Jurnal Pendidikan Indonesia
Volume 12, Number 1, 2023 pp. 59-67
P-ISSN: 2303-288X E-ISSN : 2541-7207
Open Access: https://doi.org/10.23887/jpiundiksha.v12i1.50163

Pro-Environmental Behavior Learning by Using a Mini Research Project and Its Impact on Problem Solving Abilities

Evita Anggereini[1*], Upik Yelianti[2], Intan Hermaya[3]

[1,2,3] Biology Education, Faculty Of Teacher Training And Educational Sciences, Universitas Jambi, Jambi, Indonesia

ARTICLE INFO

Article history:
Received January 05, 2023
Revised January 09, 2023
Accepted March 20, 2023
Available online March 25, 2023

Kata Kunci:
Problem Solving, mini research, pro environmental behavior

Keywords:
Problem Solving, mini research, pro environmental behavior

This is an open access article under the CC BY-SA license.

Copyright ©2023 by Author. Published by Universitas Pendidikan Ganesha.

ABSTRAK

Saat ini siswa diharapkan memiliki kemampuan memecahkan masalah lingkungan, khususnya dalam kehidupan sehari-hari, yang dikenal dengan perilaku atau tindakan pro lingkungan. Salah satu strategi dalam mengajarkan kemampuan pemecahan masalah siswa adalah dengan pembelajaran mini research untuk memecahkan masalah di lingkungan sekitar khususnya dalam lingkup biologi. Penelitian ini bertujuan untuk menganalisis pengaruh pembelajaran perilaku pro lingkungan dengan menggunakan mini research project terhadap kemampuan pemecahan masalah dan seberapa besar pengaruhnya terhadap siswa di SMA. Metode penelitian yang digunakan adalah kuantitatif asosiatif dengan tipe komparatif. Populasi dalam penelitian ini adalah siswa kelas X SMA pada kelas IPA dan dari populasi ini akan diambil sampel dengan menggunakan teknik simple random sampling, dengan jumlah sampel sebanyak 96 siswa dari tiga kelas. Prosedur penelitian ini meliputi tahap persiapan, tahap pelaksanaan dan tahap analisis data. Instrumen penelitian yang digunakan berupa lembar pertanyaan dan angket. Berdasarkan data yang diperoleh, skor rata-rata nilai pemecahan masalah tertinggi adalah 74,7 dan terendah adalah 68,9. Maka dapat disimpulkan bahwa terdapat pengaruh penggunaan pembelajaran dengan mini research project terhadap kemampuan pemecahan masalah. Implikasi dari penelitian ini adalah dapat digunakan oleh staf pengajar sebagai acuan dalam menggunakan model pembelajaran terpadu mini research perilaku pro lingkungan untuk meningkatkan kemampuan pemecahan masalah siswa.

ABSTRACT

Currently students are expected to have the ability to solve environmental problems, especially in everyday life, which is known as pro-environmental behavior or actions. One of the strategies in teaching students' problem solving abilities is by learning mini research to solve problems in the surrounding environment, especially in the scope of biology. This study aims to analyze the effect of pro-environmental behavior learning by using a mini research project on problem solving abilities and how much influence it has on students in Senior High School. The research method used is associative quantitative with comparative type. The population in this study were students of ten grade Senior High School in science class and from this population a sample would be taken using simple random sampling technique, with a total sample of 96 students from three classes. This research procedure includes the preparation stage, implementation stage and data analysis stage. The research instruments used were in the form of question sheets and questionnaires. Based on the data obtained, the average score of the highest problem solving value is 74.7 and the lowest is 68.9. Then it can be concluded that there is an influence from the use of learning with a mini research project on problem solving abilities. The implication of this research is that it can be used by teaching staff as a reference in using the integrated mini research learning model of pro environmental behavior to improve students' problem solving abilities.

*Corresponding author
E-mail addresses: evita.anggereini@unja.ac.id (Evita Anggereini)

1. INTRODUCTION

Learning that aims to improve students' abilities optimally must be carried out through structured and measurable steps. A good learning structure is applied gradually starting from simple to complex steps, because all these steps are made so that they can be measured, both in terms of implementation and achievement and apply in general, including in learning Natural Sciences (IPA) such as biology, physics, chemistry, geology, and astronomy (Amin et al., 2021; Kamid, Sofnidar, et al., 2021). Biology is one of the branches of science that studies living things and their environment. Where in the implementation of learning a lot about everything that exists in nature such as the environment (Insyasiska et al., 2015; Mustofa & Hidayah, 2020). The environment has various kinds of problems that have not been resolved, so the problem solving abilities of students need to be improved to help improve environmental conditions.

In biology learning, students' problem-solving abilities are still low in observing physical phenomena that exist in nature. Poor problem solving ability can be one of the causes of not achieving the expected learning outcomes (Bayley, 2022; Ramdan et al., 2018). Problem-solving skills are very important, not only for those who deepen mathematics, but also the ability to understand and solve real-world situations or everyday life. Problem solving skills are important because they can show students' abilities in understanding, choosing approaches, solving strategies and solving models to solve problems (Maharani & Kartini, 2019; Turkmen & USTA, 2016). *Problem solving*provide understanding by stimulating students to pay attention, examine and think about a problem to further analyze the problem as an effort to solve the problem(Ariyanto et al., 2018; Budiarti, Kurniawan, & Rohana, 2022; M. D. W. Ernawati et al., 2022). According to previous study students who are trained in solving problems will be able to make decisions, because they have skills on how to collect relevant information, analyze information, and realize how necessary it is to re-examine the results they have obtained (Amelia & Pujiastuti, 2020; Surur & Tartilla, 2019). Learners can gather information through the study of various reliable sources and analyze whether the information obtained is in accordance with the expected information. The information that has been analyzed can be re-analyzed whether the scope of the discussion that has been obtained is as expected so that there are no errors and can become a new science that can be accounted for. In addition, according to other study problem solving can also train students to face various problems, both individual and group problems to be solved alone or together (Utami et al., 2017).

Someone who can solve problems well will be able to recognize the existing situation and identify problems, as well as recognize concepts and principles that are relevant to the problem, so that they can develop ways to solve problems and then carry out problem solving procedures appropriately (Habibi et al., 2020; Kamid, Rohati, et al., 2021b). Therefore, learning with problem solving is important to apply to students because according to previous study psychologically, conceptual understanding has increased because problem solving learning activities make students optimal in absorbing and connecting declarative knowledge and procedural knowledge (Sadiqin et al., 2017). There is a relationship between problem-solving skills with learning and everyday life, This results in how important it is for each individual to have problem-solving abilities (M. D. Ernawati et al., 2021; Kamid, Syaiful, et al., 2021). Thus providing an understanding that problem solving applied in schools will greatly help students to solve problems in their daily environment.

Solving problems in the environment, especially in everyday life, can be studied with pro-environmental behavior or actions where students are trained to have environmental care characters and can maintain and care for the environment properly. Pro-environmental behavior is generally defined as behavior to reduce environmental impacts caused by humans, and is behavior that can improve environmental quality (Rahman, 2020; Zhang et al., 2014). Environmentally friendly behavior is environmentally conscious behavior in order to protect the environment from the damage and impacts of world development (Fielding & Hornsey, 2016; Nadiroh et al., 2019). According to previous study pro-environmental behavior is human behavior or action in reducing or minimizing environmental damage and improving the environment related to the behavior of efforts to reuse used goods, recycle waste, responsible consumption, energy conservation efforts, and transportation behavior that tends to be free from pollution (Andzari et al., 2021). This pro-environmental behavior must be owned by every individual to reduce environmental damage which must be instilled as early as possible so that environmental awareness can be obtained through education, both formal and non-formal. Therefore, mini research learning can be an alternative for students to solve problems that exist in the surrounding environment, especially in the scope of biology. Mini research learning which is contextual learning by observing the surrounding environment in the scope of small sample groups and this learning focuses on the core principles and concepts of a scientific discipline, involves students in solving problems and other task activities, giving students the opportunity to work autonomously in construct their own knowledge and

reach its peak to produce real products (Suroso Mukti Leksono & Ekanara, 2019; Nouraey et al., 2020). Meanwhile, according to previous study mini research learning is a learning model that uses problems as the first step in collecting and processing information (S. M. Leksono, 2016). Existing problems will be examined and solutions are sought through various relevant studies and similar previous problems so that solutions can be found that can overcome these problems.

This research mini learning can also be interpreted simply as a scientific paper, which has the aim that students or students who have ideas in solving problems in a problem can be poured or expressed. Research mini learning can grow students' skills while increasing their understanding (Musa et al., 2022; Williams et al., 2009). The increase that occurs because students actively participate or are directly involved in the source of the problem during learning so as to provide a meaningful experience during learning. Mini research or mini research at least includes questions (hypotheses, main objectives), theories, instruments, data collection, data analysis, and conclusions (Meedan, 2016; Williams et al., 2009). Previous research conducted by previous study researched environment-based education is in line with the research currently being carried out by researchers (Laksana et al., 2019). With the results of previous studies it was obtained that the educational environment taught transversally in schools is important and that teaching practices should be promoted in the use of materials, institutional support, and didactic resources that focus on the promotion of environmental attitudes, skills and values in children. The difference is that in the current study, generalization is carried out, namely research carried out at the high school level and there is a renewal, namely measuring the comparison of student problem solving abilities in each class and measuring the effect of environmental behavior learning in the form of mini research on student problem solving abilities. Based on the explanation above, here the researcher aims to conduct research in an effort to analyze the problem-solving abilities of students with the form of mini research in learning environmental behavior. Second, knowing the differences in the problem solving abilities of students in each class in learning environmental behavior in the form of mini research. Third, knowing the effect of learning environmental behavior in the form of mini research on students' problem solving abilities.

2. METHOD

This type of research is quantitative associative and comparative. Where associative quantitative aims to determine the relationship of two or more variables. This research can build a theory that can function to explain, predict and control a symptom. While comparative quantitative is a research that compares two or more variables. The variables are still the same as independent variable studies but for more than one sample, or at different times (Nana & Elin, 2018). The population is a collection of people used by researchers with special characteristics to draw conclusions after previously studied (Dewi et al., 2019). The population in this study were students of SMAN class X MIPA and samples from this population would be taken using a simple random sampling technique. So that obtained a sample of 96 students from classes of 3 classes, each of which amounted to 32 students.

This research procedure includes the preparation stage, implementation stage and data analysis stage. In the preparation stage, a mini research-based pro-environment behavior learning strategy is prepared which will later be applied to students in the classroom. In addition, at the preparation stage, searches, collection and identification of problem solving questions are also carried out in accordance with the indicators so that they can be used to measure students' problem solving skills in biology subjects. The next stage is implementation, namely implementing the preparation stage in the form of teaching using a mini research-based pro-environmental behavior learning strategy and giving 10 essay questions according to the material being taught and giving a questionnaire with 25 statements related to students' problem solving skills in learning biology.

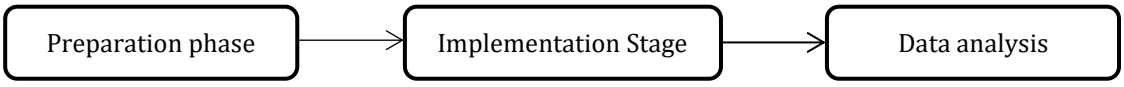

Figure 1. Pro-environmental behavior learning strategy based on mini research

The research instruments used were in the form of question sheets and questionnaires. The questions consist of 10 essay questions with problem solving indicators for each question contained in table 1 and the questionnaire consists of 25 statements with a Likert scale of SS (Strongly Agree), S (Agree), RR (Doubtful), TS (Disagree) , STS (Strongly Disagree). Indicators of biology problem solving is show in Table 1.

Table 1. Indicators of Biology Problem Solving

Problem Solving Indicator	Question Number
Identify the problem	1.2
Formulate alternative solutions	3,4,5
Define and implement preferred solutions	6,7,8
Check and evaluate solutions	9.10

Data analysis is intended to test hypotheses and answer the proposed problem formulation. The data that has been collected was analyzed using regression tests to determine the effect of implementing pro-environmental behavior learning strategies based on mini research on students' problem solving abilities and using the t test to see the differences in students' problem solving abilities between classes AB, BC and AC. This data analysis was assisted by using SPSS 26 software for windows.

3. RESULT AND DISCUSSION

Result

The data presented in Figure 2 shows the average score of biology practice with problem solving indicators using the mini research learning model in classes A, B and C. Of the three classes, students in class A have an average problem solving score that is higher. excels with a value of 74.7 while in class B has the lowest score with an average value of students in problem solving of 68.9 and in class C has an average value of problem solving of 71.3. Regression test is show in Table 2.

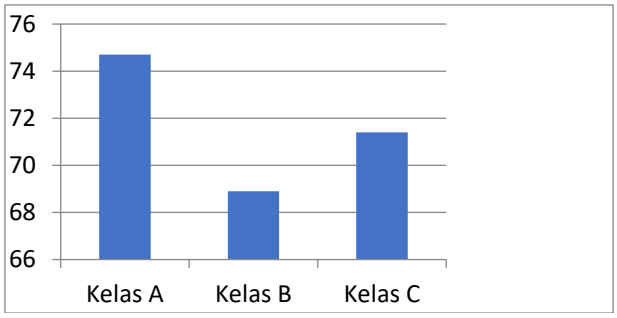

Figure 2. The Average Problem Solving Ability Of Students

Table 2. Regression Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1864931	1	1864931	8.321	0.005b
	Residual	21068.402	94	224.132		
	Total	22933.333	95			

From Table 2, it is known that the calculated F value is 8.321 with a significance level of 0.005 <0.05, so it can be concluded that there is an effect of problem solving on student learning outcomes. T-test of class A and B is show in Table 3.

Table 3. T-Test Class A and B

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Problem solving ability	Equal variances assumed	0.815	0.370	1.498	62	0.139	5.781	3.860	-1.936	13.498
	Equal variances not assumed			1.498	61.9	0.139	5.781	3.860	-1.936	13.498

Based on Table 3 show the output of the T-test, it is known that the 2-tailed significance value for the class A and B tests is 0.139, meaning 0.139 > 0.05, which means that there is no significant difference between learning outcomes in class A and class B. Then the result of T-test from class B and C is show in Table 4.

Table 4. T-Test Class B and C

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
student learning outcomes with problem solving	Equal variances assumed	0.308	0.581	-0.526	62	0.601	-2.031	3.864	-9.755	5.692
	Equal variances not assumed			-0.526	61.9	0.601	-2.031	3.864	-9.755	5.692

Base on Table 4 show class B and C tests, the significance of the 2 taileds obtained is 0.601, meaning 0.601 > 0.05, which means that there is no significant difference between learning outcomes in class B and class C. The result of T-Test Class A and C is show in Table 5**.**

Table 5. T-Test Class A and C

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
problem solving results	Equal variances assumed	1.316	0.256	-1.904	62	0.062	-6.406	3.365	-13.132	0.320
	Equal variances not assumed			-1.904	57.7	0.062	-6.406	3.365	-13.142	0.329

Base on Table 5 show the results of the T test in classes A and C, the 2-tailed significance value obtained is 0.006, meaning 0.006 <0.05, which means that there is a significant difference between the learning outcomes of students in classes A and C.

Discussion

This study aims to determine the ability of problem solving or problem solving of students with pro-environmental behavior learning which is carried out by carrying out a mini research project by looking at the significance value of the correlation test and t test which was carried out on the data obtained from 96 students who were divided into three classes. . Based on the results that have been obtained from the tests that have been carried out by conducting data analysis with the t-test, it can be seen whether there are differences in the problem solving abilities of students in pro-environmental behavior learning that is carried out through mini research. The difference obtained between classes A and B on their problem solving abilities is that there is no significant difference between the learning outcomes obtained by class A and class B because the significance obtained is > 0.05, which is 0.139. For classes B and C there is also no significant difference between the learning outcomes obtained by students in class B and C when conducting pro-environmental behavior learning through activities in the form of a mini research project by looking at the ability of students to solve problems, because the significance results obtained through the test performed is 0.601 which means it is greater (> 0.05). Based on the analysis conducted on the resulting data through regression testing, the results can also be obtained, namely that there is an effect of pro-environmental behavior learning carried out by mini research on the problem solving abilities of students. These results are known from the significance value obtained through the regression test is 0.005 which means > 0.05. The basis for making these decisions is as according to Pasaribu, et al (2020) that the basis for making simple linear regression test decisions: 1) By comparing the value of t count with t table; 2) By comparing the significance value or in SPSS Software written sig. with a probability value of 0.05. Record decision: 1) If the value of t count is greater than t

table (t count > t table) it can be concluded that the independent variable (x) has an effect on the dependent variable (y); 2) If the value of t count is less than t table (t count < t table) it can be concluded that the independent variable (x) has no effect on the dependent variable (y).

To compare the significance value or in SPSS Software written sig. with a probeability value of = 0.05. 1) If the significance value is greater than the probability value of 0.05 (sig. count from SPS > 0.05), it can be concluded that the independent variable (x) has no effect on the dependent variable; 2) (sig. count from SPSS <0.05) it can be concluded that the independent variable (x) has an effect on the dependent variable (y). Differences in problem solving abilities of students from three classes, namely class A, B and C. Significant differences in the problem solving abilities of students can only be seen between class A and class C. Meanwhile, for classes A and B and classes B and C, the results are the same, that is, there is no significant difference. This is because the results of students' problem solving abilities have scores that are not far away, only between classes A and C the difference in results is visible. The difference in the average value of problem solving occurs because students do not understand the concept of the problem. This is reinforced by the previous research which states that an error is caused by ignorance of the concept of the subject because to understand the meaning of the questions that have been presented, the subject must master the material and know the concepts related to the questions (Greiff et al., 2013). Students who lack self-confidence tend to solve problems according to procedures and prioritize memorization so they tend to be weak in making decisions (Budiarti, Kurniawan, Septi, et al., 2022; Kamid, Rohati, et al., 2021a; Pebianto et al., 2018)

The data also shows that not all students have the same problem solving abilities. Problem solving abilities are obtained through strategies and learning models used by teachers during their learning in class. Learning that does not support students' problem solving abilities makes students weak in planning and completing so that students have less time to write a complete and detailed problem analysis. Students tend to focus their work on the final three steps rather than the initial steps which are actually also important (Dewi et al., 2019; Kurnia Putri et al., 2019). Uncertain learning makes students think in solving problems, making students find it difficult to work, determining strategies, determining formulas to solve problems from existing problems.

In pro-environmental behavior learning, students will learn how to behave to reduce environmental damage and how to improve it. Then because this learning is done with mini research, which means students have to do a small research to solve a problem. Students must of course have an active attitude to be able to do this learning. Where in this mini research, students must make a hypothesis, then objectives, instruments, collect data, analyze data, and conclude, so that in the process it will be seen how the ability of students to solve problems (problem solving) in their mini research. Pro-environmental behavior will certainly not be formed if the teacher does not condition learning (Baga et al., 2022; Spínola, 2015). Previous study also stated that knowledge and understanding can shape pro-environmental behavior if you pay attention to the right evaluation instruments (Shirokova et al., 2016). So that teachers do not only assess the pro-environmental behavior of students through what they see, but also assess students' pro-environmental behavior. using an evaluation instrument in order to find out how the perspective of students is and the extent of understanding that has been obtained.

Mini research-based learning helps students develop problem solving skills by using complex problems that need to be studied systematically. Likewise, research that state the learning process using mini research can make it easier for students to solve problems (Suroso Mukti Leksono & Ekanara, 2019). Research in pro-environmental behavior learning by other study reveals a positive relationship between environmental-based learning or pro-environmental behavior with problem-solving abilities, meaning that environmental-based learning can improve problem-solving abilities (Andzari et al., 2021). Previous research examines the problem solving skills of biology education students through environmental learning based on an integrated mini research project on proenvironmental behavior where students solve problems with the environment as the problem (Karagöz & Çakir, 2011). In addition, other study also researched about mini research proenvironmental behavior which measures students' critical attitude skills and the results of the study stated that learning about the environment using mini research was effectively applied in learning (Wardani et al., 2022). Discussion is the most important part of the entire contents of scientific articles. The objectives of the discussion are: answering research problems, interpreting findings, integrating findings from research into existing sets of knowledge and composing new theories or modifying existing theories. The implication of this research is that it can be used by teaching staff as a reference in using the integrated mini research learning model of pro environmental behavior to improve students' problem solving abilities. In addition, the limitations of this study are that this research was only conducted on biology students, and is not known to students of other study programs, and this research was only conducted at the university level. So the researcher recommends

that further research be conducted and integrate learning mini research integrated pro-environmental behavior on variables other than problem solving such as critical thinking skills.

4. CONCLUSION

Problem Solving is the ability to solve a problem or problem. The problem solving ability of students in this study was carried out in pro-environmental behavior learning by using mini research. The problem solving ability of students in carrying out their mini research will run well if these students are able to understand the problem in the problem, then are able to plan a solution in this case, not only planning, but also being able to carry out the solution, and check the mini research. can solve the problem or not. The results obtained in this study after data collection and testing were carried out, there were differences in the average values obtained by students, then there is the influence of pro-environmental behavior learning by using a mini research project on problem solving abilities. Furthermore, the difference in the results obtained that determine the problem solving ability of students in each class is that there is a significant difference between class A and B. The problem solving ability of students will grow well if learning is carried out using scientific methods in solving the problem, namely in the form of mini research projects.

5. REFERENCES

Amelia, S. R., & Pujiastuti, H. (2020). Analisis Kemampuan Berpikir Kreatif Matematis Melalui Tugas Open-Ended. *Jurnal Pembelajaran Matematika Inovatif*, *3*(3), 247–258. https://doi.org/10.22460/jpmi.v3i3.247-258.

Amin, A., Alimni, Azzahra, M. Z., & Septi, S. E. (2021). Associative and Comparative Study on Students' Perseverance and Religious in Islamic Education Subject. *Pendidikan Progresif*, *11*(3), 676–691. https://doi.org/10.23960/jpp.v11.i3.

Andzari, A., Purwandari, D. A., & Yuliani, S. (2021). Hubungan Budaya Sekolah dengan Pro Environmental Behavior Siswa. *Jurnal Pendidikan Lingkungan Dan Pembangunan Berkelanjutan*, *22*(01), 1–10. https://journal.unj.ac.id/unj/index.php/plpb/article/view/19945.

Ariyanto, M. F., Kristin, I., & Anugraheni. (2018). Penerapan Model Pembelajaran Problem Solving untuk Meningkatkan Kemampuan Berpikir Kritis dan Hasil Belajar Siswa. *Jurnal Guru Kita*, *2*(3), 106–115.

Baga, S., Astuty, E. R., Astra, I. M., Budiaman, B., & Hasanah, U. (2022). Perilaku Pro-Lingkungan Peserta Didik Berdasarkan Media Pembelajaran dan Gender. *Jurnal Basicedu*, *6*(5), 8368–8380. https://doi.org/10.31004/basicedu.v6i5.3809.

Bayley, S. H. (2022). Learning for adaptation and 21st-century skills: Evidence of pupils' flexibility in Rwandan primary schools. *International Journal of Educational Development*, *93*(March 2021), 102642. https://doi.org/10.1016/j.ijedudev.2022.102642.

Budiarti, R. S., Kurniawan, D. A., & Rohana, S. (2022). A Comparison by Gender: Interest and Science Process Skills. *Journal of Education Research and Evaluation*, *6*(1), 88–97. https://doi.org/10.23887/jere.v6i1.37723.

Budiarti, R. S., Kurniawan, D. A., Septi, S. A., & Perdana, R. (2022). Differences and Relationship Between Attitudes and Self Efficacy of Female and Male Students in Science Subjects in Junior High School. *Jurnal Pendidikan Sains Indonesia*, *10*(1), 73–88. https://doi.org/10.24815/jpsi.v10i1.21979.

Dewi, N. N. K., Kristiantari, M. . R., & Ganing, N. N. (2019). Pengaruh Model Pembelajaran Picture and Picture Berbantuan Media Visual terhadap Keterampilan Menulis Bahasa Indonesia. *Journal of Education Technology*, *3*(4), 278–285. https://doi.org/http://dx.doi.org/10.23887/jet.v3i4.22364.

Ernawati, M. D., Asrial, Perdana, R., Septi, S. E., & Rahmi. (2021). Evaluation of Students' Attitudes and .Science Process Skills toward Middle School Science Subject in Indonesia. *Jurnal Pendidikan Progresif*, *1*(2), 258–274. https://doi.org/10.23960/jpp.v1.

Ernawati, M. D. W., Asrial, A., Perdana, R., Septi, S. E., Rohana, S., & Nawahdani, A. M. (2022). Evaluation of Students' Interest, Attitudes, and Science Process Skills in Science Subjects. *Journal of Education Research and Evaluation*, *6*(1), 181–194. https://doi.org/10.23887/jere.v6i1.37583.

Fielding, K. S., & Hornsey, M. J. (2016). A social identity analysis of climate change and environmental attitudes and behaviors: Insights and opportunities. In *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2016.00121.

Greiff, S., Fischer, A., Wüstenberg, S., Sonnleitner, P., Brunner, M., & Martin, R. (2013). A multitrait-multimethod study of assessment instruments for complex problem solving. *Intelligence*, *41*(5), 579–596. https://doi.org/10.1016/j.intell.2013.07.012.

Habibi, Mundilarto, Jumadi, J., Gummah, S., Ahzan, S., & Prasetya, D. S. B. (2020). Project brief effects on creative thinking skills among low-ability pre-service physics teachers. *International Journal of Evaluation and Research in Education*, *9*(2), 415–420. https://doi.org/10.11591/ijere.v9i2.20531.

Insyasiska, D., Zubaidah, S., & Susilo, H. (2015). Pengaruh project based learning terhadap motivasi belajar, kreativitas, kemampuan berpikir kritis, dan kemampuan kognitif siswa pada pembelajaran biologi [The effect of project based learning on learning motivation, creativity, critical thinking skills, a. *Jurnal Pendidikan Biologi*, *7*(1), 9–21. https://doi.org/http://dx.doi.org/10.17977/um052v7i1p9-21.

Kamid, K., Rohati, R., Rahmalisa, Y., Anggo, M., Septi, S. E., Azzahra, M. Z., & Nawahdani, A. M. (2021a). Engklek Game" in mathematics: How difference and relationship student attitude towards science process skills? *Cypriot Journal of Educational Sciences*, *16*(6), 3109–3123. https://doi.org/10.18844/cjes.v16i6.6500.

Kamid, Rohati, Rahmalisa, Y., Anggo, M., Septi, S. E., Azzahra, M. Z., & Nawahdani, A. M. (2021b). Engklek Game " in mathematics : How difference and relationship student attitude towards science process skills ? *Cypriot Journal of Educational Sciences*, *16*(6), 3109–3123. https://doi.org/https://doi.org/10.18844/cjes.v16i6.6500 Education.

Kamid, Sofnidar, Septi, S. E., & Citra, Y. D. (2021). The contribution of the traditional game of congklak to mathematics learning : How is the relationship and influence of interest , cooperative character and student responses. *Premiere Educandum : Jurnal Pendidikan Dasar Dan Pembelajaran*, *11*(October), 280–295. https://doi.org/10.25273/pe.v11i2.9995.

Kamid, Syaiful, Theis, R., Septi, S. E., & Widodo, R. I. (2021). Traditional " Congklak " Games and Cooperative Character in Mathematics Larning. *Jurnal Ilmiah Sekolah Dasar*, *5*(3), 443–451. https://doi.org/http://dx.doi.org/10.23887/jisd.v5i3.37740.

Karagöz, M., & Çakir, M. (2011). Problem Solving in Genetics: Conceptual and Procedural Difficulties. *Educational Sciences: Theory & Practice*, *11*(3), 1668–1674. https://eric.ed.gov/?id=EJ936343.

Kurnia Putri, D., Sulianto, J., & Azizah, M. (2019). Kemampuan Penalaran Matematis Ditinjau dari Kemampuan Pemecahan Masalah. *International Journal of Elementary Education*, *3*(3), 351. https://doi.org/10.23887/ijee.v3i3.19497.

Laksana, D. N. L., Dasna, I. W., & Degeng, I. N. S. (2019). The effects of inquiry-based learning and learning styles on primary school students' conceptual understanding in multimedia learning environment. *Journal of Baltic Science Education*, *1*(1). https://doi.org/10.33225/jbse/19.18.51.

Leksono, S. M. (2016). Pengaruh Pembelajaran Mini Riset Berbasis Kearifan Lokal Terhadap Kemampuan Penguasaan Materi Biologi Konservasi. *Proceeding Biology Education Conference*, *13*(1), 575–578. Leksono.

Leksono, Suroso Mukti, & Ekanara, B. (2019). Profil Kemampuan Berpikir Kritis Siswa Sma Melalui Pembelajaran Mini-Riset Berbasis Pendidikan Konservasi. *Jurnal.Untirta.Ac.Id*, *2*(1), 218–223. http://jurnal.untirta.ac.id/index.php/psnp/article/view/5648.

Maharani, N., & Kartini, K. S. (2019). Penggunaan google classroom sebagai pengembangan kelas virtual dalam keterampilan pemecahan masalah topik kinematika pada mahasiswa jurusan sistem komputer. *PENDIPA Journal of Science Education*, *3*(3), 167–173. https://doi.org/10.33369/pendipa.3.3.167-173.

Meedan, U. N. (2016). *Critical book report, critical jurnal review*.

Musa, M. M., Qudsiyah, W. H., & Rahman, A. D. (2022). Implementasi Literasi Digital Era Abad 21 Dalam Membentuk Karakter Peserta Didik MIS Soko Kota Pekalongan. *Caruban*, *5*(2), 161–170. https://doi.org/10.33603/caruban.v5i2.7184.

Mustofa, R. F., & Hidayah, Y. R. (2020). The effect of problem-based learning on lateral thinking skills. *International Journal of Instruction*, *13*(1), 463–474. https://doi.org/10.29333/iji.2020.13130a.

Nadiroh, N., Hasanah, U., & Zulfa, V. (2019). Behavioral geography: An ecoliteracy perspective and critical thinking skills in men and women. *Indonesian Journal of Geography*, *51*(2), 115–122. https://doi.org/10.22146/ijg.36784.

Nana, D., & Elin, H. (2018). Memilih Metode Penelitian Yang Tepat: Bagi Penelitian Bidang Ilmu Manajemen. *Jurnal Ilmu Manajemen*, *5*(1), 288. https://doi.org/10.2827/jeim.v5i1.1359.g1118.

Nouraey, P., Al-Badi, A., Riasati, M. J., & Maata, R. L. (2020). Educational Program and Curriculum Evaluation Models: A Mini Systematic Review of the Recent Trends. *Universal Journal of Educational Research*, *8*(9), 4048–4055. https://doi.org/10.13189/ujer.2020.080930.

Pebianto, A., Suhartina, R., Yohana, R., Mustaqimah, I. A., & Hidayat, W. (2018). Kemampuan Berpikir Kritis Matematis Siswa Sma Ditinjau Dari Gender. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *1*(4), 631. https://doi.org/10.22460/jpmi.v1i4.p631-636.

Rahman, A. A. (2020). Hubungan Antara Orientasi Nilai (Value Orientation) dengan Perilaku Pro Lingkungan (Pro Environmental Behavior) Siswa. *IJEEM - Indonesian Journal of Environmental Education and Management*, *5*(2), 152–164. https://doi.org/10.21009/ijeem.052.04.

Ramdan, Z. M., Veralita, L., Rohaeti, E. E., & Purwasih, R. (2018). Analisis Self Confidence Terhadap Kemampuan Pemecahan Masalah Matematis Siswa Smk Pada Materi Barisan Dan Deret. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *7*(2), 171. https://doi.org/10.24127/ajpm.v7i2.1335.

Sadiqin, I. K., Santoso, U. T., & Sholahuddin, A. (2017). Pemahaman Konsep IPA Siswa SMP Melalui Pembelajaran Problem Solving pada Topik Perubahan Benda-benda di Sekitar Kita. *Jurnal Inovasi Pendidikan IPA*, *3*(1), 52–62. https://doi.org/10.21831/jipi.v3i1.12554.

Shirokova, G., Osiyevskyy, O., & Bogatyreva, K. (2016). Exploring the intention-behavior link in student entrepreneurship: Moderating effects of individual and environmental characteristics. *European Management Journal*, *34*(4), 386–399. https://doi.org/10.1016/j.emj.2015.12.007.

Spínola, H. (2015). Environmental Literacy Comparison between Students Taught in Eco-schools and Ordinary Schools in the Madeira Island Region of Portugal. *Science Education International*, *26*(3), 392–413. https://digituma.uma.pt/handle/10400.13/1361.

Surur, M., & Tartilla, T. (2019). Pengaruh Problem Based Learning Dan Motivasi Berprestasi Terhadap Kemampuan Pemecahan Masalah. *Indonesian Journal of Learning Education and Counseling*, *1*(2), 169–176. https://doi.org/10.31960/ijolec.v1i2.96.

Turkmen, H., & USTA, E. (2016). Student misconceptions about force and acceleration in physics and engineering mechanics education. *Kastamonu Education Journal*, *13*(2), 19–29. https://doi.org/10.1088/1742-6596/1157/2/022034.

Utami, L. O., Utami, I. S., & Sarumpaet, N. (2017). Penerapan Metode Problem Solving Dalam Mengembangkan Kemampuan Kognitif Anak. *Tunas Siliwangi*, *3*(2), 175–180. https://doi.org/10.22460/ts.v3i2p175-180.649.

Wardani, K., Prayogo, M. M., & Hangestiningsih, E. (2022). Penerapan program sekolah ramah anak di SD Negeri Tlacap pada masa pandemi covid-19. *Jurnal Fundadikdas (Fundamental Pendidikan Dasar)*, *4*(3), 278–294. https://doi.org/10.12928/fundadikdas.v4i3.4891.

Williams, M. K., Foulger, T. S., & Wetzel, K. (2009). Preparing Preservice Teachers for 21st Century Classrooms: Transforming Attitudes and Behaviors About Innovative Technology. *Journal of Technology and Teacher Education*, *17*(3), 393–418. https://www.learntechlib.org/primary/p/28216/.

Zhang, Y., Zhang, H. L., Zhang, J., & Cheng, S. (2014). Predicting residents' pro-environmental behaviors at tourist sites: The role of awareness of disaster's consequences, values, and place attachment. *Journal of Environmental Psychology*, *40*, 131–146. https://doi.org/10.1016/j.jenvp.2014.06.001.