. Boston: Allyn And Bacon, 1998.
27. Kilic D. The Effect of the Jigsaw Technique on Learning the Concepts of the Principles and Methods of Teaching. World Applied Sciences Journal. 2008; 4(3):109-114.
28. Koc Y, Doymus K, Karacop A, Simsek U. The Effects of Two Cooperative Learning Strategies on The Teaching and Learning of The Topics of Chemical Kinetics. Journal of Turkish Science Education, 2010; 7(2):52-65.
29. Kocak R. The Effect of Cooperative Learning on Psychological and Social Traits among Undergraduate Students. Social Behavior and Personality, 2008; 36(6):771-782.
30. Kurdi FN. Penerapan Student-Centered Learning dari Teacher-Centered Learning Mata Ajar Ilmu Kesehatan pada Program Studi Penjaskes (Implementing Student-Centered Learning from Teacher-Centered Learning in Healthy Science Subject at Study Program Physical Education and Health Science). Journal Forum Kependidikan, 2009; 28(2):108-113.
31. Lie A. Cooperative Learning: Mempratikkan Cooperative Learning di Ruang-Ruang Kelas (Cooperative Learning: Implement The Copperative Learning in The Classrom). Gramedia, Jakarta, Indonesia, 2008.
32. Martin DJ. Elementary Science Methods: A Constructivist Approach. Delmar Publisher, USA, 1997.
33. Mikarsa HL. Pendidikan Anak di SD (Education of Children in Elementary School). Universitas Terbuka, Jakarta, Indonesia, 2009.
34. Moje EB, Collazo T, Carrillo R, Marx RW. Maestro, What is 'Quality'?: Language, Literacy, and Discourse in Project-Based Science. Journal of Research in Science Teaching. 2001; 38(4):469-498.
35. Muhiddin. Pengaruh Integrasi PBL dengan Pembelajaran Kooperatif Jigsaw dan Kemampuan Akademik Terhadap Metakognisi, Berpikir Kritis, Pemahaman Konsep, dan Retensi Mahasiswa pada Perkuliahan Biologi Dasar (Effect of PBL Learning integrated with Cooperative Jigsaw and Academic Level on Students' Metacognition, Critical Thinking, Concept Comprehension, And Retention In Basic Biology) (Unpublished Doctoral Dissertation). The State University of Malang, Indonesia, 2012.
36. Nwagbo C. Effect of Two Teaching Methods on The Achievement in and Attitude to Biology of Students of Different Level of Scientific Literacy. International Journal of Educational Research. 2006; 45(3):216-229.
37. Ozdilek Z, Bulunuz N. The Effect of a Guided Inquiry Method on Pre-Service Teachers' Science Teaching Self-Efficacy Beliefs. Journal of Turkish Science Education. 2009; 6(2):24-42.
38. Prayitno AB. Potensi Pembelajaran Kooperatif dalam Memberdayakan Prestasi Belajar Siswa Under Achievement (Potency of Cooperative Learning to Empower The Lower Students' Achievement). Paper Presented at National Seminar of Biology Education at Faculty of Teacher and Educational Science, State University of Sebelas Maret, Surakarta, Indonesia. Http://Eprints.Uns.Ac.Id/1698/1/1280-2881-1-SM.Pdf, 2010.
39. Plourde LA. The Influence of Student Teaching on Pre-Service Elementary Teachers' Science Self-Efficacy and Outcome Expectancy Beliefs. Journal of Instructional Psychology. 2002; 29(4):245-252.
40. Prince M. Does Active Learning Work? A Review of the Research. Journal of Engineering Education. 2004; 93(3):223-231.
41. Ramdhani MA. Perbandingan Strategi Pembelajaran Teacher-Centered Learning dengan Student Centered Learning terhadap Hasil Belajar pada Mata Pelajaran Tarikh Siswa Kelas VII SMP Muhammadiyah 4 Surakarta (Comparing Teacher-Centered Learning Strategy Toward Learning Outcome in Tariqh Subject Of 7th Grade Students at Junior High School of Muhammadiyah 4 Surakarta, Indonesia) (Unpublished Bachelor's Thesis).University Of Muhammadiyah Surakarta, Indonesia. 2014.
42. Rochaniningsih NS, Masruri MS. Penggunaan Metode Jigsaw dengan Bantuan Media untuk Meningkatkan Keterampilan Kerjasama dan Hasil Belajar IPS (Using Jigsaw with Learning Media to Improve Cooperative Skill and Learning Outcome of Social Subject). Jurnal Pendidikan IPS Harmoni Sosial, 2015; 2(1):42-53.
43. Rokhmatika S, Harlita, Prayitno BA. Pengaruh Model Inkuiri Terbimbing Dipadu Kooperatif Jigsaw Terhadap keterampilan Proses Sains Ditinjau dari Kemampuan Akademik (The Effect of Guided Inquiry Combined with Jigsaw toward Science Process Skill Based on The Academic Level). Jurnal Pendidikan Biologi, 2012; 4(2):72-83.
44. Sanjaya W. Strategi Pemran Berorientasi Standar Belajar Proses (Learning Strategy Oriented to Process Standard). Kencana Predana Media Group, Jakarta, Indonesia, 2013.
45. Shepardson DP, Pizzini EL. A Comparison of Student Perceptions of Science Activities within Three Instructional Approaches. School Science Mathematics, 1993; 93(3):127-131.
46. Siegel MA, Ranney MA. Developing The Changes in Attitude About The Relevance of Science (CARS) Questionnaire and Assessing Two High School Science Classes. Journal Research Science Teaching. 2003; 40(8):757-775.
47. Slavin RE. Cooperative Learning: Theory, Research, and Practice. MA: Allyn And Bacon, Boston, 2000.

48. Slavin RE. Cooperative Learning: Applying Contact Theory in Desegregated Schools. Journal of Social. 2010; 41(3):45–62.
49. Suratno. Pengaruh Strategi Kooperatif Jigsaw dan Resiprocal Teaching terhadap Keterampilan Metakognisi dan Hasil Belajar Biologi Siswa SMA Berkemampuan Atas dan Bawah di Jember (The Effect Of Jigsaw And Reciprocal Teaching toward Metacognitive Skill and Biology Learning Outcome of Senior Highschool Students with Higher and Lower Academic Level in Jember, Indonesia). (Unpublished Doctoral Dissertation)**.** The State University of Malang, Indonesia, 2009.
50. Taraban R, Box C, Myers R, Pollard R, Bowen CW. Effects of Active-Learning Experiences on Achievement, Attitudes, and Behaviors in High School Biology. Journal of Research Science Teaching. 2007; 44(7):960-979.
51. Tuan HL, Chin CC, Tsai CC, Cheng SF. Investigating The Effectiveness of Inquiry Instruction on The Motivation of Different Learning Styles Students. International Journal of Science and Mathematics Education. 2005; 3(1):541-566.
52. Widiantara AG, Wayan LI, Ketut SN. Determinasi Penerapan Model Pembelajaran Inkuiri Sosial terhadap Sikap Sosial dan Hasil Belajar IPS Siswa Kelas VIII SMP Negeri 3 Singaraja (Determination of Applying Social Inquiry Model toward Social Attitudes And Learning Outcome of Social Subject Class VIII, Junior High School 3 in Singaraja, Indonesia). E-Journal Program Pascasarjana Universitas Pendidikan Ganesha Jurusan Pendidikan Dasar. 2013; 3(1):1-13.
53. Yerrick RK. Lower Track Students' Argumentation and Open Inquiry Instruction. Journal of Research in Science Teaching. 2000; 37(8):807-838.
54. Yurdakaban I. The Influence of Peer and Self-Assessment on Learning and Metacognitive Knowledge: Consequential Validity. International Journal on New Trends in Education and Their Implications. 2011; 2(4):44-57.