Learning Science with *Group Investigation* and *Guided Inquiry* to Increase Biological Literacy in Coordination System Materials of Class Science Xi Students

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Abstrak: *The aims of this research are to find out : the effect difference between implementation of cooperative learning model's Group Investigation and type, and Guided Inquiry model's to Increase Biology Literacy , and the effect interaction between implementation of cooperative learning model's and student's on the learning motivation to Increase Biology Literacy.*
The research was in the Senior High School in the Rancabungur District academic year 2016/2017. The research method used is a quasi-experimental method with a two factorial design. The population of the research is students at the twelth grade Senior High School in the Rancabungur District. The samples of research consist of 80 students. Instruments used for collecting data are achievement test of Biology and the questionnaires of study motivation. To get appropriate and accuracy of the Biology achievement test Technique of t test with significance level of = 0.05.
The result of the research are as follows : there is a significant difference in effect of implementation of cooperative learning Group Investigation (GI) and type, and Guided Inquiry model's on Increase Biology Literacy (F $_h$ > Ft $_{, 0.05}$ = 2.58 > 1.99). The questionnaire results showed that students and teacher responded positively to the Group Investigation and Group Inquiry Learning Model. Based on those findings, the research concludes that learning achievement of Biology can be increased throught learning models and improving the student's achievement motivation. The improving of learning quality is able to be achieved through the use of cooperative learning model's Group Investigation and type, and Guided Inquiry model's and by pay attention to the student's Increase Biology Literacy.

Keyword: *Group Investigation and Group Inquiry Learning Model, Biology Literacy.*

INTRODUCTION

Law number 20 of 2003 concerning National Education chapter 1 article 1 states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual, religious, self-control, personality, intelligence strengths. , noble

character, and skills needed in society, nation and state.

Problems in the learning process of students arise simultaneously with the development and increase of students and the existing environmental conditions and situations. The reality in the field is that many teachers' teaching methods are not optimal, so the learning process is not effective. Learning that uses a conventional approach is considered ineffective and causes boredom in the classroom, therefore teachers are required to always strive to improve learning management.

Referring to the data obtained from the learning outcomes of biology subjects for the last three years (2014-2016) the daily test scores for biology subjects for the coordination system material at SMA Negeri 1 Rancabungur showed that of the total 29 students who reached the KKM limit (75) only 9 people (31%) in the 2013/2014 academic year, while for the 2014/2015 academic year, 13 of the 28 students who have reached the KKM limit (75) , and in the 2015/2016 academic year of the total students 75 with a KKM of 76 students who have completed as many as 28 people (36%). This is because learning biology in schools still refers to the conventional teaching model. The learning process is still teacher-centered, so learning becomes dry, unpleasant and boring for students. In this case the teacher as a facilitator in the learning process needs to give a concrete and objective positive response that seeks to generate active participation of students in learning biology.

Michaels (2005: 5), cooperative learning is a learning model that helps students develop their understanding and attitudes in accordance with real life in society, so that by working together among group members will increase motivation, productivity and learning outcomes.

There are at least seven factors that cause the low participation of students in Biology learning, namely: 1) Students lack the courage to express opinions to other people (teachers or friends), both in asking and answering questions, 2) Students have not been actively involved in learning activities, so that biological science literacy skills do not develop, 3) Lack of variety of teaching methods or techniques used by teachers, 4) Limited learning media that are suitable and interesting for students, 5) Low competence of teachers in carrying out interactive learning, 6) Low student input at the time of entry as a new student.

Referring to the above facts, teachers are required to have interesting learning strategies and models so that the learning process will run synergistically with the expected material targets. Teachers should be good facilitators, also have high creativity as well as innovators in learning to support the emergence of student creativity. This can be done by combining various approaches, methods, models, strategies and various teaching techniques so that students can be motivated to create optimally competent learning conditions in biology subjects, especially in

improving biological literacy in coordination system materials.

To overcome the problems above, one of the appropriate learning models is the *Group Investigation model,* this model is a cooperative learning model that involves students maximally, learning activities are more focused and systematic and can develop a high curiosity attitude and find solutions from the existing problems, so that learning becomes more interesting, fun and easier for interaction to occur in learning because more learning with peers, demanding individual and group responsibilities as well as practicing to compete positively. *The investigative group* type tends to provide students with problem-solving and critical thinking skills and trains students to become independent learners who have fairly good metacognitive awareness.

In addition to the *Group Investigation* model, the use of a model that can also stimulate and arouse students' attention is *Guided Inquiry.* The *Guided Inquiry* learning model is a learning model developed by Lorna Curren. The main characteristic of the *Guided Inquiry model* is that students seek and find answers to the problems discussed.

The learning process is an important aspect in improving the quality of education, because it is feasible if the procurement of reforms to improve the quality of education starts from the learning process. In developing learning, learning strategies are needed. In the world of education, strategy is defined as *a plan, method, or series of activities design to achieve a particular educational goal* (David, 1978). Thus the learning strategy can be interpreted as a plan that contains a series of activities designed to achieve certain educational goals. According to Pardamen (2011) in education, the learning model has long been known and used in developed countries. In Indonesia, the learning model by many people is almost identified with the method, causing the understanding of the model to be less clear. Teaching with certain learning models that are widely known to be the demands of the times, especially if it is associated with the many indications of a decrease in students' learning passion. The current learning model has undergone development following the curriculum. Development is carried out in accordance with the new paradigm, namely student-oriented learning (*Student Centered). Learning*), active learning (*Active Learning*), and contextual learning (*Contextual Teaching and Learning*). This new paradigm shift occurred in line with the implementation of the 2013 Curriculum in the national education system. Teachers are required to be able to use and prepare learning tools that support the success of the learning process in the classroom.

According to Trianto (2007), in teaching a certain subject (material) it is necessary to choose the learning model that is most appropriate to the objectives to be achieved. Therefore, there is a need for considerations in choosing a learning model, for example subject matter, the level of cognitive development of students,

and the facilities or facilities available so that the learning objectives that have been set can be achieved.

The concept of active learning can be obtained. The learning conditions needed to achieve maximum learning outcomes/achievements, according to Gagne (1983: 22) are broadly grouped into internal conditions and external conditions. Internal conditions are the factors that exist within students which include: readiness, ability, prerequisite knowledge that has been possessed by students, motivation, aspirations, talent and intelligence. External conditions are everything that is outside the students themselves including infrastructure, weather, learning climate, school buildings, study rooms and so on. Therefore, it is clear that one of the problems faced by teachers to carry out an effective learning process in order to increase learning achievement is to increase motivation in students effectively. Several ways to grow student motivation are through learning strategies with varied teaching methods, providing opportunities for students to channel their learning desires, using learning media, and so on. In general, students will be motivated to be actively involved in the learning process if students see the learning situation tends to satisfy themselves according to the expected needs.

The formulation of the problem posed through this research are:
"Is there a significant difference in the effect between the use of the *Group Investigation* and *Guided Inquiry models* on students' biological literacy abilities and Is there a significant interaction effect between the use of Learning Models and students' learning motivation on students' biological literacy skills on the human coordination system material in high school students XI IPA.

In essence, the purpose of this study is to determine the significant difference between the use of the *Group Investigation* and *Guided Inquiry models* and the significant interaction between the use of Learning Models and students' learning motivation on students' biological literacy skills on the human coordination system material in high school students of class XI IPA in SMA Negeri 1 Rancabungur, Bogor Regency.

METHOD

This research was conducted at SMA Negeri 1 Rancabungur, Bogor district in April 2017 the even semester of the 2017/2018 school year. The method used in this study is a quantitative method with experimental techniques. The type of research used is *Quasy Experiment design (Nonequivalent Control Group Design).*

There are two variables in this study. The first variable is the treatment variable (X) which is divided into two treatments, namely the *Group Investigation* learning model and the *Guided Inquiry learning model* . The second variable is the dependent variable (Y), namely the biological literacy ability of students.

Table 1. Research Design

Class	Pre Test	Treatment	Post Test
E1		X_1	O2 _
	O_1		
E2	O_1	X_2	O2 _

Information:

X_1 = Model learning *Group Investigation*
X_2 = Model learning *Guided Inquiry*
O_1 = Pre Test Value in the experimental class 1
O_2 = Post Test Value in the experimental class 2

The population in this study were all students of class XI science at SMA Negeri 1 Rancabungur in 2016/2017. Class XI IPA SMA Negeri 1 Rancabungur consists of 2 classes, namely class XI IPA 1 as experimental class 1 (*Group Investigation*) and XI IPA 2 as experimental class 2 (*Guided Inquiry*). The total population is 80 students.

The calculations used in this study come from *N-Gain data* with the following calculations:

$$N\text{-Gain} = \frac{posttest\ score - pretest\ score}{Max\ value - pretest\ score} \times 100$$

Information :
Posttest score: test scores after learning
Pretest Score: test scores before learning
Max Score : Maximum Score

Collecting data on biological literacy skills in the form of an objective test of 30 questions given before treatment (pretest). Previously, the instrument calibration test has been carried out. Testing is done by testing the validity and reliability. Questions that have the appropriate level of validity will be used and those that are invalid will be discarded.

Data were analyzed using descriptive statistical tests and inferential statistics. Descriptive statistics are used to describe one sample, including by calculating the median, mode, mean, presenting data through tables and histograms, through calculating the average, standard deviation and calculating percentages. Then to make conclusions, hypothesis and significance tests are carried out sequentially, as follows 1) perform test scoring and look for the average score and

standard deviation, 2) test the normality of the data with the *Chi-Square formula* to prove that the population is normally distributed, where the normality test have criteria, namely: if $X_{chi}{}^2{}_{count} X_{chi}{}^2{}_{table}$ then Ho is accepted and Ha is rejected, which means that the data distribution is not normal. If $X_{chi}{}^2{}_{calculate} X_{chi}{}^2{}_{table}$ then Ho is rejected and Ha is accepted, which means the data distribution is normal. 3) test the homogeneity of variance using the t test with the following criteria: if $F_{count} Ft_{able}$ then Ho is accepted and Ha is rejected, which means the variance of the two populations is not homogeneous. If $F_{count} Ft_{able}$, then Ho is rejected and Ha is accepted, which means the variance of the two populations is homogeneous, 4) test the hypothesis with the t test which is used to determine the significance of the average score of the experimental class. The t test has the following criteria: if $t_{arithmetic} tt_{able}$ then the null hypothesis (H_o) is rejected and the alternative hypothesis (Ha) is accepted, if $t_{arithmetic} tt$ is $_{able}$ then the null hypothesis (H_o) is accepted and the alternative hypothesis ($_{Ha}$) rejected.

RESULTS AND DISCUSSION

The description of the data from this research is grouped into two parts. Consisting of two groups of data from the dependent variable, namely students' biological literacy skills in the *Group Investigation class group coordination system material and students' biological literacy skills in the Guided Inquiry* class group coordination system material. The number of data sources was 80 respondents from two experimental classes.

Based on the results of the descriptive statistical calculation of N-Gain, the results of the evaluation of the biological literacy ability of the *Group Investigation group students* with a sample of 40 people obtained a minimum score of N-Gain 55 and a maximum score of N-Gain 84. After descriptive statistical analysis was carried out, the average value was obtained at 72, median 72, mode 71. The frequency distribution of these data can be seen in Figure 1.
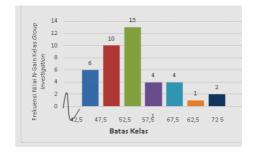

Figure 1. The N-Gain Value of Biological Literacy Ability of *Group Investigation Model Group Students*

Based on the results of the descriptive statistical calculation of N-Gain, the results of the evaluation of the biological literacy ability of the *Guided Inquiry group students* with a sample of 40 people obtained a minimum score of N-Gain 57 and a maximum score of N-Gain 82. After descriptive statistical analysis, obtained an average value of 69, median 70, mode 70. The frequency distribution of the data can be seen in Figure 2
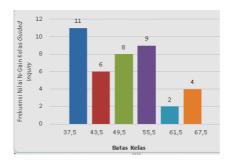

Figure 2. The value of N-Gain Biological literacy ability of students in the *Guided Inquiry model group*

Prerequisite analysis of research data was carried out by calculating the hypothesis test using the t test, before conducting data analysis, the hypothesis prerequisite test was first carried out through normality and homogeneity tests.

Normality testing was carried out using the chi-squared technique to determine whether the distribution of the data came from a normal population or not in the two groups of data from the experimental *group Investigation Group* and the experimental group *Guided Inquiry. With the following criteria: :* if $X_{chi}{}^{2}{}_{calculate}$ $X_{chi}{}^{2}{}_{table}$ then Ho is accepted and Ha is rejected, which means that the data distribution is not normal. If $X_{chi}{}^{2}{}_{calculate}$ $X_{chi}{}^{2}{}_{tables}$ then Ho is rejected and Ha is accepted.

Table 2. Normality test results of students' biological literacy ability test results

No.	Distribusi Kelompok Perlakuan	$\chi^2{}_{hitung}$	$\chi^2{}_{tabel}$	Kesimpulan
1	*Group Investigation*	-22,19	7,81	Distribusi Normal
2	*Guided Inquiry*	-19,58	7,81	Distribusi Normal

The homogeneity of variance test was conducted to analyze whether the data from the two sample populations had homogeneous variances or not. Homogeneity testing was carried out using *Fisher* 's exact test with the following test criteria: if F_{count} Ft_{able} then Ho is accepted and Ha is rejected, which means the variance of the two populations is not homogeneous. If F_{count} Ft_{able} , then Ho is

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rejected and Ha is accepted and the data is declared homogeneous.

Table 3. The results of the homogeneity of variance test of students' biological literacy abilities

Kelompok Kelas	N	S^2	F_{hitung}	F_{tabel}	Status
Group Investigation	40	5373,6	0,92	1,73	Homogen
Guided Inquiry	40	4957,3			

After the data obtained are declared normal and homogeneous, the next step is to test the hypothesis. This hypothesis testing is conducted to determine whether the proposed null hypothesis (Ho) is accepted or rejected.

The null hypothesis was tested by calculating based on the average score of the results of the biological literacy test. To test the hypothesis using statistical techniques t test with the following criteria: if t $_{count}$ tt $_{able}$ then the null hypothesis (H $_o$) is rejected and the alternative hypothesis (Ha) is accepted, if t $_{count}$ tt $_{abel}$ then the null hypothesis (H $_o$) is accepted and the alternative hypothesis (Ha $_a$) is rejected.

Table 4. The results of the research hypothesis test

Kelompok Kelas	n	rata-rata N-Gain	t hitung	t table ($\alpha= 0,05$)	Kesimpulan
Kemampuan literasi biologi kelas *Group Investigation*	40	71,83	2,58	1,99	t hitung > t tabel
Kemampuan literasi biologi kelas *Guided Inquiry*	40	69,21			

The results of the calculation of the hypothesis using the t-test technique show that there are differences in the biological literacy abilities of students who use the *Group Investigation learning model* with *Guided Inquiry* and which shows better results, namely the *Group Investigation learning model* compared to the *Guided Inquiry class group.*

The results of data analysis and hypothesis testing that have been carried out show that the two learning models are *Group Investigation* and *Guided Inquiry* can improve the biological literacy skills of students of class XI IPA SMA Negeri 1 Rancabungur Bogor Regency on the material of the coordination system between XI IPA 1 which is an experimental class with the *Group Investigation model* and class XI. IPA 2 which is the experimental class of the *Guided Inquiry model.* This is evidenced by the results of the value of the pretest and posttest of the two models have increased.

Through hypothesis testing using the t-test by comparing the t - count value with the t- table value, it is obtained that the t - count value = 2.58 tt - able = 1.99, meaning that there are differences in students' biological literacy abilities in the human coordination system material in the class group that received the *Group treatment. Investigation* and class groups that received *Guided Inquiry treatment.*

The learning group of the *Group Investigation class* has a higher average biological literacy ability than the *Guided Inquiry class group.* The learning process in the *Group Investigation class group at the* first meeting did not go well because students were still adapting to the learning model used. The second meeting of the learning process became more interactive, effective and fun, students became more daring to express opinions and ask questions both to friends and to the teacher.

Group Investigation is a model that actively involves students in the process of teaching and learning activities to be involved in problem solving and has the obligation to seek and find solutions to the problems presented, because this model requires students to make their own questions and answers based on the questions given by the teacher through a stimulus in the form of discussion and practice. The stimulus is carried out at the core activity stage.

Through the *Group Investigation model,* students are asked to conduct direct and direct investigations with their group members to find solutions to the problems posed, so that students' creative and critical thinking can develop more. As the theory put forward by Kowiyah (2012) that students who are able to think critically will ask the right questions, answer questions in an original way, collect various information needed essentially and creatively.

Based on the results of data analysis, it can be said that the *Group Investigation learning model* gives better results than the *Guided Inquiry model* on students' biological literacy skills. This is because in the classroom using the *Guided Inquiry model,* to explore the material. Students are presented with a variety of information.

In contrast to students who use the *Guided Inquiry learning model* where during the learning process, which begins by giving problems to students so that students are still not able to try new things and have not been able to express opinions.

Thus, the *Guided Inquiry learning model* has a better influence on the results of critical thinking skills. The advantages of the *Group Investigation learning model* proposed by Yusrin (2012) are 1) learning activities are not centered on the teacher, but student activity is required 2) all students are encouraged to be actively involved in making questions 3) by making questions can have an impact on ability students in solving problems. The weaknesses in the *Group Investigation model* are 1) Teacher preparation must be maximized because it must prepare information so that it can be conveyed properly to students.

From the discussion above, it can be concluded that there is an influence on students' literacy skills using the *Group Investigation model* and the *Guided Inquiry* learning model. The results of the Group Investigation group's biological literacy ability *were better than the Guided Inquiry* learning model class.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the two learning models, namely *Group Investigation* and *Guided Inquiry* , can improve students' biological literacy skills in the coordination system material at SMA Negeri 1 Rancabungur, Bogor Regency. this is evidenced by the results of the value of the pretest and posttest of the two model classes has increased.

Through hypothesis testing using t-test by comparing the values of t_{count} with t_{table} , it is obtained that $t_{count} = 2.58$ $tt_{able} = 1.99$. There are differences in biological literacy abilities in the coordination system material in the groups of students who received the *Group Investigation* and *Guided Inquiry learning treatment.*

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