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## **THE EFFECT OF PBL INTEGRATED WITH IGYA SER HANJOB'S LOCAL WISDOM TO IMPROVE STUDENTS' PROBLEM-SOLVING SKILLS IN CONSERVATION BIOLOGY COURSES**

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### **Abstract**

The purpose of this study is to ascertain how PBL combined with local knowledge from Igya Ser Hanjob affects students' ability to solve problems in the Conservation Biology course. The 48 students enrolled in Conservation Biology classes during Biology Education Semester VII served as the sample for this study. There were 24 students in class A, which was the experimental class, and 24 students in class B, which was the control class. This kind of study employs a nonequivalent control group design and is classified as quasi-experimental research. Questionnaires and description tests were the instruments employed in this study. Following the analysis of the data using descriptive and inferential statistics that had previously satisfied the conditions for homogeneity and normalcy, the Anacova test was run using the SPSS IMB 20 software. The study's findings demonstrated that: 1) after using PBL with local wisdom, students' average score on problem-solving skills increased. A significant value of  $0.000 < 0.05$  indicates that there was a difference in the problem-solving abilities of the students in the PBL group that included Igya ser hanjob local wisdom and the group of students that participated in traditional learning. Thus, it can be said that PBL instruction combined with Igya Ser Hanjob's local knowledge can enhance students' capacity for problem-solving.

**Keywords:** PBL; Problem-solving skills; Igya ser hanjob; Local wisdom; Biology Conservation

### **Abstrak**

Tujuan dari penelitian ini adalah untuk mengetahui pengaruh PBL yang dipadukan dengan kearifan lokal dari Igya Ser Hanjob terhadap kemampuan mahasiswa dalam memecahkan masalah pada Biologi Konservasi. Sampel penelitian ini adalah 48 mahasiswa Pendidikan Biologi Semester VII. Kelas eksperimen berjumlah 24 mahasiswa dan kelas kontrol berjumlah 24 siswa. Jenis penelitian ini menggunakan desain kelompok kontrol nonekuivalen dan tergolong penelitian eksperimen semu. Instrumen yang digunakan berupa angket dan tes uraian. Data dianalisis menggunakan uji Anacova dengan menggunakan software SPSS IMB 20. Hasil penelitian menunjukkan bahwa: 1) setelah menggunakan PBL dengan kearifan lokal, nilai rata-rata keterampilan pemecahan masalah mahasiswa meningkat. Nilai signifikansi  $0,000 < 0,05$  menunjukkan bahwa terdapat perbedaan kemampuan pemecahan masalah siswa pada kelompok PBL yang menyertakan kearifan lokal Igya ser hanjob dan kelompok mahasiswa yang mengikuti pembelajaran tradisional. Dengan demikian, dapat dikatakan bahwa pembelajaran PBL yang dikombinasikan dengan pengetahuan lokal Igya Ser Hanjob dapat meningkatkan kapasitas mahasiswa dalam pemecahan masalah.

**Kata Kunci:** PBL; Keterampilan pemecahan masalah; Igya ser hanjob; Kearifan lokal; Konservasi Biologi



## INTRODUCTION

For pupils to reach their full intellectual potential and develop into clever adults, education is crucial. According to estimates, Indonesia has a high potential level of preparedness for the coming industrial revolution (4.0) (Estheriani & Muhid, 2020). In light of the fourth industrial revolution, every class must comprehend students in order for them to solve a variety of issues (Patil et al., 2020). To create a fully formed human being prepared to face a world full of problems and changes, education is necessary (Della, 2021). Thinking skills are one of the 21st century living skills required in the higher education process. Among other aspects, one's capacity for success in life can be assessed by the way they think, particularly when trying to solve difficulties in their lives. Problem-solving abilities are one life talent that is necessary and useful in all areas of life (Amin & Harahap, 2023)

Skills in problem solving are skills that are very important for success (Felstead, Gallie, Green, & Inanc, 2013). Problem solving reflects an individual's capacity to deal with problems they have never encountered before (Greiff, 2014). Problem solving skills in higher education are very important for students in terms of preparation for future life and work life. Therefore, it is important for students to have problem solving skills to face problems based on their experience. To equip students with problem solving skills, currently students' problem solving skills must be empowered (Harahap et al., 2023).

According to Polya, problem solving ability is the process taken by students to solve the problems they face until the problem is no longer a problem for them. Problem solving ability is the skill or potential that students have in solving problems and applying them in everyday life. According to Polya, problem solving indicators include (1) understanding the problem, (2) designing a problem solving strategy, (3) implementing the strategy or carrying out calculations, (4) reviewing or developing. Furthermore, indicators of problem solving skills according to Greenstein (2012), namely: 1) problem identification, 2) applying problem solving steps, 3) solution identification, 4) solution evaluation, 5) maintaining the solution, 6) application in the real world, 7) reasoning inductive, and 8) deductive reasoning. Students need to be encouraged to practice solving problems, discover things for themselves, and work hard to realize their ideas. The current information age has focused attention on the process of problem solving and decision making. Problem solving abilities are very important to achieve educational success in college (Greiff et.al, 2014; Greiff et.al, 2013)

Observation results regarding students' problem solving skills in the biology education study program in conservation biology courses show that students' problem solving skills are still in the low category at 21.43%. This low percentage of achievement in problem solving can be caused by several



things, firstly, students in the learning process are not trained enough in problem solving skills. This is supported by research from Memanah et al., (2019) and Ferreira & Trudel (2012) which states that students who are not used to practicing solving problems in the learning process, the difference in scores is lower and quite significant with students who are used to learning using problem based. Students must be accustomed to solving problems, because getting used to solving problems in learning will have a positive effect on students' critical thinking and perception of problem solving (Temel, 2014). Students who are used to being given problem solving will not experience difficulty in implementing these skills (McInerney, 2020). Therefore, one effort to activate and develop students' problem solving skills in the learning process is through the implementation of a problem-based learning model (Putri et al., 2023).

Throughout the phases in PBL, it is hoped that cognitive strategies can be developed that help the thinking process and maintain problem-solving, self-directed, and reflective skills (Chua et al., 2016). Students tend to be rigid and do not try harder to solve problems in PBL so that the analysis results of their problem solving skills are low (Mabley et al., 2020). Even so, PBL is still better at facilitating the improvement of students' solving skills compared to lecturer-centered learning models (Aslan, 2021). Implementing PBL can increase ability and confidence in solving problems (Gardner & Belland, 2017). Problem solving means dealing with complex and uncertain situations, requiring analysis, reasoning, and thinking which in the process shows a person's thinking style (Güner & Erbay, 2021). Through problem-based learning (PBL), it is hoped that students will be sensitive to the environment and can become actors in protecting natural resources (conservation) and the environment and finding solutions to problems (Supriatna & Promarck, 2012).

The PBL learning model is a learning model that uses real problems encountered in the environment. It needs to include cultural content and local wisdom in Conservation Biology learning as a basis for gaining knowledge and concepts through students' problem-solving skills because students are invited to think to solve real problems that arise. presented in the everyday environment where students live. According to (Leksono, 2017) The use of local wisdom in PBL learning allows students to improve relations with the surrounding community and can link local knowledge with modern knowledge. One of the local wisdoms related to nature conservation of the indigenous people of the Arfak tribe is "Igya Ser Hanjob" with the philosophy of let's protect nature for the common good. This concept is a regulation and warning for the large Arfak tribe community which is regulated informally and aims to protect and not exceed the specified territorial boundaries when utilizing



forest/natural products (Hujairin, Ismadi, & Kustana, 2017; Toansiba, Katmo, Krisnawati, & Wambrauw, 2021).

Igya Ser hanjob's local wisdom can be integrated into learning to increase student awareness about the importance of preserving Papua's natural resources (Ungirwalu et al., 2019)). Utilizing local wisdom content in learning, apart from being able to save local wisdom knowledge itself, also increases students' awareness about nature and environmental conservation. PBL learning based on local wisdom is very important in maintaining local wisdom itself, because local wisdom is rarely well documented. Local content in learning will increase students' understanding of the material and their concern for nature. Utilizing local content in learning can enrich learning materials and increase student awareness of the importance of preserving nature and the environment (Leksono, Syachruroji, Marianingsih, 2015). Based on the concept of culture and local wisdom of Igya ser hanjob, the implementation of the curriculum used in the learning process must pay attention to the potential of the region and environment where students live. As mandated by law, learning must be based on local excellence, and in fact, this local wisdom is very much in line with government policies related to sustainable development goals (SDGs) and environmentally friendly policies (green constitution) which prioritize the preservation of natural resources and the environment without having to reduce the rights of local communities and their generations

Based on the description above, local wisdom can be used as a way to implement an independent learning curriculum which is an application of the education obtained by students at universities in the community environment. This is in line with Wahyuni (2015) who states that local wisdom is closely related to education. The transmission of local wisdom must have a reciprocal relationship between autonomous learning networks so that it can play an important role in national development. Research conducted (Alimah, 2019) shows that Local Wisdom has the potential to innovate learning resources to develop students who are literate, have character, and also act as conservation agents. Agenda 21 recommends that teaching biodiversity conservation requires a learning approach based on local culture or local wisdom, because education based on local wisdom can further increase awareness of biodiversity conservation. Therefore, problem solving skills are very necessary in solving problems or finding solutions. Based on this background, the aim of this research is to determine the effect of the PBL model integrated with local wisdom Igya Ser Hanjob on improving students' problem solving skills.

## METHODS

### Research Design

This research is a type of quasi-experimental research. The research design, namely Pretest-Posttest, nonequivalent Control Group Design, according to Cohen, Manion, and Morrison (2018).

Tabel.1 Quasi-Experimental Research Design

Group	<i>Pre test</i>	Treatment	<i>Post test</i>
Experiment	O1	X1	O 2
Control	O 3	X2	O 4

Notes :

E: Experimental Group

C: Control Group

X1: PBL Intergrate Igya Ser hanjob

X2: Conventional learning strategies

O1, O3 : Pre-test Score; O2,O4 : Post-test score

### Participants

Participants in this research were students from the VII Semester Biology Education Study Program who were taking the Conservation Biology Course. The sample used by researchers in this study was 48 people consisting of 2 groups. The random sampling technique, namely: The experimental group, came from a group of students who used the PBL learning model with a total of 24 students participating. The control group was taken from a group of students who used the lecture method with 24 students participating.

### Instruments and Data Collection

There are ten essay questions in total that make up the instrument. The University of Southern Maine was cited in the development of the problem-solving skills assessment tool (2012). Experts rate the constructed problem-solving skills question instrument as very valid, with 89.17% rating it as such. With a Cronbach's Alpha of 0.880, the critical thinking skills reliability test was deemed reliable. Students were given essay questions on both the pretest and posttest to gather data.

## Data Analysis

Research data was analyzed using descriptive statistics and inferential statistical tests, namely Analysis of Covariance (ANAKOVA) at a significance level of 0.05% with the pretest value as a covariate. Before Anacova analysis is carried out, the prerequisite tests are first carried out, namely normality and homogeneity. Normality test uses the One-Sample Kolmogorov-Smirnov test. Homogeneity test uses Levene's Test of Equality of Error Variances. Statistical analysis using the SPSS 20.0 for Windows program.

## RESULT AND DISCUSSION

Students' problem solving skills were measured before and after lectures, then the data was analyzed using descriptive statistics to determine the average and percentage change in concept mastery scores from pretest to posttest. Research data regarding the average score and percentage change in pretest-posttest scores for problem solving skills in learning strategies can be seen in Table 2

Table 2. Mean scores and Percentage Change in Pretest-Posttest Scores for Problem-Solving Skills

No	Learning Models	Average		Change (%)	Category
		Pre-test	Post-test		
1	Experimental (PBL)	69,79	83,85	20,14	Increase
2	Control (Conventional)	68,54	76,56	11,70	Increase

Based on Table 2, it can be seen that the percentage of students' problem solving skills taught using the PBL model is 20.14%. Meanwhile, conventional strategies also experienced an increase with a percentage of 11.70%.

Table 3. Normality Test Results for Problem Solving Skills

No	Aspect	Df	Group	Sig	Decision
1	Pre-test	24	Ekperimental	0,493	Normally
2	Post- test	24	Eksperimental	0,731	Normally
3	Pre-test	24	Control	0,171	Normally
4	Post-test	24	Control	0,855	Normally

Based on Table 3, it shows that the normality test for problem solving skills is sig > Significant Level = 0.05, so it can be said that the data meets the normality assumption.

The following are the results of Levene's Test of Equality of Error Variance homogeneity test. Students' problem solving skills can be seen in Table 4.

Table 4. Homogeneity Test Results for Problem Solving Skills

Uji Levene's Test of Equality of Error Variances <sup>a</sup>			
Dependent Variable: Posttest Keterampilan berpikir kritis			
F	df1	df2	Sig.
.093	1	46	.762

Based on Table 4, it shows that  $\text{Sig} > 0.05 = 0.0762 > 0.05$  which means that homogeneous data variance.

Table 5. Data of Anacova Test Results for Problem-Solving Skills

Dependent Variable: Posttest Problem Solving Skills					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1039.614 <sup>a</sup>	2	519.807	22.915	.000
Intercept	881.546	1	881.546	38.861	.000
Pretest	401.593	1	401.593	17.703	.000
Metode	534.694	1	534.694	23.571	.000
Error	1020.803	45	22.685		
Total	310862.500	48			

a. R Squared = .505 (Adjusted R Squared = .483)

The PBL learning model linked with local wisdom yields Anacova test results that indicate a probability value of 0.000, which is less than 0.05 ( $p < 0.05$ ). This demonstrates that the group of students taught the PBL model and the group of students taught conventional techniques differ significantly in their problem-solving abilities.

## Discussion

The students who were taught the problem-based learning model (experimental class) in the conservation biology course scored differently from the students who were taught the control (conventional) class, according to the results of Anacova's testing in this study. This is due to PBL learning, a paradigm for instruction that presents real-world issues to students and necessitates their participation in finding solutions (Fadhilah, Nurdiyanti, Anisa, & Wajdi, 2022). PBL instruction gives students the chance to practice sophisticated problem-solving techniques in small discussion groups,



which improves their capacity for identification, assessment, logical reasoning, and interpretation (Misidawati & Sundari, 2021).

The lecturer serves as the focal point of the learning system in the control class, and traditional teaching approaches such as lectures are employed. Comparing the experimental class, which was taught using the PBL paradigm combined with *Igya ser hanjob* local wisdom, to the control class, showed that the latter had more engaged students. Students' problem-solving skills are weakened when they participate in little in the learning process. Students' problem-solving skills improved in the experimental class as a result of PBL learning combined with local knowledge, which gave students more opportunities to hone their problem-solving skills. PBL incorporates local wisdom by starting learning concepts from situations that students frequently face in their daily lives. The learning is not abstract, and the goal is to make it simple for students to apply what they have learned in the classroom to their everyday lives. Next, teachers encourage students to actively participate in working with their group friends to solve the challenges that are presented.

The results of the study are consistent with previous research (I.W. Surita et al., 2022) which indicates that students' enthusiasm to learn and develop their own conceptions can be increased by assigning challenges that incorporate local wisdom. Excellent assessment results were obtained when the PBL model with local wisdom was implemented to help students become better problem solvers. Similarly, research by (Handayani, 2023) on the use of the Problem Based Learning Model with Ethnoscience (Ethno-Pbl) can assist students in becoming independent learners and developing generic science skills through problem solving. Students are actively involved in identifying concepts and seeking answers to the issues they encounter. The same research by (Rosidi, et al., 2023) revealed that the PBL-based e-module incorporates Sesaot Village's traditional knowledge of using plants as medicines, and that their conservation efforts meet the requirements of being legitimate, useful, and effective for enhancing students' environmental attitudes, problem-solving abilities, and critical thinking skills (Iwan et al., 2023; Iwan et al., 2020; Salamun et al., 2023; Nasution et al., 2023; Hasan et al., 2023; Iwan et al., 2023).

Multiple studies (Oktaviana & Haryadi, 2020) that show students who learn utilizing the PBL model enhance their problem solving abilities substantially better than students who learn through direct instruction corroborate the findings of this study. The PBL methodology encourages students to be more curious about solving problems because the problem scenarios are based on real-world or everyday circumstances. Students' increased enthusiasm for attending lectures, their increased focus





during lectures, and their increased enthusiasm during group discussions where they exchange ideas for solving problems demonstrate how the PBL model has increased their problem-solving abilities. In the meantime, there was no evidence of student activity in the control group that received direct instruction. Students with exceptional abilities were the only ones that dominated learning in the control class. The study's findings indicate that using the PBL paradigm has a major impact on students' capacity for problem-solving. This is consistent with the study that was done by (Syam, 2020; Kusuma & Nurmawanti, 2023; Kodariyati & Astuti, 2016).

The PBL model is an approach to teaching that begins with a problem in order to help students develop their problem-solving skills. Because PBL is authentic problem-oriented learning, it allows students to construct their own knowledge and develop higher abilities. As such, the PBL model is learning that involves students actively in learning activities (Ariandi, 2016). By employing the PBL paradigm, students can attain excellent attitudes and abilities in the learning process and outcomes, claim Cahyani & Setyawati (2016). There was advancement in learning using the PBL paradigm since students appeared content with the new instructional components. In addition, PBL is a learning model that makes use of real-world issues to teach students how to solve problems creatively and skillfully while also acquiring necessary knowledge and concepts. This allows students to learn actively while developing their critical thinking, creative problem-solving, and problem-solving abilities. PBL instruction gives students the chance to directly discuss their ideas regarding the challenges at hand, either through discourse or visuals/phenomena. The problems are real-world issues that students encounter on a daily basis in order to encourage them to actively participate in providing answers for the problems (Fadhilah et al., 2022).

Has carried several studies to investigate the possibilities of using local wisdom in the classroom. The principles of local knowledge in natural life can be utilized for modern learning since, in theory, this local knowledge is consistent with current knowledge (Pingge, 2017). This is consistent with study (Istiwati, 2016) that demonstrates the comprehensive character component of the Ammatoa tradition's local wisdom, as found in the Pasang ri Kajang, pertaining to the development of human resources' quality in relation to God, humans, and nature. According to research (Tresnawati, 2018) teaching science based on traditional knowledge from the community can promote a love of the community's original knowledge as a component of the country's culture, which has consequences for maintaining the balance of the environment and conserving nearby natural resources.

## CONCLUSION

The application of the PBL learning model integrated with Igya Ser Hanjob local wisdom in the conservation biology course has a real effect and improves students' problem solving skills. PBL learning integrated with local wisdom can raise students' awareness to be sensitive to the problems around them so that they can find solutions to overcome these problems to protect natural resources through conservation activities. Problem solving skills need to be developed and familiarized by every student in order to be able to solve problems well. This problem-solving habit will be carried over by students until they enter the world of work. Problem solving abilities will help students solve various problems they will face, whether they are encountered now or in the future

## REFERENCES

- Alimah, S. (2019). Kearifan Lokal Dalam Inovasi Pembelajaran Biologi: Strategi Membangun Anak Indonesia Yang Literate dan Berkarakter Untuk Konservasi Alam. *Jurnal Pendidikan Hayati*, 5(1), 1–9. <https://doi.org/10.33654/jph.v5i1.574>
- Ariandi, Y. (2016). Analisis Kemampuan Pemecahan Masalah Berdasarkan Aktivitas Belajar pada Model Pembelajaran PBL. *PRISMA, Prosiding Seminar Nasional Matematika*, 1(1), 579–585. <https://journal.unnes.ac.id/sju/index.php/prisma/article/view/21561>
- Aslan, A. (2021). Problem- based learning in live online classes: Learning achievement, problem-solving skill, communication skill, and interaction. *Computers and Education*, 171(May), 104237. <https://doi.org/10.1016/j.compedu.2021.104237>
- Belland, B. R., Gu, J., Kim, N. J., Jaden Turner, D., & Mark Weiss, D. (2019). Exploring epistemological approaches and beliefs of middle school students in problem-based learning. *Journal of Educational Research*, 112(6), 643–655. <https://doi.org/10.1080/00220671.2019.1650701>
- Chua, B. L., Tan, O. S., & Liu, W. C. (2016). Journey into the problem-solving process: cognitive functions in a PBL environment. *Innovations in Education and Teaching International*, 53(2), 191–202. <https://doi.org/10.1080/14703297.2014.961502>
- Della, L. (2021). The Effectiveness of PBL-Based LKPD for Empowering the Senior High School Student's Critical and Creative Thinking Skills. *International Journal of Social Science and Human Research*, 04(07), 1776–1784. <https://doi.org/10.47191/ijsshr/v4-i7-29>
- Demir Barutcu, C. (2017). The Relationship Between Problem Solving and Creative Thinking Skills among Nursing Students. *International Journal of Psychology and Educational Studies*, 4(2), 34–41. <https://doi.org/10.17220/ijpes.2017.02.004>
- Estheriani, N. G. N., & Muhid, A. (2020). Pengembangan Kreativitas Berpikir Siswa Di Era Industri 4.0 Melalui Perangkat Pembelajaran Dengan Media Augmented Reality. *Insight: Jurnal Ilmiah Psikologi*, 22(2), 118. <https://doi.org/10.26486/psikologi.v22i2.1206>
- Fadhilah\*, N., Nurdiyanti, N., Anisa, A., & Wajdi, M. (2022). Integrasi STEM-Problem Based Learning melalui Daring Terhadap Keterampilan Berpikir Kritis Mahasiswa Pendidikan Biologi. *Jurnal IPA & Pembelajaran IPA*, 6(1), 1–10. <https://doi.org/10.24815/jipi.v6i1.22721>



- Ferreira, M., & Trudel, A. (2012). The Impact of Problem Based Learning (PBL) on Student Attitudes Toward Science, Problem-Solving Skills, and Sense of Community in the Classroom. *Journal of Classroom Interaction*, 47(1), 23–30
- Felstead, A., Gallie, D., Green, F., & Inanc, H. (2012). *Skills at Work in Britain: First Findings from the Skills and Employment Survey, 2012*. 6.
- Gardner, J., & Belland, B. R. (2017). Problem-Centered Supplemental Instruction in Biology: Influence on Content Recall, Content Understanding, and Problem Solving Ability. *Journal of Science Education and Technology*, 26(4), 383–393. <https://doi.org/10.1007/s10956-017-9686-0>
- Greiff, S., Wüstenberg, S., Csapó, B., Demetriou, A., Hautamäki, J., Graesser, A. C., & Martin, R. (2014). Domain-general problem solving skills and education in the 21st century. *Educational Research Review*, 13(June 2018), 74–83. <https://doi.org/10.1016/j.edurev.2014.10.002>
- Greiff, S., Wüstenberg, S., Holt, D. V., Goldhammer, F., & Funke, J. (2013). Computer-based assessment of Complex Problem Solving: Concept, implementation, and application. *Educational Technology Research and Development*, 61(3), 407–421. <https://doi.org/10.1007/s11423-013-9301-x>
- Güven, M. (2010). An analysis of the vocational education undergraduate students' levels of assertiveness and problem-solving skills. *Procedia - Social and Behavioral Sciences*, 2(2), 2064–2070. <https://doi.org/10.1016/j.sbspro.2010.03.282>
- Handayani, E. F. (2023). Penerapan Model Problem Based Learning Bermuatan Ethnoscience (Ethno-Pbl) Terhadap Hasil Belajar Kognitif Siswa Sekolah Dasar. *Jurnal Citra Pendidikan*, 3(4), 1288–1297. <https://doi.org/10.38048/jcp.v3i4.1935>
- Hujairin, M., Ismadi, A., & Kustana, T. (2017). Revitalisasi kearifan lokal Suku Arfak di Papua Barat dalam rangka mendukung ketahanan pangan wilayah. *Prodi Manajemen Pertahanan*, 3(1), 53–77.
- I. W. Surita, I. W. Suja, & A. A. I. A. R. Sudiarmika. (2022). Perancangan Dan Validasi Lembar Kerja Peserta Didik Untuk Mendukung Implementasi Model Problem Based Learning Bermuatan Kearifan Lokal Guna Meningkatkan Kemampuan Pemecahan Masalah. *Jurnal Pendidikan Dan Pembelajaran IPA Indonesia*, 12(2), 70–80. <https://doi.org/10.23887/jppii.v12i2.56558>
- Istiawati, N. F. (2016). Pendidikan Karakter Berbasis Nilai-Nilai Kearifan Lokal Adat Ammatoa Dalam Menumbuhkan Karakter Konservasi. *CENDEKIA: Journal of Education and Teaching*, 10(1), 1. <https://doi.org/10.30957/cendekia.v10i1.78>
- Hasan, M., Sihotang, D. O., Pagiling, S. L., Tanjung, R., Lotulung, C., Aruan, D. G. R., ... & Iwan, I. (2023). *Riset Pendidikan*. Penerbit Kita Menulis.
- Iwan, I., Sumitro, S. B., Ibrohim, I., & Rohman, F. (2023). Analysis of critical thinking skills for biology teacher prospective at university of papua. *Jurnal Eduscience (JES)*, 10(2), 442-450.
- Iwan, I., Istisaroh, I., Sirait, S. H. K., & Damopolii, I. (2020). The development of teaching materials oriented problem-based learning integrating Tifa to train student's critical thinking skills. *AIP Conference Proceedings*, 2215(April). <https://doi.org/10.1063/5.0000587>
- Iwan, Sumitro, S. B., Ibrohim, & Rohman, F. (2023). Environmental Care Attitude Analysis of Prospective Biology Teachers. *Pegem Egitim ve Ogretim Dergisi*, 13(2), 72–78. <https://doi.org/10.47750/pegegog.13.02.09>
- Kodariyati, L., & Astuti, B. (2016). Pengaruh Model Pbl Terhadap Kemampuan Komunikasi Dan



- Pemecahan Masalah Matematika Siswa Kelas V Sd. *Jurnal Prima Edukasia*, 4(1), 93. <https://doi.org/10.21831/jpe.v4i1.7713>
- Kusuma, A. S., & Nurmawanti, I. (2023). Pengaruh Strategi Pembelajaran Problem Based Learning (PBL) Terhadap Keterampilan Metakognitif dan Kemampuan Pemecahan Masalah Mahasiswa. *Jurnal Ilmiah Profesi Pendidikan*, 8(3), 1922–1934. <https://doi.org/10.29303/jipp.v8i3.1890>
- Leksono, S. M. (2017). Pengaruh Pembelajaran Mini Riset Berbasis Kearifan Lokal Terhadap Kesadaran Konservasi Keanekaragaman Hayati. *Prosiding Seminar Nasional Pendidikan*, 1–10. <https://jurnal.untirta.ac.id/index.php/psnp/article/view/1-10>
- McInerney, D. M. (2020). Publishing Your Psychology Research. Publishing Your Psychology Research. <https://doi.org/10.4324/9781003117018>
- Nst, N. E. A., Iwan, I., Saputro, A. N. C., Tanjung, D. S., Kunusa, W. R., Sukristiningsih, S., ... & Sumanik, N. B. (2023). *Keterampilan Esensial Peserta Didik Abad 21 dan Asesmen*. Yayasan Kita Menulis.
- Oktaviana, D., & Haryadi, R. (2020). Pengaruh Model Pembelajaran Problem Based Learning (Pbl) Terhadap Kemampuan Pemecahan Masalah Mahasiswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 9(4), 1076. <https://doi.org/10.24127/ajpm.v9i4.3069>
- Patil, P., Tamilmani, K., Rana, N. P., & Raghavan, V. (2020). Understanding consumer adoption of mobile payment in India: Extending Meta-UTAUT model with personal innovativeness, anxiety, trust, and grievance redressal. *International Journal of Information Management*, 54, 102144.
- Pingge, H. D. (2017). Kearifan lokal dan penerapannya di sekolah core View metadata, citation and similar papers at core.ac.uk provided by Jurnal STKIP Weetebula. *Jurnal Edukasi Sumba*, 01(02), 128–135.
- Maemunah, S. (2019). Kemampuan Pemecahan Masalah Melalui Model Flipped Classroom Pada Pembelajaran Kimia Abad Ke 21. *Orbital: Jurnal Pendidikan Kimia*, 3(2), 143–154.
- Felstead, A., Gallie, D., Green, F., & Inanc, H. (2013). *Skills at Work in Britain*. First Findings from the Skills and Employment Survey.
- Nugroho, Wahyu Adhi, and Puguh Karyanto. (2016). “Development Of Subject Specific Pedagogy Based On Problem Based Learning To Reinforce Student’s Environmental-Caring Attitude In Grade Vii Junior High School Student.” 12.
- P21. (2019). Partnership for 21st Century Learning A Network of Battelle For Kids Frameworks for 21st Century Learning Definitions. *Framework For21" Century Learning*, 9. [https://static.battelleforkids.org/documents/p21/P21\\_Framework\\_DefinitionsBFFK.pdf](https://static.battelleforkids.org/documents/p21/P21_Framework_DefinitionsBFFK.pdf)
- Polya, G. (1973). *How to Solve it*. New Jersey. Princenton University Press
- Rosidi, Adelina, Fatchur.Rohman, Vivi, Novianti & Ismawan Hariadi (2023) Pengembangan E-Module Keanekaragaman Makhluk Hidup Berbasis PBL Bermuatan Kearifan Lokal Dan Pengaruhnya Terhadap Keterampilan Berpikir Kritis, Pemecahan Masalah, Dan Sikap Lingkungan.
- Salamun, S., Widyastuti, A., Syawaluddin, S., Astuti, R. N., Iwan, I., Simarmata, J., ... & Arief, M. H. (2023). *Model-Model Pembelajaran Inovatif*. Yayasan Kita Menulis.
- Sukma, U., & Nasution, Z. (2020). Pengaruh Model Problem Based Learning Terhadap Kemampuan



- Pemecahan Masalah. *Jurnal Sintaksis: Pendidikan Guru Sekolah Dasar IPA, IPS Dan Bhs. Inggris*, 2(2), 101–107. <http://jurnal.stkipalmaksum.ac.id/>
- Toansiba, M., Katmo, E. T. R., Krisnawati, K., & Wambrauw, Y. L. D. (2021). Pengelolaan Tanah dalam Pengetahuan Lokal dan Praktik Pertanian Berkelanjutan pada Masyarakat Arfak, Papua Barat. *Jurnal Ilmu Pertanian Indonesia*, 26(3), 370–378. <https://doi.org/10.18343/jipi.26.3.370>
- Tresnawati, N. (2018). Pembelajaran Sains Berbasis Kearifan Lokal dalam Upaya Peningkatan Konservasi Lingkungan pada Mahasiswa PGSD di Batik Tulis Ciwaringin Cirebon. *Al Ibtida: Jurnal*
- Ungirwalu, A., Arobaya, A., Tokede, M., Peday, M., Padang, D., Tasik, S., Mardiyadi, Z., Sadsoetoeben, B., & Matani, O. (2019). Konstruksi Etnoteknokonservasi Burung Pintar (Amblyornis Inornata) di Kawasan Cagar Alam Pegunungan Arfak. *Igya Ser Hanjop: Jurnal Pembangunan Berkelanjutan*, 1(1), 1–9. <https://doi.org/10.47039/ish.1.2019.1-9>
- Zubaidah, S (2017). *Pembelajaran Kontekstual Berbasis Pemecahan Masalah Untuk Mengembangkan Kemampuan Berpikir Kritis*. Disampaikan pada Seminar Nasional dengan Tema Mengimplementasikan Pendidikan Biologi Berwawasan Konservasi dalam Mewujudkan Sumber Daya Manusia yang Berkarakter pada Tanggal 6 Mei 2017 di Universitas Muhammadiyah Makassar