*Proceeding International Conference on Religion, Science and Education* (2024) **3**, 505-513

# *Discovery Learning* to Improve Student Collaboration Animal Tissue Materials Class XI at SMAN 3 Surakarta

**Eva Fadliilatul Fithriyana[1], Meti Indrowati[2], Parmadi[3]**
[1,2]PPG Prajabatan, Biology Education Department, University Sebelas Maret; [3]Biology Department, SMA Negeri 3 Surakarta
Jl. Ir. Sutami No 36 Surakarta 57126, Indonesia. Tel. 0271-646994, Fax. 0271-646655.

**Corresponding author**
evafadliila19@gmail.com

**Abstract:** The purpose of this study is to improve the ability of students' collaboration with *Discovery Learning* Model of Animal Tissue Materials Class XI at SMAN 3 Surakarta. The type of research used is Classroom Action Research (CAR) with 36 people in class XI F3 students consisting of 12 men and 24 women. This research was conducted in two cycles consisting of planning, implementation, observation and reflection stages. Collaboration capabilities are measured through observation and questionnaire by following the guidelines for the collaboration capability assessment rubric. The results showed significant progress on the ability of students' collaboration in each cycle. The percentage of collaboration capability before action or pre -cycle is 38% (very low category), 55% (low category) in cycle I and 83% (good category) in cycle II. Based on the results of the study it can be concluded that the use of *discovery learning* models can improve the collaboration capabilities of class XI students in animal tissue material.

**Keywords:** Collaboration capabilities, discovery learning.

## Introduction

Life is increasingly advanced and change from time to time requires that everyone must have the skills needed to face complex life challenges. From this challenge, education plays a role in realizing a developed generation to be able to be parallel to other nations in the world in the aspect of life. Education is not just transferring knowledge but by equipping students with skills that can ensure these students can compete with the global and successful community in the future. Akbar (2022), states that the skills needed by the 21st century are called 4C, including *critical thinking and problem solving, creative and innovation, collaboration, communication.* Firman et al. (2023), 21st century skills bring changes in the paradigm of learning which initially centered on teachers to be centered on students. The government responded to the demands of the 21st century era with a curriculum that contained the concept of 21st century education and developed education towards creative Indonesia in 2045, Maulidia et al. (2023). The independent curriculum is in accordance with the 21st century skills which gives the freedom of teachers and students to not only focus on the field of knowledge but rather the emphasis of the mastery of character, skills, literacy and technology, Maulidia et al. (2023).

The new paradigm gives the freedom of students to be active in learning. Firman et al. (2023), saying that students are given freedom in learning and are required to be independent, active and collaborative. Collaboration is one of the abilities that must be mastered by 21st century students, Pramudiyanti et al. (2020). In collaboration, students can learn knowledge and experience by exchanging ideas with each other, increasing communication skills and developing critical thinking skills, Devi et al. (2023).

The quality of learning can be improved with the learning model. This is in line with Maulina (2014) which states that the principle in improving learning is to apply the right learning model. One way to improve students' collaboration skills by


ISSN 2829-3355 | EISSN 2828-8467

applying *discovery learning* models, Balqist et al. (2019). Based on research Aziz et al. (2019), *discovery learning* models can improve collaboration capabilities because this model emphasizes the involvement of students to be active in learning activities. In line with Masdariah et al. (2017) which says that the discovery learning model is able to encourage students to actively work together in the learning process so that the learning process becomes more increase. *Discovery learning* is a learning model that requires students to be active and independent in finding information in a learning, Ardianto et al. (2019). The syntax of the *discovery learning* model according to Bruner includes: *stimulation, problem statement, data collection, data processing, verification, and generalization*, Ariyana (2019) in Sundari and Fauziati (2021).

SMAN 3 Surakarta is a high school in Jebres District, Surakarta City. Based on the observations of the implementation of learning by biology teachers provide important materials by repeating the terms in a material. The teacher uses learning resources from the internet in the form of powerpoint and video. Then based on the results of observations some students seem to still have difficulty in socializing and reluctant to socialize with other students when carrying out learning in the classroom. Sajidan (2018) in Pramudiyanti et al. (2020) 21st century learning encourages students to be able to think critically in choosing valid and relevant information, able to innovate creatively, competent to work independently or in groups, able to solve the problems of daily life and have a basis of knowledge and understanding deep as students.

Based on the problems that have been described, the application of discovery learning models is an alternative in improving the ability of students' collaboration. Therefore, researchers are interested in conducting research entitled "Discovery Learning to Improve Student Collaboration Animal Tissue Materials Class XI at SMAN 3 Surakarta". This study aims to determine the effectiveness of the discovery learning model in increasing students' collaboration.

## Materials and Methods

The type of research used is Classroom Action Research (CAR) Kurt Lewin model. Quoting from Ardiawan and Wiradnyana (2020), there are four steps in preparing CAR is planning, implementation, observation and reflection. Classroom action research subjects is class XI F3 students of SMAN 3 Surakarta with a total of 36 people, consisting of 12 men and 24 women in the odd semester of the school year 2023/2024. This research was conducted for 2 cycles, including the pre-cycle stages, cycle I and cycle II. Implementation of Classroom Action Research at SMAN 3 Surakarta, Odd Semester of Academic Year 2023/2024 on Animal Tissue Materials.

Classroom action research uses qualitative analysis with data collection techniques in the form of questionnaires and observations. Observations made by the observed the collaboration of each student during the learning process. While the questionnaire is used to obtain data on the collaboration capability of each student, which is obtained during the cycle. Pre cycle is carried out before the application of discovery learning, then the first cycle is carried out after the second meeting in the first cycle ended and the second cycle was carried out after the second meeting in the second cycle ended. The purpose of the questionnaire at the end of the first cycle I and II aims to determine the increase in collaboration capabilities after being given treatment. The questionnaire used to collect data using collaboration capabilities indicators from Susan M. Brookhart is *contributions, time management, problem solving, working with others and research techniques.* The data obtained based on the questionnaire are then interpreted with the criteria for the collaboration of students from Devi et al. (2023) in Purwanto (2013) in the following table.

**Table 1**. Criteria for Collaboration Capabilities.

| Percentage | Category |
|---|---|
| 86-100% | Very good |
| 76-85% | Good |
| 60-75% | Enough |
| 55-59% | Low |
| ≤ 54% | Very low |

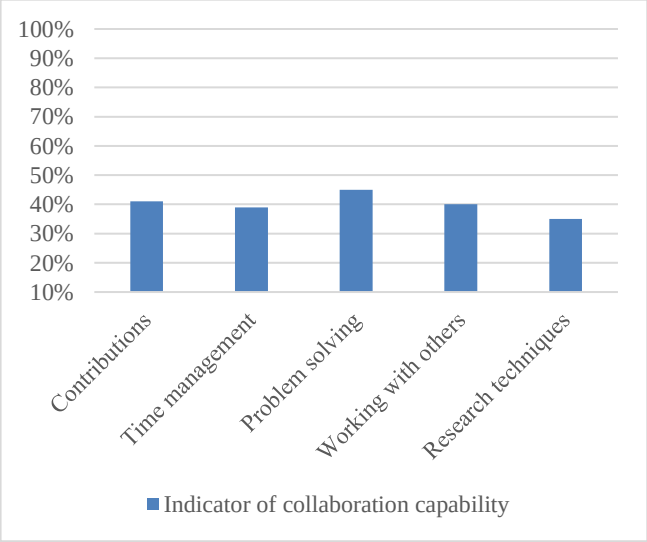
## Results and Discussion

### Result

#### 1. Pre Cycle

Before conducting Classroom Action Research (CAR) by applying the *discovery learning* model, researchers made preliminary observations to identify problems that took place during the biology learning process in the F3 SMAN 3 Surakarta class. Based on the observations of some students, it seems that it is still difficult to socialize with other students when learning in the classroom. Low of sensitivity and interaction between students and teachers is one indication of the low collaboration skills students. The results of students' collaboration abilities before action are as follows.

**Table 2**. Percentage of collaboration capability.




#### 2. Cycle 1

***a. Planning***

At the planning stage, the researcher conducts students' observations during the learning process and then discuss with teachers and peers to equalize the perception of the problems of the observed class. After determining the main problem, researchers designed learning activities by preparing material, learning strategies and learning media to be used. In addition, researchers also prepare observation and questionnaire sheets for students to be distributed at the end of the I and II cycle.

***b. Implementation***

At this stage, researchers carry out learning that has been prepared according to plan. Learning practices are summarized into three activities that introduction, core, and closing. Preliminary activities, model teachers condition the class, open classes with greetings, check the presence of students, convey lighters, motivation, formulate learning objectives and problem formulations. The lighter contains a series of questions made by the teacher about several things that are important and contained in a learning topic. This question is derived from meaningful understanding which is discussed with students as a warm up before carrying out learning activities in the classroom. The motivational activity is carried out by the teacher by conveying the benefits of studying cells. After students know the benefits to be obtained then the students are assisted by the teacher to formulate learning objectives and the formulation of the problem.

Core activities, learning is carried out using the *discovery learning* model that has six syntaxes is stimulation, problem statement, data collection, data processing, verification, and generalization. During the learning process, the teacher observes that students are still not accustomed to learning with discussion and presentation activities. They also pay less attention to friends who are presenting due to irregular and facing the future seating plans. Then in discussing, students rely on one of their friends in the discussion activity. As a result, the discussion time does not go according to the syntax because of an extension of time and the discussion is not optimal because all members do not contribute ideas or share tasks.

Closing activities, by concluding the material that has been studied today together with teacher and students. Students reflect on learning related to learning materials that have been learned, the material to be learned further, the process of implementing learning, and suggestions for improvement for the process of implementing further learning. At the closing stage the teacher also delivered the material to be learned at the next meeting and closes learning with greetings and advice enthusiasm to continue learning.

### *c. Observation*

In the first cycle, observations of the activities of teachers and students during the learning process. The following are the results of observations of the implementation of learning cycle I.

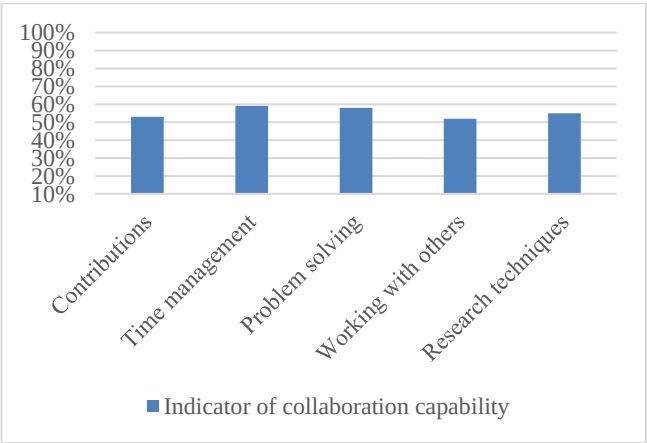
**Table 3**. Observation Results of Learning Implementation.

| Observed things | Observations |
|---|---|
| Have all students really learned about today's learning topics? How do they learn? | Yes, almost all students learn well on the learning topic delivered by the model teacher, they learn with group discussion methods. |
| Which students cannot participate in learning activities today? | Many students have permission (dispensation) when biology takes place. In addition, students who sit in the back do not follow learning well. |
| Why can't these students learn well? What do you think is the cause and what is the alternative solution? | These students cannot participate in learning well because they are not focused due to distraction such as sleepy and playing cellphones outside the teacher instructions. |
| How is the teacher's effort to encourage inactive students to learn? Whether the effort was successful | The teacher gives an assignment in groups to students and then gives direction and guidance to groups that experience difficulties and are inactive in finding information to complete LKPD. |
| Is learning effective? (All activities given are meaningful for students, all students are actively involved and no idle) | The syntax has been well implemented by the model teacher, although students are not familiar with discussion and presentation activities. |
| How do the teacher's efforts to help students who experience difficulties in achieving learning goals? | The teacher gives tutoring intensely by asking questions and guiding students when difficulties during learning. |
| How is the teacher's efforts to facilitate students who are faster than the class average in achieving learning goals? | The teacher facilitates these students by giving enrichment. |
| Does the teacher make modifications from the Teaching Module/RPP? Is this modification the teacher's decision to respond to the situation of the class and students? | Yes, the teacher makes modifications from the module by making decisions in responding to the classroom conditions being taught. |

Based on the table above it is known that according to the observer there are several aspects carried out by the teacher not yet run well, including: The teacher has not given an interesting message to students. It is important for teachers to provide a different class atmosphere so that students do not get bored and are easily distributed by distractions. While the results of observations of students' activities during learning according to the observer have not shown maximum results, because students are less active in discussion activities, are low to ask the teacher and there are still very few who respond to the teacher's questions.

In addition to using an observation sheet, another data that is also used for CAR is a collaboration questionnaire. Following are the results of student questionnaires to the ability of collaboration at the end of cycle I.

**Table 4**. Percentage of collaboration capability.




### *d. Reflection*

The results of the reflection of the implementation of the first cycle have not reached maximum completeness, then the researcher must improve learning in the next cycle.

**3. Cycle 2**

***a. Planning***

Cycle II is a follow up to cycle I. Planning in cycle II is the same as cycle I, the teacher prepares a learning plan so that students are more active in the implementation of learning activities. The action taken for cycle II is that the teacher emphasizes the concept of material before the discussion activity, the teacher will invite students to ask questions from what is not yet understood and which is felt difficult and invite students to be more active during discussion. The teacher gives directions to students to find trustworthy references by increasing sources not only holding on to one source.

***b. Implementation***

The implementation of learning cycle II uses the same model, but there are some improvements from cycle I. Learning activities are summarized into three activities, namely introduction, core and closing. Preliminary activities, model teachers condition the class, open classes with greetings, check the presence of students, convey lighters, motivation, formulate learning objectives and problem formulations. The lighter question succeeded in making students answer the material to be discussed. The teacher continues learning activities by providing motivation to always be grateful for the gift of God almighty because it creates something in detail for the continuity of living things. Then, the teacher and students both formulate learning objectives and problem formulation.

The core learning activities are carried out using the discovery learning model that has six syntaxes is stimulation, problem statement, data collection, data processing, verification, and generalization. The teacher provides worksheets as a process of discovery of the concept of the material being studied. Through discussion activities, the model teacher found a number of students who were only fouled at one source and even looked for reading sources from invalid sources. Although the model teacher has directed students to search for accurate sources, the model teacher has not been able to control whether all children follow the direction of the teacher. This is evidenced by the inappropriate students' answers from the activity sheet given by the teacher.

Closing activities, by concluding the material that has been studied today together that is teacher and students. Students reflect on learning related to learning materials that have been learned, the material to be learned further, the process of implementing learning, and suggestions for improvement for the process of implementing further learning. At the closing stage the teacher also delivered the material to be studied at the next meeting and closes learning with greetings and advice to increase reading literacy from accurate sources.

***c. Observation***

In cycle II, observations of the activities of teachers and students during the learning process. The following are the results of observations of the implementation of learning cycle II.

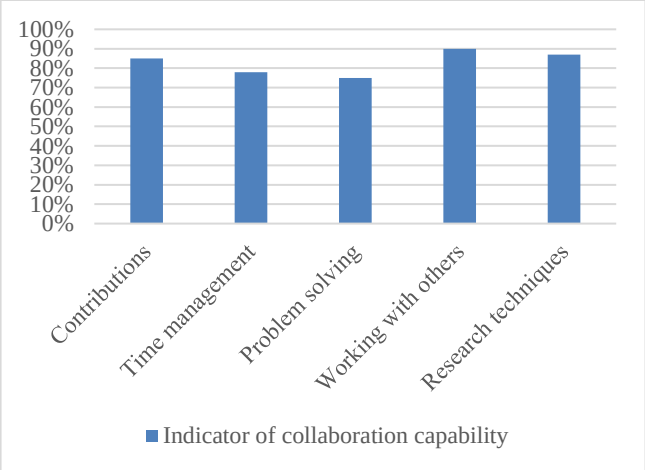
**Table 5.** Observation Results of Learning Implementation.

| Observed things | Observations |
|---|---|
| Have all students really learned about today's learning topics? How do they learn? | Students respond to the teacher's lighter question as a benchmark for the readiness of students in learning and to find out the extent to which they understand the material to be discussed. |
| Which students cannot participate in learning activities today? | Most students listen and pay attention to the teacher at the beginning of learning. Although there are also some students who sit in the back less attention. But the model teacher continues to communicate with these students so that they can participate in learning well. |
| Why can't these students learn well? What do you think is the cause and what is the alternative solution? | Students who are far away in the reach of the teacher are absorbed in themselves because they feel that they are not considered by the teacher from the front. |

| | |
|---|---|
| How is the teacher's effort to encourage inactive students to learn? Whether the effort was successful | By asking these students about the difficulties in doing assignments or other things so that students can complete appropriately. |
| Is learning effective? (All activities given are meaningful for students, all students are actively involved and no idle) | Most students are active in learning. Active when discussing and presenting. Students are also enthusiastic in answering and asking the teacher. |
| How do the teacher's efforts to help students who experience difficulties in achieving learning goals? | • The teacher approaches students and gives individual guidance by explaining what is not yet understood<br>• The teacher goes around to each group to ensure that each student understands what will be done |
| How is the teacher's efforts to facilitate students who are faster than the class average in achieving learning goals? | The teacher gives questions with different cognitive levels so that they will facilitate students who are faster than the class average. |
| Does the teacher make modifications from the Teaching Module/RPP? Is this modification the teacher's decision to respond to the situation of the class and students? | he teacher modified the teaching module in response in adjusting the needs of students and the condition of the class. |

In addition to using an observation sheet, another data that is also used for CAR is a collaboration questionnaire. The following are the results of student questionnaires to the ability of collaboration at the end of cycle II.

**Table 6**. Percentage of collaboration capability.




### *d. Reflection*

Based on the results achieved at the end of cycle II experienced an increase in the ability of students' collaboration as evidenced from the results of the observations and questionnaires of students, it can be said this research is complete.

## Discussion

In each learning, discussions are carried out both group and class discussions. In the group discussion process, students are expected to be able to find the concept of material with a group of friends. Meanwhile, class discussions are carried out to discuss the results of each group. Then, students and the teacher draw conclusions from the learning that has been done.

At the first meeting students can find their own concepts although there are several indicators of collaboration that have not been maximized regarding the understanding, cell structure and bioprocess that occur such as membrane transport from the results of the discussion through the independent learning process. While at the next meeting, students look more active than the first meeting. There are some students who ask about things that are not yet understood. Students are also enthusiastic in responding to the results of discussions from other groups. At the third meeting, students look quite active. The majority of students are active in discussions both in group discussions and class discussions. Some students also responded after other groups presented the results of their discussion. This is because students have started to get used to the learning model used.

In general, the implementation with the discovery learning model in the first cycle has been going well. The interaction between the teacher and students looks quite good. Communication has lasted in two directions. During the learning, ranging from the first to third meeting, there is an increase in the collaboration of students. During the first meeting, during group discussions there

were some students who were only silent and inactive in discussion activities. However, over time almost all students are active in group discussion activities. At the initial meeting, there were only one or two students who dared to ask questions or submitted their opinions. But over time, students have dared to ask questions or express their opinions. This can be seen from the increase in the number of students who ask questions or express their opinions. Some of the things that have been explained show that there is an increase in students' collaboration during the learning process when compared to the collaboration of students before action.

The collaboration capability of students of animal tissue material is higher than the material at previous meetings. The ability of collaboration in animal tissue material has increased a higher increase in each indicator compared to the material at the previous meeting. Collaboration indicators in the form of working with others have the highest value and classified into very good criteria (Table 5). Increasing the ability of student collaboration occurs because in the learning process uses discovery learning models. During the learning process, students are trained to always collaborate well in completing worksheets with the help of steps from the discovery learning model.

At the stimulation stage and problem identification, students begin to work together to analyze the structure and function of animal tissue. Students must work together with their group members so that students analyze the structure and function of animal tissue based on worksheets. In the problem identification step, students show indicators of collaboration abilities, namely problem solving by participating in the learning process so that students are able to formulate problems from the material being studied. At this stage educators help students in identifying problems. At the data collection stage and data processing, students are required to be able to work together with group members to gather information and answer questions. This activity, students have shown indicators of collaboration capabilities, is investigation techniques. In addition, students are also given effective and efficient time in working on group tasks that have been divided so that the cooperation in the team is formed up to the generalization stage so that students have shown indicators of collaboration capabilities, namely time management. Students also share tasks between group members to make decisions. At this stage students also collaborate so as to build students to be more responsive and active and careful in analyzing the structure and function of animal tissue. This is in accordance with the opinion of Hamilton et al. (2021), collaboration requires effective communication, cooperation between group members, responsiveness or willingness to participate and contribute to the tasks given to them. At the verification stage each student conveys the results of the discussion that has been done with the group better and more confidently. At the time of the presentation, it appears that the indicator of collaboration skills is working with other people. Students convey the results of the discussion well and some students give responses and maps to groups who are presenting and students are able to receive responses and questions given by other group members.

The ability of students' collaboration in animal tissue material has increased because the learning process uses the syntax of the discovery learning model and improvement in each cycle. According to Istiana et al. (2015), increasing student learning activities in application of discovery learning is caused by several factors, among others, the discovery learning model that requires students to be more active in finding material concepts and the existence of discussion activities that train students to be active in the learning process. With the discussion, students are bolder in expressing opinions, responding to statements both friends and teachers and asking questions about things that are not yet understood. In addition, discussion activities train students to work in groups, so that students are not only able to work individually. With the discovery learning model, students are trained to work in teams to analyze the structure and function of animal tissue. This is in line with the research of Pramudiyanti et al. (2020), discovery learning model provides the opportunity for students to be able to work together with their groups in identifying a problem. Learning with

discovery learning is recommended for teacher use in learning science based on several facts and research results that show strengths including, directing student learning activities independent Others, as well as centered on students and teachers, are actively active in issuing ideas, Utami (2017). Learning that emphasizes the ability of collaboration between students is very important to be developed. Students can gain knowledge and skills through teamwork with collaborative learning, as in the research of M. Usman et al. (2022).

## Conclusions

Based on the results of the discussion, it can be concluded that the discovery learning model has a positive effect on the ability of students' collaboration so that it can improve collaboration skills. Good teaching materials are very helpful for students in improving learning. Therefore, it is important for a teacher to design learning in accordance with the needs and characteristics of students. Some steps and efforts that must be made by teachers to be able to make learning meaningful as in the goals of Indonesian education.

## References

Almaidah Balqist, Tri Jalmo dan Berti Yolida. Penggunaan Model Discovery Learning Untuk Meningkatkan Keterampilan Kolaborasi dan Berpikir Tingkat Tinggi. Jurnal Bioterdidik, Vol.7 No.2, Maret 2019.

Andi Asmawati Azis, Adnan, Abd Muis, Musawwir, dan Faisal. Penerapan Pembelajaran Kolaboratif untuk Meningkatkan Aktifitas Belajar Siswa Kelas XI IPA 3 Melalui Lesson Study Berbasis Sekolah di SMA Negeri 8 Makassar. Jurnal Bionature, Volume 14, Nomor 1, April 2013, 38-43.

Ardianto, A., Mulyono, D., & Handayani, S. (2019). Pengaruh Model Discovery Learning Terhadap Hasil Belajar Matematika Siswa Kelas VII SMP. Jurnal Inovasi Matematika (Inomatika), 1(1), 31–37.

Dina Maulina. 2014. Pemahaman Konsep Belajar Mahasiswa Melalui Model Pembelajaran Inkuiri. Jurnal Pendidikan MIPA, Volume 15, Nomor 1, April 2014.

Firman , Syamsiara Nur dan Moh. Aldi SL.Taim. 2023. Analisis Keterampilan Kolaborasi Siswa SMA pada Pembelajaran Biologi. Diklabio: Jurnal Pendidikan dan Pembelajaran Biologi, 7 (1), 82-89.

Frances A Hamilton, Kimberly A Hile, Dana L Skelley, Sarah A Roller, Sandra A Lampley dan Erica Slate Young. 2021. Exploring Students' Perceptions Of Collaboration And Critical Thinking Skills Following An Escape Room Experience. The Journal of Campus Activities Practice and Scholarship Volume 3 Issue 1.

Galuh Arika Istiana, Agung Nugroho Catur S dan J.S Sukardjo. Penerapan Model Pembelajaran Discovery Learning Untuk Meningkatkan Aktivitas dan Prestasi Belajar Pokok Bahasan Larutan Penyangga pada Siswa Kelas XI IPA Semester II SMA Negeri 1 Ngemplak Tahun Pelajaran 2013/2014. Jurnal Pendidikan Kimia (JPK), Vol. 4 No. 2 Tahun 2015.

I Ketut Ngurah A dan I Gede Arya W. 2020. Kupas Tuntas Penelitian Tindakan Kelas. Bali: Nilacakra Publishing House.

K.Saeful Akbar. 2022. Peningkatan Kemampuan Kolaborasi dan Komunikasi Siswa Kelas VII Melalui Model Pembelajaran Kooperatif Teknik Jigsaw. Jurnal Pembelajaran dan Karya Guru Vol. 2 No. 2 Juni 2022.

Lisa Maulidia, Tia Nafaridah, Ahmad, Monry Fraick Nicky Gillian Ratumbuysang, Eva Maya Kesuma Sari. 2023. Analisis Keterampilan Abad Ke 21 Melalui Implementasi Kurikulum Merdeka Belajar di SMA Negeri 2 Banjarmasin. Seminar Nasional(PROSPEK II).

Maria Fransiska Lestari Budi Utami. Penerapan Strategi *Discovery Learning* (DL) Untuk Meningkatkan Keterampilan Berpikir Kritis dan Pemahaman Konsep IPA. JINoP (Jurnal Inovasi Pembelajaran), Volume 3, Nomor 1, Mei 2017.

Masdariah, N. B., Rachmawaty. (2017). Kajian Deskriptif Model Discovery Learning dalam Meningkatkan Motivasi Belajar, Aktivitas Belajar dan Hasil Belajar Peserta Didik. Makasar: Program Pascasarjana. Jurusan Biologi, FMIPA. Universitas Negeri Makassar.

Pramudiyanti, Intan Okta Nabilla dan Dina Maulina. Pengaruh Model Pembelajaran Discovery Learning Terhadap Keterampilan Kolaborasi Pencemaran Lingkungan. Jurnal Bioterdidik, Vol. 8 No. 2, Oktober 2020.

Ratih Shintia Devi, Effy Mulyasari dan Gunawan Anggia R. 2023. Peningkatan Keterampilan Kolaborasi Peserta Didik Melalui Penerapan Model Kooperatif Tipe Group Investigation Berbasis Pembelajaran Berdiferensiasi Pada Mata Pelajaran IPA di Sekolah Dasar. Jurnal Ilmiah PGSD FKIP Universitas Mandiri Volume 09 Nomor 01, Maret 2023.

Sundari dan Endang Fauziati. Implikasi Teori Belajar Bruner dalam Model Pembelajaran Kurikulum 2013. Jurnal Papeda: Vol 3, No 2, Juli 2021.

Susan M. Brookhart. 2017. *Annotated Examples of Rurics for Thinking Skills, Approaches to Learning, Creativity,*

*Collaborationand Other 21st Century Skills.* Diakses dari https://www.nesacenter.org/uploaded/conferences/WTI/2018/handouts/SueBrookhart_Annotated-Examples-Rubrics-ThinkingSkills.pdf

Usman M, I Nyoman S. Degeng, Sugeng Utaya dan Dedi Kuswandi. 2022. The Influence of JIGSAW Learning Model and Discovery Learning on Learning Discipline and Learning Outcomes. Pegem Journal of Education and Instruction, Vol. 12, No. 2, 2022 (pp. 166-178).

THIS PAGE INTENTIONALLY LEFT BLANK