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Using inquiry-based learning to strengthen student learning outcomes

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Abstract: The research objective is to strengthen student learning outcomes using inquiry-based learning. This type of research is called classroom action research. This study's subjects were 34 students of class X MIPA 4 SMA Negeri 1 Wonomulyo, consisting of 12 boys and 22 girls. The instrument used to measure students' learning outcomes in this study was a multiple-choice test of 50. The indicator that shows the success of the research implementation is that students can achieve a minimum completeness value of 80% at a minimum standard score of 65. Based on the results of the classroom action research that has been implemented In SMA Negeri 1 Wonomulyo, it can be concluded that the application of the Inquiry learning model can improve student learning outcomes in class X MIPA 4 SMA Negeri 1 Wonomulyo. The increase in learning outcomes indicates the research results from cycle I to cycle II; namely, the average value of student learning outcomes increased from 26.47% to 88.23%.

Keywords: Inquiry learning, Students learning outcome, Biology learning, student complete

Menggunakan pembelajaran berbasis inkuiri untuk menguatkan hasil belajar siswa

Abstrak: Tujuan penelitian adalah untuk menguatkan hasil belajar siswa menggunakan pembelajaran berbasis inkuiri. Jenis penelitian ini disebut penelitian tindakan kelas. Subjek penelitian ini adalah peserta didik kelas X MIPA 4 SMA Negeri 1 Wonomulyo yang berjumlah 34 orang terdiri dari 12 laki-laki dan 22 perempuan. Instrumen yang digunakan untuk mengukur hasil belajar pada peserta didik dalam penelitian ini berupa tes pilihan ganda sebanyak 50. Indikator yang menunjukkan keberhasilan pelaksanaan penelitian yaitu peserta didik dapat mencapai nilai ketuntasan minimal 80% pada nilai satndar minimum 65. Berdasarkan hasil penelitian tindakan kelas yang telah dilaksanakan di SMA Negeri 1 Wonomulyo, dapat disimpulkan bahwa penerapan model pembelajaran Inquiry dapat meningkatkan hasil belajar siswa kelas X MIPA 4 SMA Negeri 1 Wonomulyo. Dimana peningkatan hasil belajar ditunjukkan oleh hasil penelitian dari siklus I ke siklus II yaitu nilai rata-rata hasil belajar siswa meningkat dari persentase 26,47% menjadi 88,23%.

Kata Kunci: Pembelajaran inkuiri, Hasil belajar siswa, Pembelajaran biologi, Siswa tuntas

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INTRODUCTION

Education is essential in life because, without education, a person cannot know something, both in family, national, and state life. For this reason, every individual is a requirement to be able to study. The progress and decline of a country are determined by the increase in education in Indonesia. Through education, the nation's generation knows to become independent and qualified individuals. Therefore, innovation and development of national education need to be carried out to produce quality Indonesian people who are superior in science and technology and have good moral and spiritual qualities. (Jayawardana, 2015).

The learning process at this time still tends to place the teacher as the center of learning or the only source of education. Teachers only provide knowledge to students. Students are not allowed to build their own experience. Of course, such circumstances affect student learning outcomes. Thus, there is a need for learning changes where the learning process is more directed at student activity. Teachers can provide students opportunities to build their knowledge, and teachers are not the only learning source. A challenge for teachers is that they will have to pick a model that will follow the learning material to ensure adequate student learning outcomes (Ayuwanti, 2017), with that in mind, educators should motivate students to achieve. (Kurniawan et al., 2021).

A significant problem that teachers often face in learning activities is learning outcomes that do not match expectations—selection or determination of the appropriate learning model to help students achieve competence. Competence is using to determine the extent to which students can understand and understand the material. Learning outcomes become a measure of the assessment of learning activities or the learning process. The value of learning outcomes is one form of indicator commonly used to measure a person's learning success. In the teaching and learning process, many factors affect student learning outcomes both from within students (internal) and outside (external). Internal factors are related to discipline, response, and student motivation. In contrast, external factors are the learning environment, learning objectives, and creativity in selecting learning media by educators and learning models. These factors influence each other and form a unity that underlies student learning outcomes (Damopolii, Lefaan, et al., 2018; Maisaroh & Rostrieningsih, 2010)

Based on interviews conducted by researchers with one of the biology subject teachers at SMA Negeri 1 Wonomulyo, it can be seen that the learning outcomes of students are still low. Learning outcomes is especially in class X MIPA 4 with a value range of 35.29 and the minimum completeness criteria (MCC) standard 65. The learning model is still seen to be dominated by teachers and has not varied in using the learning model in teaching so that it causes students to tend to be passive in activities. Learning feels difficult and feels bored in receiving lessons—less involving students in the learning environment while students only act as listeners. The interaction among teachers and students and between classmates themselves is reduced. Students are solely direct to memorize information without being required to understand it. Most students have difficulty learning biology material and tend to think of biology subjects as boring memorization subjects. Some students do not pay attention when the teacher teaches, does other activities in learning activities. There is a commotion in the classroom caused by students who have an attitude of disturbing other friends during learning to find it difficult to concentrate.

One learning model that can enhance student learning performances is the inquiry learning model. The teacher applies the inquiry learning model by guiding students to use the school's facilities and facilities. The inquiry learning model has advantages that encourage students to be more courageous and creative in their imagination. With imagination, students are guided to create discoveries, both in the form of refinement of what already exists or developing ideas, ideas, or tools that have never existed before (Anam, 2015). This inquiry learning model aims to provide students with intellectual abilities (thinking abilities) associated with the process of reflective thinking (Nunaki et al., 2019). If thinking is the primary purpose of education, then methods must be developed to assist individuals in developing that capacity (Novelsa, 2016), and inquiry is the solution (Nasir et al., 2020). The inquiry has a significant effect on student performance (Abdi, 2014; Almuntasheri et al., 2016; Cobern et al., 2010; Nowak et al., 2013)

The inquiry learning model promotes active involvement in learning activities by encouraging participants to think critically and develop new ideas. It assists students' thinking and promotes tentative knowledge recognition and appreciation of explanation (Asmayani, 2014), and improves student skills (Damopolii et al., 2020; Nunaki et al., 2020). Several research results indicate that inquiry can improve student learning completeness. More than 90% of students achieve mastery learning when studying in an inquiry class (Purwadewi & Ruqoyyah, 2021; Supartiyani, 2020). The implementation of inquiry learning makes all students achieve learning completeness, and the student's response to the inquiry application is 97.27% (Makawiyah & Zuraida, 2021). Other researchers found that the increase in learning completeness was 22.23% (Wulandari, 2016), there was also an increase of 7.25% in student science learning outcomes with 70% of total students completing (Juniati & Widiana, 2017). Specifically for biology learning, learning inquiry encouraged more than 94% of students to complete (Damopolii, Yohanita, et al., 2018). Therefore, the purpose of this study was to use inquiry to strengthen student learning outcomes.

METHOD

This type of research is called classroom action research (CAR). Classroom action research describes the causes and consequences of treatment, explains what happens when the treatment is given and represents the entire process from the start of the treatment to its impact. This research was conducted in November and December in the odd semester of the 2019/2020 school year in class X MIPA 4 SMA Negeri 1 Wonomulyo. This study's subjects were 34 students of class X MIPA 4, consisting of 12 boys and 22 girls.

Research Design Arikunto (2015) adapted in this action research:

Planning; At this stage, the researcher completes a learning device consisting of a syllabus, a lesson plan (LP), the necessary facilities and infrastructure such as media: student worksheet, and laboratories. Besides, preparing an observation sheet for the teacher and students' implementation in the classroom will be filled in by two observers.

Implementation: There were four meetings in this cycle: three meetings to deliver material and one meeting for evaluation exams. The performance of the action for each material in the first cycle, namely the teacher opening the lesson with the opening greetings and the teacher and students praying together according to their respective religions and beliefs, and checking the attendance of students then explaining the learning model to be

used, namely the inquiry learning model. Explain the importance of the topic and learning activities, define the learning objectives, and explain the learning material. Guiding students in finding problems in learning material. Dividing groups of students heterogeneously 5-6 students. Explain the experimental activities or data collection that will be carried out. Provide opportunities for students to make observations through a microscope, guiding students in discussions and asking the groups one by one to present the results of their meeting. Ask students to formulate conclusions.

Observation and Evaluation; During the learning activities, the researcher was assisted by two observers who determined students' activeness. The observation consists of students' activeness in working, cohesiveness, and asking questions during group discussion. During the learning process from the first meeting to the last meeting, the research took place, and the evaluation was carried out to know the increase in student learning outcomes, which could be seen from the answers obtained by learners.

Reflection; The results obtained from observation and evaluation are then collected and analyzed at this stage. At this stage, it is used as a reference for carrying out the second cycle.

The instrument used to measure students' learning outcomes in class X Mipa 4 in this study was a 50 multiple-choice test. The device to be used as the observation sheet for the implementation of the Inquiry learning model. The observation sheet was used to determine the extent of teachers' and students' abilities using inquiry learning.

The success of the implementation of research conducted base on the indicator. Students' learning outcomes using the inquiry model show changes, where students can achieve a minimum completeness value of 80%. Students are said to be complete if the value obtained is at least 65 based on the minimum completeness criteria (MCC) in biology subjects in class X SMA Negeri 1 Wonomulyo.

RESULTS

First cycle

The implementation of the first cycle activities was carried out three times with the Protists' topic and one meeting to evaluate researchers carrying out actions according to the learning plan that had been compiled. Two observers assisted the researcher. Observer helps researchers observe the activities of teachers and learners by using observation sheets.

Table 1. Teacher activities in the first cycle

Observer	Meet			Total	Average	Percentage
	1st	2nd	3rd			
1	17	13	14	44	44	61.11
2	17	13	14	44		

Table 2. Students activities in the first cycle

Observer	Meet			Total	Average	Percentage
	1st	2nd	3rd			
1	7	10	13	30	30	41.67
2	7	10	13	30		

The data analysis table for the observation of teacher and student activity in cycle I from 24 aspects obtained that the final score of the teacher's activity 61 was in the moderate category and the activities of the 42 students were categorized as lacking, so it was necessary to make improvements in cycle II.

Biology learning achievement data in the first cycle were obtained through the provision of learning outcomes tests. The percentage of students' biology learning outcomes in class X MIPA 4 SMA Negeri 1 Wonomulyo in the first cycle can be seen in Table 3.

Table 3. Percentage of student learning outcomes in the first cycle

Score	Frequency	%	Category
80 – 100	4	11,76	Excellent
66 – 79	5	14,71	Good
56 – 65	8	23,52	Moderate
40 – 55	12	35,29	Less
30 – 39	5	14,71	Failed
Total	34	100	

Table 3 showed that 11.76% of students scored in the excellent category. 14.71% of students achieved good classification. 23.52% of students scored in the moderate category. In the less category, as many as 35.29% students. 14.71% of students were included in the failing category. The learning outcomes of learners are grouped into the minimum completeness criteria (KKM) 65 used in SMA Negeri 1 Wonomulyo so that it can be seen in the following table:

Table 4. The percentage of student learning outcomes completeness in the first cycle

Score	Number of students	%	Category
65-100	9	26,47	Complete
0-64	25	73,52	Incomplete
Total	34	100	

Table 4 shows that of the 34 students of class X MIPA 4 SMA Negeri 1 Wonomulyo, nine students with a percentage of 26.47% were in a complete category after giving the first cycle of action. Twenty-five students with a ratio of 73.52% were in the incomplete category. It shows that students have not finished learning in the first cycle classically because students who get ≥ 65 are 26.47%. It is smaller than the desired percentage of completeness of 80%. A smaller percentage is since students still feel the first time and they don't understand the inquiry learning model to not concentrate on the lesson.

Based on the findings of observations that have been made in cycle I, it can be seen that the use of inquiry learning has not been optimally able to enhance student learning results. The problems found during the learning process and their improvements are as follows:

1) Students may feel for the first time and confused about the implementation of the inquiry learning technique. Students do not concentrate on lessons and usually only receive class lessons and rarely do the practicum. Teachers should clearly explain the

ease and benefits obtained when learning using the inquiry learning model so that students can find their abilities and skills to help individuals build thinking and imagining skills to formulate their findings confidently.

2) Students pay less attention to learning, so they are only passive and less active. Teachers should give perceptions or motivation to students so that they are enthusiastic about learning and pay attention to knowledge and take a personal approach and try to ask about the inability of students to learn biology and provide encouragement to study more diligently so that they can get better grades than before
3) Students do not understand the learning material, because according to the observer, the researcher is too fast in explaining the learning material. Teachers should explain the material in more detail and easy to understand. Provide examples in everyday life and well explain terms that are difficult to understand. They are then easy to understand and not confusing when answering evaluation questions to make learning more enthusiastic.
4) In the completeness of the learning media, some groups do not bring the complete media. The teacher should assign students to prepare the media long before learning, and if there are media that are difficult to carry, the teacher will provide it.
5) When doing practicum, some students are just noisy and do not join their group friends to make observations so that students are only passive and inactive. Teachers should control students well by walking to each group, not just in place, and giving punishment and reprimands if students do not want to join their group friends
6) When working on student worksheets, students are not disciplined and tend to ask answers from other groups. Teachers should control students well.
7) Not taking part in the group during the discussion, some students do not want to join their group friends and are busy with their respective activities to be less active and only noisy.
8) When each group is about to present their discussion results, they still look shy and throw their assignments at each other to deliver the debate results. Teachers should motivate students by saying that teachers value students who dare to explain their discussions' works and provide more value.
9) When asking, answering questions, and making conclusions, the categories are deficient, and students are still not confident in their abilities both in presentations and in taking tests. Teachers need to help students be sure and dare to ask questions, answer questions, and make conclusions with their sentences if they are too shy to submit their findings. The teacher can appoint students who seem less active in initial activities and core activities to provide conclusions to determine how students understand the lesson.
10) When giving evaluations, some students were not disciplined in working on questions and tended to ask other students for answers. Teachers should provide reprimands and punishments if students ask for answers with other students, increase self-confidence in their abilities, and give students confidence that work done alone will provide good results.

Second cycle

The implementation of cycle II activities was carried out in 3 times meetings with mushrooms and a one-time session for evaluation. Researchers carry out actions according

to the learning plan that has been prepared. Observers assist researchers. The observer helps researchers observe the activities of teachers and students by using observation sheets.

Table 5. Teacher activities in the second cycle

Observer	Meet			Total	Average	Percentage
	1st	2nd	3rd			
1	16	23	23	62	62	86.11
2	16	23	23	62		

Table 6. Students activities in the second cycle

Observer	Meet			Total	Average	Percentage
	1st	2nd	3rd			
1	16	24	24	64	64	88.89
2	16	24	24	64		

The observations of teacher activities during the learning process carried out by two observers obtained an average score of 86 with excellent criteria. Observing students' activities during the learning carrying by two observers received an average score of 89 with excellent standards.

Data in cycle II were obtained by giving biology learning results tests at the end of the process. The percentage of biology learning results of class X MIPA 4 students of SMA Negeri 1 Wonomulyo in cycle II can be seen in Table 7.

Table 7. Percentage of student learning outcomes in the second cycle

Score	Frequency	%	Category
80 – 100	19	55,88	Excellent
66 – 79	11	32,35	Good
56 – 65	4	11,76	Moderate
40 – 55	0	0	Less
0 – 39	0	0	Failed
Jumlah	34	100	

Table 7 shows that 55.88% of students scored in the excellent category. 32.35% of students scored in the good category. 11.76% of students scored in the moderate category.

Table 8. Percentage of students' learning outcomes in the second cycle

Score	Number of students	%	Category
65-100	30	88,23	Complete
0-64	4	11,76	Incomplete
Total	34	100	

Table 8 shows that of the 34 students of class X MIPA 4 SMA Negeri 1 Wonomulyo, after giving cycle II action, as many as 30 students with 88.23% were in the complete four

students with a percentage of 11.76% were incomplete. These results indicate that in cycle II classically, students' completeness was complete learning because students who were ≥ 65 were 88.23% greater than the desired classical completeness percentage of 80%.

Table 9. Comparison of students' complete learning in cycle I and cycle II

Score	Cycle I		Cycle II		Category
	Number of students	%	Number of students	%	
65 – 100	9	26,47	30	88,23	Complete
0 – 64	25	73,52	4	11,76	Incomplete
Total	34	100	34	100	

The data on the percentage comparison of the students' overall evaluation results shows that the number of students in the incomplete category decreased from 73.52% in cycle I to 11.76% in cycle II. The students were included in the complete category with a percentage of 26.47% to 88.23%.

The successes obtained in this second cycle are as follows:

a) The tests carried out in the second cycle reached the classical completeness value / the percentage of the minimum completeness criteria got 88.23%, and the classical completeness value in the first cycle was only 26.47%. It indicates that students' use of the inquiry learning model has been understood to enhance the value of learning outcomes.
b) The implementation of cycle II as an improvement from the cycle's performance positively impacts students' activities; in general, the results are more as expected. Each group became more active than previous studies to work on the questions that had been given.
c) The test results in cycle II indicate that students' learning outcomes have increased compared to the cycle I test results. Students have been very active in answering questions, making conclusions, actively discussing, and presentations and practicum.
d) The increased learning outcomes of students in learning are supported by increased teacher activity in maintaining and enhancing the learning atmosphere by using the inquiry learning model.

The achievement of research success indicators shows that this classroom action research can be ended in 2 cycles (the investigation was not continued to cycle III).

DISCUSSION

Based on the research results that have been carried out in cycle one, the completeness of students' learning outcomes in cycle 1 reached 26.47%—the number of students who completed as many as nine people. Incomplete as many as 25 students, these students' learning outcomes still have not reached the stipulated conditions. The learning in this first cycle is very lacking. This is evidenced by the results of observations of student activities and teaching activities that are still lacking. Besides, students even do not play an active performance in the process of instructional. Based on observations made by observers on student activities, it reached 42% and was included in the inferior category. The findings of the observance of teacher activities came 61% in the moderate category.

Based on the second cycle research results, students' learning outcomes have reached the specified target, namely 88.23% with 30 students who completed and four people who did not complete. In the observations, teachers' and students' activities were in the excellent category, with the percentage of teacher activities reaching 86% (excellent) and for student activities reaching 89% (excellent). The achievement of the portion of student activities in this second cycle showed that students carried out the learning process well. They make useful observations, are very active in discussions, ask questions, answer questions, and provide conclusions. The research results using the inquiry learning model show that students' learning outcomes in class X MIPA 4 are said to be increased or successful. Research is sufficient in the second cycle because it fits the predetermined category. The research results found are in line with the research that has been conducted by previous researchers (Damopolii, Yohanita, et al., 2018; Hamidi & Ahda, 2020; Makawiyah & Zuraida, 2021; Purwadewi & Ruqoyyah, 2021; Supartiyani, 2020). They found that inquiry could improve student learning outcomes.

Based on students' learning outcomes in class X MIPA 4 SMA Negeri 1 Wonomulyo, there has been an increase from cycle I to cycle II. It is known that by using the inquiry learning model and focusing learning activities on students. They will have experiences gained from learning outcomes as a result of their activities. Students experience and feel for themselves everything related to the achievement of goals. It proves that students' biology learning outcomes have increased, marked by the increasing number of students who have completed their learning outcomes. The results showed that an inquiry-based teaching and learning approach positively affected developing student engagement and direct thinking skills such as critical, communication, and collaboration (Chen, 2021).

Damopolii, Yohanita, et al. (2018); Peng (2020) states that the inquiry learning model is very suitable for biology learning. Inquiry Learning can improve learning outcomes. Its because the syntax and stages of inquiry learning are built through the scientific method can train students' science process skills. In this method, every student is encouraged to be actively involved in the teaching and learning process. One form of involvement is by actively asking the right questions on each material presented. These questions do not always have to be answered by the teacher because all students have the same opportunity to provide answers to the questions asked.

The inquiry learning model can make students learn meaningfully. Problem-solving is inextricably linked to meaningful science learning. Education emphasizes thinking, problem-solving, and thinking tendencies that strengthen students' experience, find significant concepts and built scientific attitudes that include efforts to build curiosity, be open-hearted, learn from mistakes, and persevere. The teacher invites students to be actively involved both physically and mentally in their learning. Students are asked to recognize problems and investigate in search of answers to their difficulties until they reach conclusions. With inquiry, student learning is enhanced (Katan & Baarts, 2021), and students can think well (Budnyk et al., 2021).

Various attempts have been made to increase further the numbers of completeness of learning outcomes, including clearly explaining the ease and benefits obtained when learning using the inquiry learning model. Provide apperception or motivation to students so that they are enthusiastic about learning. Pay attention to knowledge, take a personal approach, and try to ask about students' inability to learn biology. Encourage to study more diligently to get better grades than before. Besides that, it explains the material in more detail and clarity in a dialect that is quick to understand and provides examples in everyday

life. Students who were involved in investigative activities showed better learning progress (Cottone & Yoon, 2020). Explain well-known terms that are difficult to understand and are not confusing when answering evaluation questions. Make students more enthusiastic about learning to get better grades than before, assigning students to prepare the media long before learning if there are media that isn't easy to bring the teacher who will provide.

Control students well by walking in each group. Teachers don't just stay put. They were giving punishment and warning if students do not want to join their group friends. It can also be given notice and penalty to noisy students, especially students who do not wish to join their group friends. Giving punishment by asking students to explain the material explained by the teacher again motivates students by saying that the teacher appreciates students who dare to clarify the discussion results and provide more value. Inquiry learning facilitates the transfer of knowledge (Wang & Guo, 2021). By helping students to be confident and dare to ask, answer questions, and make conclusions with their sentences, the teacher can point to students who seem less active in initial activities. And core activities to conclude to find out the extent to which students understand the lesson, increase self-confidence in their abilities, and give students confidence that work that is done alone will provide good results.

The increase in learning outcomes occurs because students are getting used to applying the inquiry learning model. Learners are involved from the beginning of planning and given full control of the material they are investigating. Share tasks and cooperate in working on group assignments. Based on the indicators of success, it can be said that this research was successful. Successfully is evident from the total students of class X MIPA 4; there are 34 students or 88.23% in the complete learning category, so the research is successful. Investigations and real-life activities in science such as inquiry provide new insights into how students conceptualize their knowledge (Peffer et al., 2020). The Inquiry method in biology learning can improve student learning outcomes where there is an increase in learning interest among students who follow the inquiry model's use. Students give positive responses to the inquiry learning model in biology lessons so that this inquiry learning model is a new knowledge as a prospective teacher. It can develop and can be a reference for other researchers and strengthen the quality of the teaching and instructional process for biology teachers to enhance their learning outcomes.

CONCLUSION

Based on the results of the class action research conducted at SMA Negeri 1 Wonomulyo, it can be concluded that the implementation of the inquiry teaching strategy can enhance the learning outcomes of students in class X MIPA 4 SMA Negeri 1 Wonomulyo. The improvement in learning outcomes is shown by the Cycle I results to Cycle II study, i.e., the average value of student learning outcomes increased from 26.47% to 88.23%.

REFERENCES

Abdi, A. (2014). The effect of inquiry-based learning method on students' academic achievement in science course. *Universal Journal of Educational Research*, *2*(1), 37–41. https://doi.org/10.13189/ujer.2014.020104

Almuntasheri, S., Gillies, R. M., & Wright, T. (2016). The effectiveness of a guided inquiry-based, teachers' professional development programme on Saudi students' understanding of density. *Science Education International*, *27*(1), 16–39.

http://www.icaseonline.net/seiweb/index.php?option=com_content&view=article&id=109:volume-27-issue-1-2016&catid=41:archive-2011-2014&Itemid=119
Anam, K. (2015). Pembelajaran berbasis inkuiri metode dan aplikasi. In *Yogyakarta: Pustaka Pelajar*.
Arikunto, S. (2015). Penelitian tindakan kelas (classroom action research-CAR). In S. Arikunto, Suhardjono, & Supardi (Eds.), *Penelitian Tindakan Kelas (Edisi Revisi)* (p. 260). Bumi Aksara.
Ayuwanti, I. (2017). Meningkatkan Aktivitas dan hasil belajar matematika menggunakan model pembelajaran kooperatif tipe group investigation di smk tuma'ninah yasin metro. *SAP (Susunan Artikel Pendidikan)*, *1*(2).
Budnyk, O., Protas, O., Voloshchuk, H., Berezovska, L., & Rusakova, O. (2021). Current challenges in the conditions of distance education: Inquiry based learning. *Revista Inclusiones*, 210–222.
Chen, R. H. (2021). Fostering students' workplace communicative competence and collaborative mindset through an inquiry-based learning design. *Education Sciences*, *11*(1). https://doi.org/10.3390/educsci11010017
Cobern, W. W., Schuster, D., Adams, B., Applegate, B., Skjold, B., Undreiu, A., Loving, C. C., & Gobert, J. D. (2010). Experimental comparison of inquiry and direct instruction in science. *Research in Science & Technological Education*, *28*(1), 81–96.
Cottone, A. M., & Yoon, S. (2020). Improving the design of undergraduate biology courses toward the goal of retention: the case of real-world inquiry and active learning through metagenomics. *Journal of Microbiology \& Biology Education*, *21*(1).
Damopolii, I., Keley, U., Rianjani, D. T., Nunaki, J. H., Nusantari, E., & Kandowangko, N. Y. (2020). Potential of inquiry-based learning to train student's metacognitive and science process skill. *Jurnal Ilmiah Peuradeun*, *8*(1), 83–98.
Damopolii, I., Lefaan, P. T., & Manga, M. (2018). Hubungan motivasi belajar dengan hasil belajar biologi siswa di SMP 21 Rendani Manokwari. *Prosiding Seminar Nasional Pendidikan Biologi*, *1*(1), 427–430.
Damopolii, I., Yohanita, A. M., Nurhidaya, N., & Murtijani, M. (2018). Meningkatkan keterampilan proses sains dan hasil belajar siswa melalui pembelajaran berbasis inkuiri. *Jurnal Bioedukatika*, *6*(1). https://doi.org/10.26555/bioedukatika.v6i1.8029
Hamidi, S., & Ahda, Y. (2020). Implementation of guided inquiry learning models aid of LKS to improve the competency of learning science biology in class VIII. D MTsN Padang Panjang. *International Journal of Progressive Sciences and Technologies*, *22*(1), 176–181.
Jayawardana, H. B. A. (2015). Pengaruh penerapan metode guided inquiry terhadap aktivitas dan hasil belajar biologi siswa kelas X SMA N 2 Banguntapan. *Jurnal Bioedukatika*, *3*(2), 1–8. https://doi.org/10.26555/bioedukatika.v3i2.4147
Katan, L., & Baarts, C. A. (2021). Improving student learning through inquiry-based reading. *Teaching in Higher Education*, 1–16. https://doi.org/10.1080/13562517.2021.1872529
Kurniawan, R. P., Damopolii, I., & Sirait, S. H. K. (2021). The correlation between biology teacher learning strategies during the covid-19 pandemic on student motivation. In *AECON* (pp. 299–305).
Maisaroh, M., & Rostrieningsih, R. (2010). Peningkatan hasil belajar siswa dengan menggunakan metode pembelajaran active learning tipe quiz team pada mata pelajaran keterampilan dasar komunikasi di SMK Negeri 1 Bogor. *Jurnal Ekonomi Dan Pendidikan*, *7*(2), 17197.
Makawiyah, & Zuraida. (2021). Penerapan model pembelajaran inkuiri untuk meningkatkan hasil belajar siswa SMA Negeri 1 Kembang Tanjong pada Materi Keanekaragaman Hayati. *Jabal Ghafur Conference on Research and Community Services*, *1*(1), 160–169.

Nasir, N. I. R. F., Damopolii, I., & Nunaki, J. H. (2020). Pengaruh pembelajaran inkuiri terhadap level berpikir siswa SMA. *Bioilmi: Jurnal Pendidikan*, *6*(2), 112–119.

Novelsa, D. (2016). *Penerapan model inquiry untuk meningkatkan aktivitas dan hasil belajar IPA siswa kelas IV SD Negeri 4 Sumbergede*. UNIVERSITAS LAMPUNG.

Nowak, K. H., Nehring, A., Tiemann, R., & Upmeier Zu Belzen, A. (2013). Assessing students abilities in processes of scientific inquiry in biology using a paper-and-pencil test. *Journal of Biological Education*, *47*(3), 182–188. https://doi.org/10.1080/00219266.2013.822747

Nunaki, J. H., Damopolii, I., Nusantari, E., & Kandowangko, N. Y. (2019). The contribution of metacognitive in the inquiry-based learning to students' thinking skill based on SOLO Taxonomy. *Journal of Physics: Conference Series*, *1321*, 032044. https://doi.org/10.1088/1742-6596/1321/3/032044

Nunaki, J. H., Siagian, S. I. R., Nusantari, E., Kandowangko, N. Y., & Damopolii, I. (2020). Fostering students' process skills through inquiry-based science learning implementation. *Journal of Physics: Conference Series*, *1521*(4), 42030.

Peffer, M. E., Ramezani, N., Quigley, D., Royse, E., & Bruce, C. (2020). Learning analytics to assess beliefs about science: evolution of expertise as seen through biological inquiry. *CBE—Life Sciences Education*, *19*(3), ar47. https://doi.org/10.1187/cbe.19-11-0247

Peng, J. (2020). Strategy research on biology experiment inquiry teaching of junior middle school from the perspective of core literacy. *Frontiers in Educational Research*, *3*(5), 111–114. https://doi.org/https://doi.org/10.25236/FER.2020.030523

Purwadewi, R., & Ruqoyyah, S. (2021). Kemampuan pemahaman pada materi bangun datar untuk siswa kelas II di sekolah dasar melalui metode inkuiri berbantuan media kertas lipat. *Collase: Creative of LEarning Students Elemntary Education*, *04*(01), 9–15.

Supartiyani. (2020). Penggunaan model pembelajaran inkuiri terbimbing sebagai upaya meningkatkan prestasi belajar PKN tema keluargaku siswa. *MPI*, *1*(3), 196–201.

Wang, X., & Guo, L. (2021). How to promote university students to innovative use renewable energy? an inquiry-based learning course model. In *Sustainability* (Vol. 13, Issue 3). https://doi.org/10.3390/su13031418