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Application of Group Investigation (GI) Learning Model to Improve Biology Cognitive Ability and Cooperation of Class X-10 Students of SMA Negeri 2 Nganjuk

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ABSTRAK

Tingkat pemahaman siswa terhadap konsep-konsep sains masih tergolong rendah. Hal ini terlihat dari rendahnya hasil belajar siswa dalam aspek kognitif. Penelitian bertujuan untuk menganalisis model Pembelajaran *Group Investigation (GI)* untuk meningkatkan kemampuan kognitif biologi dan kerja sama siswa. Jenis penelitian adalah tindakan kelas dengan tiap siklus terdiri dari tahap perencanaan, pelaksanaan, observasi dan refleksi. Subjek penelitian melibatkan 36 siswa kelas X-10. Metode pengumpulan data dengan observasi dan tes. Teknik analisis data menggunakan analisis kuantitatif deskriptif. Hasil penelitian menunjukkan siklus 1 dan 2 hasil belajar menjadi lebih baik siswa pada aspek kognitif sebelum diberi tindakan dan setelah diberi tindakan sebesar 100%, hasil belajar menjadi lebih baik pada aspek psikomotor dan afektif dari siklus I ke siklus II berturut-turut 76% dan 100%. Simpulan penelitian yaitu penerapan model Pembelajaran *Group Investigation (GI)* dapat meningkatkan kemampuan kognitif biologi dan kerja sama siswa. Implikasi penelitian diharapkan adanya model Pembelajaran *Group Investigation (GI)* akan dapat mengembangkan kemampuan kerja samanya dan matematisnya karena model ini membantu siswa memecahkan masalah melalui percobaan atau penelitian sederhana.

ABSTRACT

The level of students' understanding of science concepts is still relatively low. This can be seen from the low student learning outcomes in the cognitive aspect. The research aims to analyze the Group Investigation (GI) learning model to improve students' biological cognitive abilities and collaboration. The type of research is classroom action with each cycle consisting of planning, implementation, observation and reflection stages. The research subjects involved 36 students in class X-10. Data collection methods are observation and tests. The data analysis technique uses descriptive quantitative analysis. The results showed that in cycles 1 and 2 students' learning outcomes were better in the cognitive aspect before being given action and after being given action by 100%, learning outcomes were better in the psychomotor and affective aspects from cycle I to cycle II respectively 76% and 100%. The conclusion of the research is that the application of the Group Investigation (GI) learning model can improve students' biological cognitive abilities and collaboration. The research implications are that it is hoped that the Group Investigation (GI) learning model will be able to develop cooperation and mathematical abilities because this model helps students solve problems through simple experiments or research.

1. PENDAHULUAN

Science education (Biology) is one aspect of education that is used as a tool to achieve educational goals. Science education not only includes information, ideas, and theories that have been learned, but also an active process in studying natural phenomena that are not explained using scientific thinking, so that updating scientific knowledge becomes a must (Makaborang, 2019; Pantiwati, 2016). Science education that applies in schools must include two important components, namely science as a product and a process (Rahayu et al., 2017; Yusnia, 2019). The essence of science as a product consists of a collection of knowledge in the form of facts, concepts, principles, and laws about natural phenomena (Martiningsih et al., 2018; Nuro et al., 2020). Science as a process is a collection of activities carried out systematically and organized in an effort to find ideas, principles, and laws about natural

phenomena, including the ability to think to organize and find new ideas (Styowati et al., 2022). The Indonesian government has made various efforts to improve the quality of education, especially in the field of science learning. Improving the quality of education, especially science education (Biology), is carried out by implementing Curriculum 13, developing learning methods and strategies that are more in accordance with the characteristics and nature of science, implementing the Subject Teacher Deliberation Program, implementing teacher work training, improving laboratory facilities and infrastructure, and making changes or revisions to the curriculum continuously (Buyukkarci, 2021; Rokhimawan et al., 2022; Suarni et al., 2021).

One of the learning models that has the ability to be applied in biology learning to minimize the factors that cause low understanding and learning outcomes in biology is the Environment-Based LKS Assisted Learning model. By using a group investigation learning approach or Group Investigation, this method takes a model from society, especially regarding the social mechanisms that exist in society, which are usually carried out through mutual agreement (Putra et al., 2019; Sudarsana, 2018). Students involve themselves in solving social problems and gain knowledge through this agreement. This learning model emphasizes more on providing opportunities for students to utilize and develop their intellectual basis and provides more time to interact with learning components. (Devi et al., 2021; Subudi, 2021; Sumertha, 2019). The learning process through the Group Investigation (GI) learning model provides students with the widest possible opportunity to be directly and actively involved in the learning process, from planning to how investigations study a topic (Christina et al., 2016; Putra et al., 2019; Tembang et al., 2019).

Group investigation is a small group to encourage and guide students to engage in learning. This method requires good communication skills and group process skills (Eka Lengari et al., 2020; Sumertha, 2019). The end result of group learning is the contribution of ideas from the entire group and group learning, which further enhances students' intellectual abilities compared to individual learning. Previous research findings state that Group Investigation is a small group to help students participate in learning (Asyari et al., 2016). This method requires good communication skills and group process skills (Mulyadinata et al., 2020; Tembang et al., 2019). The Group Investigation (GI) learning model has an effect on learning outcomes in Natural Sciences/Science (Dewi et al., 2018; Hanifah et al., 2020). Research related to the Group Investigation (GI) learning model has been widely conducted.

Based on the results of observations that have been conducted on students of class X-10 at SMA Negeri 2 Nganjuk, it was found that students showed poor learning outcomes in the cognitive domain, especially class students, which shows that their level of understanding of science concepts is still low. The low learning outcomes of students in the cognitive aspect can be seen from the analysis of daily test results. Analysis of the results of daily tests for biology subjects for class X-10 of SMA Negeri 2 Nganjuk in the 2024/2025 Academic Year obtained the highest score of 80, the lowest score of 30, an average of 70.27, absorption capacity of 70.27% and classical completeness of 24.36%. The biology learning process so far, especially in Class X-10 of SMA Negeri 2 Nganjuk, has not received a positive response from students and has not succeeded in helping students to achieve a better understanding of biological concepts. The difficulty of achieving understanding for students in learning biology should lead us to think carefully in designing learning methods. One way is to design biology learning based on the initial knowledge possessed by students. This identifies teaching not as a process in which teachers convey their ideas in a finished form to the head but as a process of scaffolding students so that students can transform their own initial knowledge into scientific conceptions through learning activities.

Learning aimed at improving understanding should provide more time and opportunities for students to interact with the components in the learning process, and train students' thinking skills in solving problems. Compared to assimilation, reconstruction of understanding usually occurs through the accommodation process. This study uses a method to conduct classroom action research with several cycles. This study aims to analyze the Group Investigation (GI) learning model to improve the cognitive abilities of biology and cooperation of class X-10 students of SMA Negeri 2 Nganjuk. The application of the Group Investigation (GI) Learning model can improve students' cognitive abilities of biology and cooperation.

2. RESEARCH METHODS

This research was conducted at SMA Negeri 2 Nganjuk in the odd semester of the 2024/2025 academic year at Jl. Anjuk Ladang No. 09, Winong, Ploso, Nganjuk District, Nganjuk Regency. The subjects of this study were 36 students of class X-10. Meanwhile, the research was conducted from August 2024 to October 2024. This type of research is Classroom Action Research (CAR) which is carried out in two cycles based on the Asrori and Rusman model as in Figure 1 below.

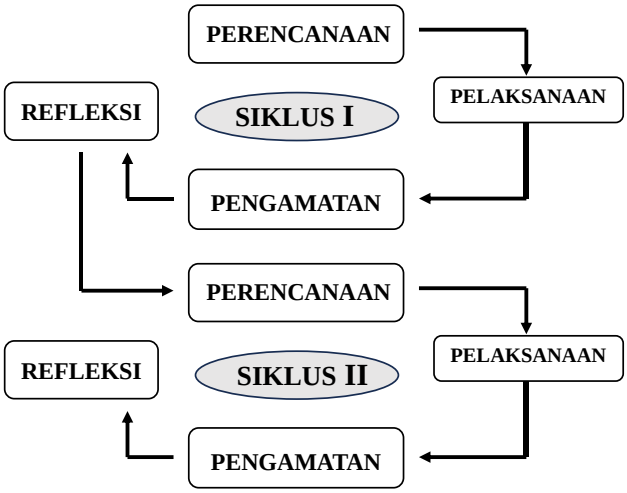

Figure 1. Asrori and Rusman's PTK Cycle Model

Based on Figure 1, the PTK cycle model used is based on the model from Asrori and Rusman which is carried out with two cycles. Each PTK cycle consists of four stages including planning, implementation, observation, and reflection. The explanation in the PTK cycle model image that will be used is as follows:

1. Planning

   Planning is the first stage for a researcher to prepare everything needed before the research is carried out. Planning is done so that the research process runs efficiently, so that researchers will find it easier to overcome the problems to be studied. At this stage, create a Teaching Module for two meetings (actions), compile question cards and answer cards used in learning given to students in the learning process in the classroom, and compile test sheets to obtain data on student learning outcomes.

2. Implementation

   Implementation is the stage to carry out an action that has been planned in advance. This stage includes scenarios or steps that will be carried out based on the teaching module that has been prepared using the Group Investigation (GI) Learning model, which include:

   a. Introduction of students in group discussions, namely providing LKPD containing several questions related to student life that need to be worked on in groups.
   b. Helping students in investigations, namely helping students to find answers to questions that have been given through group discussions.
   c. Developing and presenting results, namely students with their groups present their work in front of the class.
   d. Analysis and evaluation of problem solving, namely teachers and other groups provide feedback on the results of student group presentations, and together conclude and work on evaluation questions or carry out daily tests together.

3. Observation

   This observation is carried out simultaneously with the previous stage. The observation carried out is in the form of observing student enthusiasm, changes in student behavior and behavior from the beginning to the end of the activity. At this stage, the process of analyzing the results of the daily test data together is carried out, then the results will be used to determine whether or not the research that has been carried out in the next stage has been achieved.

4. Reflection

   Reflection activities are carried out as a form of seeing the shortcomings or weaknesses of the actions that have been implemented during the implementation. This activity is also carried out to determine the achievement of the cycle that has been carried out based on the results of the analysis of daily test data together. If the percentage of student success rates has met the target in the first cycle, the cycle is stopped, while if it has not met the targeted percentage, it will be continued to the next cycle.

   The data analysis process is carried out quantitatively descriptively by comparing the number of students who have completed the course with the total number of students then multiplied by 100%. Calculating the completeness of student learning classically using the Purwanto formula in (Tembang et al., 2019) below:

$$Ketuntasan\ Belajar\ Siswa\ Secara\ Klasikal \frac{Jumlah\ siswa\ yang\ tuntas}{Jumlah\ keseluruhan\ siswa} X\ 100$$

Student learning outcome data and observation sheets are calculated by comparing the total score achieved by students with the total maximum score then multiplied by 100%. The percentage obtained on the observation sheet is divided into each category, namely, less, enough, good, and very good Riduwan in (Tembang et al., 2019) as in table 1 below:

Table 1. Student Success Level Categories

Success Rate (%)	Category
81 – 100	Very Good
66 – 80	Good
56 – 65	Enough
0 – 55	Poor

This research is considered successful if at least ≥75% of the number of students can achieve the KKM score of 65 which is considered complete. Meanwhile, <75% of the number of students who have not achieved the KKM score of 65 are considered incomplete, so it needs to be continued in the next cycle.

3. RESULT AND DISCUSSION

1. Initial Observation

Initial observation is the first step taken by researchers before conducting classroom action research (PTK) to determine the condition of students in the classroom during learning. Initial observation was carried out on August 26, 2024. The results obtained during interviews with biology subject teachers and class X-10 students, namely that students showed poor learning outcomes in the cognitive domain, especially class students, which showed that their level of understanding of science concepts was still low. The low learning outcomes of students in the cognitive aspect can be seen from the analysis of daily test results. Analysis of the results of daily tests for biology subjects for class X-10 of SMA Negeri 2 Nganjuk in the 2024/2025 Academic Year obtained the highest score of 80, the lowest score of 30, an average of 70.27, absorption capacity of 70.27% and classical completeness of 24.36%. The biology learning process so far, especially in Class X-10 of SMA Negeri 2 Nganjuk, has not received a positive response from students and has not succeeded in helping students achieve a better understanding of biological concepts. Therefore, the researcher will conduct research in the form of implementing the Group Investigation (GI) learning model with the hope that students' biological cognitive abilities and cooperation will increase.

2. Cycle I

Cycle I is the first phase in the research that aims to assess the continuity in the next cycle. Cycle I was implemented on September 2, 2024. The learning carried out included one meeting with a duration of 2 × 45 minutes. The stages carried out in cycle I include:

A. Planning

Planning is the first stage for a researcher to prepare everything needed before conducting research. Planning is done so that the research process can run efficiently, so that researchers can easily overcome the problems to be studied. At this stage, researchers create teaching modules on the Kingdom Plantae material. In making teaching modules, researchers also pay attention to the syntax of the Group Investigation (GI) Learning model, including (1) Grouping, (2) Planning, (3) Investigating, (4) Organizing, (5) Presenting, and (6) Evaluating. Furthermore, LKPD is made, teaching materials are prepared, questions and answer cards are compiled that are used in learning that are given to students in the learning process in the classroom, and test sheets are compiled to obtain data on student learning outcomes.

B. Implementation

This implementation begins with an opening activity, then the researcher explains the material about Kingdom Plantae. After that, the researcher divides the students into four groups in the class and provides LKPD containing several questions to be discussed in groups to find solutions or answers. In the LKPD there is also a YouTube video link that can be accessed using one of the group members' cellphones to be worked on together. When students click on the link in the LKPD, they will be directed directly to YouTube and the video can be played and watched before being analyzed together in groups.

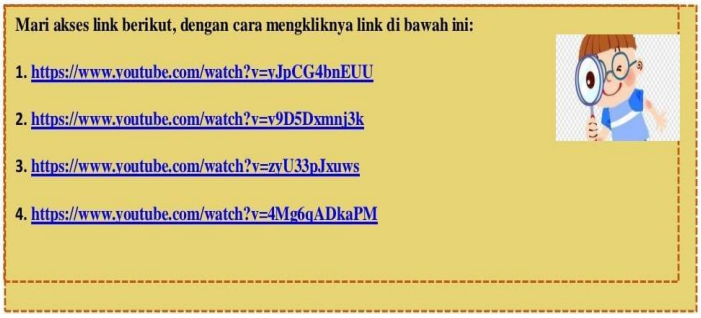

Figure 2. Cycle I YouTube link display

In the image above, which is a display of images accompanied by links, there are four links that can be accessed for groups one, two, three, and four, each of which has received its own section. Then students are asked to access the link according to the number with their group.

After completing the LKPD, students are asked to present the results of their work with their group and other groups respond to the results of the group that is presenting. Then the teacher evaluates the results of the students' work and concludes the joint learning activities. At the end of the activity, students are given evaluation questions and a daily test will be carried out together to find out how much the students' biological cognitive and cooperation have improved in each cycle that has been implemented.

C. Observation

Observation is carried out in order to obtain an overview of the results of biological cognitive abilities and cooperation. Observation is carried out by the teacher as an observer when the teacher is carrying out learning. Evaluation means all activities to collect, manage and present information in such a way that it is useful for making decisions, in this case decisions on actions. Evaluation in each cycle is carried out at the end of the second meeting by providing a final test in the form of a daily test together. The steps in the observation activity are observing student activities during the learning process. Observing and recording problems and obstacles found before the action is taken. To evaluate student learning outcomes, the test method is used at the end of the cycle. Documenting important things that happen during learning.

D. Reflection

This reflection is conducted to consider the difficulties faced by students during the learning process and to evaluate the results of students' actions in cycle I regarding biological cognitive abilities. Reflection and study of the first cycle of action, then thought about to find and discover new ways that might be better to improve biological cognitive abilities and cooperation in biology subjects. This alternative action will be determined as a new action in the action plan in the next cycle of classroom action research. Data collection is closely related to the instruments used in data collection. Because the use of appropriate instruments will support the collection of appropriate variables. The data collection used is the provision of tests. The provision of tests is used to collect information to be used for evaluation, namely to distinguish between initial and subsequent conditions. The test method is a way to obtain data in the form of tasks that must be carried out by a person or group of people being tested. From the examination, a score can be produced which is then compared with certain criteria. Data on the percentage of biological cognitive and student cooperation in cycle I are presented in table 2 as follows.

Table 2. Cognitive Results and Student Collaboration in Cycle 1

No	Aspect	Description
1.	Total student completion	30 students
2.	Total student non-completion	6 students
3.	Overall value	2736
4.	Highest value	95
5.	Lowest value	40
6.	Average	76

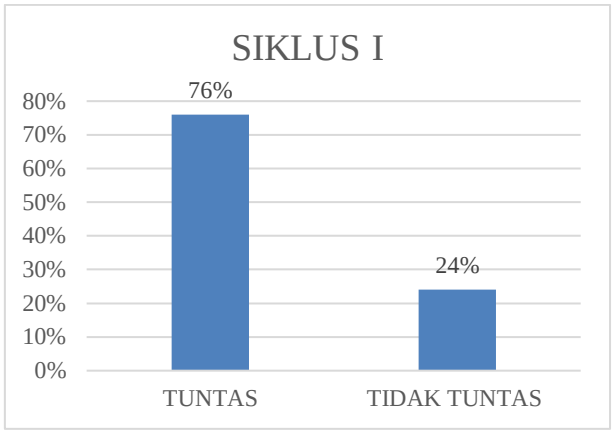

Figure 3. Diagram of Learning Outcome Completion Cycle 1

Based on the data in Figure 3 above, the percentage of students with a complete learning outcome category of 76% is 30 students. With an incomplete category of 24%, there are 6 students. However, this has not reached the research target because the research target is 80% of students complete. Some students have not met the KKM score ≤ 75. Based on the results of the evaluation of the implementation of cycle I, the researcher feels that the learning outcome target has not been achieved because some students have not achieved the target value determined by the researcher. Therefore, the researcher will continue cycle II by fixing the causes or lack of achievement of the target.

3. Cycle II

Cycle II was implemented on September 03, 2024. The learning carried out consisted of one meeting with a time allocation of 2 × 45 minutes. The stages carried out in cycle II are:

A. Planning

At this stage, the researcher makes improvements to the shortcomings in the previous cycle. The researcher also prepares facilities and infrastructure as in the previous cycle and improves the teaching module for advanced material from the previous cycle, namely the kingdom plantae. The researcher creates a new LKPD and creates a different learning design from before so that students are more interested and motivated to learn biology.

B. Implementation

At the implementation stage, carry out the learning process by referring to the previously prepared Teaching Module. In general, the learning process is to explain the learning objectives that must be mastered by students, form study groups consisting of 8-10 students, prepare several cards containing several concepts or topics that are appropriate for the assessment session, have one part of the question card and another part of the answer card, each student gets a card with the question/answer written on it, each student thinks about the answer/question with the card they are holding, each student looks for a pair of cards that match their card, each student who has the ability to match their card before the deadline is given points, if students fail to match their cards with their friends' cards (cannot find the question or answer card) will get a punishment that has been decided together, after one round, the cards are shuffled again, so that each student receives a different card from the previous round, this procedure continues until the next round as in Figure 4 below.

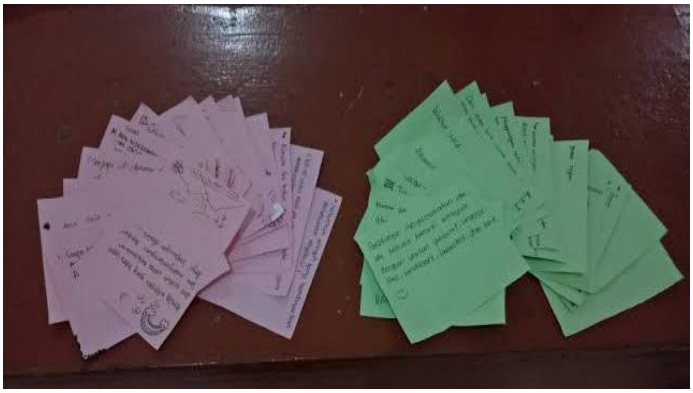

Figure 4. Question and Answer Cards for Cycle II

In the picture 4 above, a collection of several cards is presented and divided into 2 types of colors, the pink card is the question card while the green card is the answer card, then students are asked to choose one of the question cards or answer cards that have been provided, one child gets one question card or answer.

After completing the LKPD, students are asked to present the results of their work with their group and other groups respond to the results of the group that is presenting. Then the teacher evaluates the results of the students' work and concludes the learning activities together. At the end of the activity, students are given evaluation questions and will be given a daily test together.

C. Observation

At this stage, the researcher observes every student activity during the implementation of teaching and learning activities. The researcher directly observes the student's response in the form of student enthusiasm, changes in student attitudes and behavior from the beginning to the end of the activity during the investigation through simple game play and when presenting the results of the discussion with their group. Then the researcher analyzes the data from the daily test results with students, the results of which will be presented at the reflection stage.

D. Reflection

At this stage, the data obtained from the daily test results with students in Cycle II were analyzed by the researcher. The results are presented in the following table.

Table 3. Student learning outcomes in Cycle II

No	Aspect	Description
1.	Total student completion	36 students
2.	Total student non-completion	0 students
3.	Overall score	2970
4.	Highest score	95
5.	Lowest score	75
6.	Average	82,5

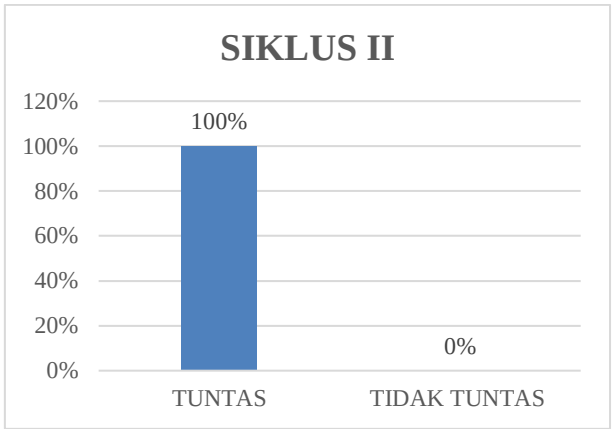

Figure 5. Diagram of Learning Outcome Completion for Cycle II

Based on the data in table 3 above, the percentage of students who have a passing grade of 100% is 36 students and the value of not passing is 0%. The results of the percentage of cognitive biology and cooperation results have increased from the previous cycle after the researcher improved the LKPD and added a simple game that can be done by all students and provides more interesting learning. The teacher also monitors and guides students in starting the game. Student learning outcomes in this cycle have met the research target, namely 100% of the total students reached the very good category with the target determined by the researcher. Thus, the research is sufficient for the second cycle.

This research was conducted in class X-10 of SMA Negeri 2 Nganjuk, totaling 36 students. The research was conducted for 2 cycles with one meeting each cycle. The material used in this study is Kingdom Plantae. This study applies the Group Investigation (GI) learning model to improve students' cognitive biology and cooperation abilities. Based on the results of data obtained for each cycle, it shows that the Group Investigation (GI) learning model can improve students' cognitive biology and cooperation abilities into a higher percentage which is represented in Figure 6 below.

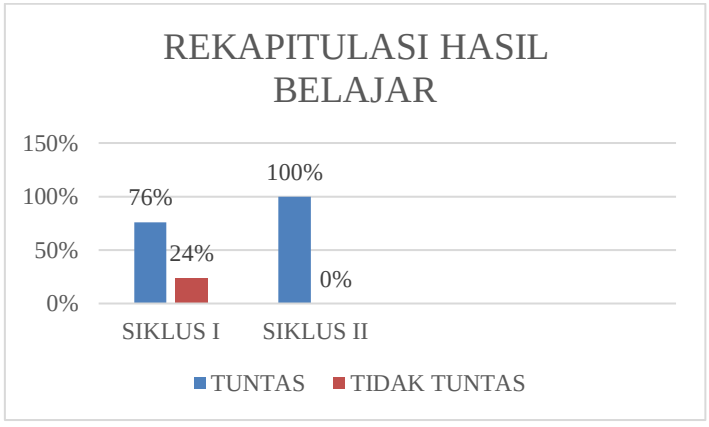

Figure 6. Comparison of Biology Cognitive Results and Student Collaboration

Based on the graph analysis above, it shows that there is a significant increase in biological cognitive and cooperation. In cycle I, there were 76% with the complete category. Then in cycle II it became 100%. The increase from cycle I to cycle II was 24%. Then for the category of not passing in cycle I it was 24%. Then it decreased in cycle II to 0%. Because after students learned to use the Group Investigation (GI) learning model, their biological cognitive and cooperation increased in the complete category.

The number of students who experienced an increase in biological cognitive and cooperation after using the Group Investigation (GI) learning model. From the beginning in cycle I in the complete learning outcome category of 30 students and the incomplete learning outcome category of 6 students. Then it increased in cycle II in the complete learning outcome category to 36 students and the incomplete category to 0 students which is presented in the following graph:

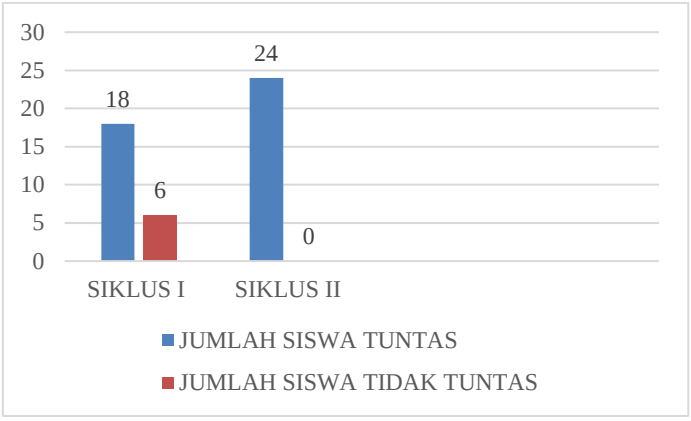

Figure 7. Number of Students Experiencing Improvement in Biology Cognitive and Collaboration

The implementation of the Group Investigation (GI) learning model can improve the cognitive biology and cooperation abilities of class X-10 students of SMA Negeri 2 Nganjuk. The achievement of student learning outcomes can be influenced by two main components, namely the internal components of the students themselves and elements that come from the students themselves or from the environment. Factors that come from the students themselves are mainly their abilities. In addition, physical and psychological factors, socio-economic factors, interests and attention, attitudes and learning habits, perseverance, are also factors that come from within the students (Abbas et al., 2022; Mulyadinata et al., 2020; Stellmacher et al., 2020). In cooperative learning, students work together to solve a problem through social relationships with their peers. This means that the cooperative learning model is a learning model based on constructivism which assumes that students will find it easier to construct their knowledge, it is easier to identify and understand solutions to challenging concepts if they discuss their problems with their friends (Mariani, 2021; Suwarsa, 2020; Suwela, 2021). The Group Investigation (GI) learning model can be used as an innovation in learning that requires student activity because in the learning process (Febiyanti et al., 2020; Putra et al., 2019). Students have the freedom to choose the material they study according to the topic being discussed provided by the teacher which will later be directly investigated and presented.

It is possible that the implementation of the Group Investigation (GI) type of cooperative learning model will improve the cognitive biology and cooperation abilities of class X-10 students of SMA Negeri 2 Nganjuk. This finding is reinforced by the findings of previous studies stating that the Group Investigation (GI) type of cooperative learning model has an effect on the learning outcomes of Natural Sciences/Science (Dewi et al., 2018; Hanifah et al., 2020). Improving students' science learning outcomes through the implementation of the Group Investigation type of cooperative learning model in Elementary Schools (Tembang et al., 2019). By using the Group Investigation (GI) type of cooperative learning model to improve the motivation and learning outcomes of social studies students in class VI of elementary school (Astuti, 2017). Based on the discussion, the Group Investigation Learning model was chosen because it can provide opportunities for students to participate in solving problems that are studied between individuals in their groups to reach an agreement in solving problems given by the teacher. The implications of this research are that the Group Investigation (GI) learning model will be able to develop their cooperation and mathematical abilities because this model helps students solve problems through simple experiments or research.

4. CONCLUSION AND RECOMMENDATION

Based on the results of the Classroom Action research and discussions conducted, it can be concluded that using the Group Investigation (GI) learning method in biology subjects in class X-10 of SMA Negeri 2 Nganjuk can improve students' biological cognitive and cooperation abilities. This is indicated by the average value in cycle I and the percentage of successful completion of 76% and 30 students with a complete score. In cycle II, the percentage of successful completion was 100% and 36 students met the KKM. The current data must be very different from the initial conditions. Based on the significant increase in biological cognitive and student cooperation data, it can be concluded that the Group Investigation (GI) learning method can be used as an alternative learning media to improve biological cognitive and cooperation of class X-10 students of SMA Negeri 2 Nganjuk.

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