



FOSTERING SCIENTIFIC LITERACY THROUGH LOCAL CONTEXTS: THE EFFECTIVENESS OF CULTURALLY RESPONSIVE WORKSHEETS

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Abstract. The integration of science literacy in the independent curriculum has not been optimally implemented and remains limited, failing to address contextual aspects relevant to everyday life. This study aims to enhance science literacy through a culturally responsive learning approach, supported by student worksheets. The development method employed was a mixed-methods approach, incorporating data collection through interviews, observations, and science literacy tests, utilizing a one-group pretest-posttest design. The results showed that there was an effect on improving students' science literacy with an N-Gain value of 0.52 which showed an increase in science literacy skills, and a paired sample T-Test value of 0.00 < 0.05 which showed that there was an effect of the approach on science literacy and the effect size test showed a significant effect with a value of 1.99, so it can be concluded that the application of culturally responsive teaching-based student worksheets effectively improves science literacy on vibration and wave material for junior high school science subjects.

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INTRODUCTION

The 21st-century challenges era continues to develop in line with the rapid advancement of Science and Technology skills, such as creative thinking, digital literacy, effective communication, critical thinking, collaboration, citizenship, character, and high productivity, which are elements that support the achievement of 21st-century competencies (Rosyid et al., 2024; Seitz & Hill, 2016; Turiman et al., 2012; Xu & Zhou, 2022). The education system must prioritize 21st-century skills to remain competitive in the rapidly evolving world of work. This is what the Indonesian education system has temporarily introduced through curriculum changes, which include the Pancasila Learner Profile (P5).

Science literacy is one of the important 21st-century skills to develop learners' ability to process and analyse information objectively, according to scientific principles, so that they can make the right decisions based on the data obtained (Kemendikbud, 2022). PISA 2025 provides a science literacy framework in terms of context, knowledge, and science identity (OECD, 2023b). This is what is assessed by OECD (Organization for Economic Cooperation and Development) member countries through the results of the PISA (Program for International Student Assessment) test. In 2018, the science literacy score of Indonesian students was 371, and in the PISA 2022 test, a score of 383, which is above the average score of the PISA test, which is 483-488 points (OECD, 2019; 2023a). These results indicate that Indonesia's level of science literacy remains below the average of OECD countries. The low science literacy of students in Indonesia is reinforced by research conducted by Durasa et al. (2022), Rohmah & Hidayati (2021), and Zulaiha & Kusuma (2021) the low science literacy of students in junior high school in science subjects.

Low science literacy is also evident at the regional level, particularly in East Nusa Tenggara Province (NTT). Data from the Ministry of Education and Culture's Literacy Access Index (2022) show that NTT scored 67.61, which falls in the moderate category, indicating that the people of NTT are still below the national average. Sabu Regency, with an index of 43.31, ranks 5th in terms of literacy among communities in East Nusa Tenggara Province (Badan Pengembangan

dan [Pembinaan Bahasa, 2022](#)). Low science literacy among the community affects the quality of education, especially science literacy, which is still very low, as supported by the Sabu district education report, which shows a figure of 50.43% in the low category, thus necessitating an increase in literacy skills ([Kementerian Pendidikan, 2023](#)).

Based on the results of observations and interviews conducted at one of the schools in Sabu District, it was found that there was a lack of achievement in literacy skills, with 60% of students not yet reaching the minimum literacy competency level. Of these, 2.22% still require exceptional guidance, 37.78% fall into the below-average category, 31.11% are classified as competent, and 8.89% exceed the minimum competency level, as measured through the 2023 national assessment. The observations conducted demonstrate that teaching materials and facilities have a significant impact on the improvement of literacy skills, as technology becomes increasingly essential in this advanced era. However, there are several areas with poor network availability for accessing teaching materials and a wide range of learning media. Therefore, a cultural approach is needed to improve science literacy skills among students.

Increasing science literacy is achieved by adopting an approach that is aligned with the culture of learners. Culturally Responsive Teaching (CRT) is an approach that focuses on learning that is increasingly racially, ethnically, socially, and linguistically plural, empowering culture as an asset in the learning process, respecting diversity, addressing gaps in subject matter, and using culturally relevant teaching methods ([Gay, 2002](#); [Krasnoff, 2016](#)). CRT focuses on learner identity, understanding of cultural concepts, collaboration, critical thinking, and transformational construction, and aims to produce high academic knowledge through culturally oriented learning ([Fitriah et al., 2024](#); [Gay, 2002](#); [Lasminawati et al., 2023](#); [Rahmawati & Sastrapraja, 2017](#); [Schirmer & Lockman, 2022](#)). Effective teaching is teaching that engages learners' culture to achieve high levels of cognitive, emotional, and political achievement ([Abraham et al., 2023](#); [Ladson-Billings, 1995](#)).

Teaching materials are designed to achieve specific objectives for a particular audience, serving as an important supporting factor in the learning process, which is arranged hierarchically to assist teachers in shaping students' character. Learner worksheets are teaching materials or materials that are systematically designed and developed to assist the learning process, so that students can more easily understand the concepts taught and enrich the learning experience ([Firdaus et al., 2024](#); [Muhlis et al., 2024](#); [Muskania et al., 2024](#); [Negoro et al., 2023](#)). Previous studies have shown that student worksheets (LKPD) are effective in improving science literacy. [Hidayat et al. \(2024\)](#) demonstrated that worksheets based on Socio Scientific Issues (SSI) help students not only understand concepts but also connect them to social contexts, while [Paiticen et al. \(2024\)](#) found that E-LKPD with the Teaching at the Right Level (TaRL) approach improved students' science literacy from a low to a moderate category with significant N-gain scores. These findings confirm that both printed and digital worksheets play an important role in fostering critical thinking and linking science to everyday life ([Hidayat et al., 2024](#); [Paiticen et al., 2024](#)). A culturally responsive teaching approach, assisted by student worksheets, can improve students' science literacy.

Research conducted by [Setyowati et al. \(2023\)](#) and [Fointuna et al. \(2019\)](#) shows an increase in science literacy among students who were taught using a practical approach in small classes using a culturally responsive teaching approach. The same thing was seen in research conducted by [Priyangga et al. \(2023\)](#), [Maskhanah \(2021\)](#), and [Khasanah et al. \(2023\)](#), which showed the effectiveness of using a culturally responsive teaching approach not only in terms of science literacy but also in terms of student learning outcomes.

The *Pedoa* dance is a traditional dance of *Sabu* that originates from ancestral stories, serving as an expression of prayer and gratitude for the arrival of rain. Its main movement is the repeated and synchronized stamping of the feet, symbolizing strength, unity, and the community's plea to God for fertility in the island's dry land. Through these circular formations and rhythmic foot stamps, the *Pedoa* dance also serves to strengthen brotherhood, foster social bonds, and even provide a space for matchmaking among the youth ([Kori'un, 2019](#)).



The integration of culture into science learning can be carried out by using local wisdom as a context for understanding scientific concepts. Vibrations and waves are fundamental concepts in physics that are closely related to everyday events, such as sound, light, and the movement of objects. Vibration is the back-and-forth motion around an equilibrium point, while a wave is the propagation of energy through a medium or space due to the vibration. According to [Giancoli & Douglas \(2016\)](#), every wave, both mechanical and electromagnetic, has characteristics such as amplitude, frequency, wavelength, and propagation speed. Meanwhile, [Young & Freedman \(2012\)](#) explain that waves can be divided into transverse and longitudinal waves, depending on the direction of vibration with respect to the direction of propagation. An understanding of vibrations and waves is important in many fields of science and technology, ranging from communication engineering, medical, to the study of natural disasters such as earthquakes ([Serway & Jewett, 2014](#)). A culturally responsive teaching approach, assisted by student worksheets, can improve students' science literacy.

Considering the low level of science literacy among students in Sabu Raijua Regency, as well as the limited access to technological facilities, this study addresses these challenges by employing teaching materials supported by student worksheets. The learning process is implemented through the CRT approach, with the goal of enhancing students' science literacy in a contextually and culturally relevant manner.

RESEARCH METHODS

The method used in this research is a mixed research method with a qualitative approach using observation and interviews, and a quantitative approach using a one-group pretest-posttest design ([Sugiyono, 2013](#)) in which there is a pretest before treatment and a posttest after treatment. This study employed a mixed-methods approach with a sequential explanatory design. In the first phase, a quantitative intervention was implemented by applying a Problem-Based Learning model integrated with CRT across four instructional sessions on science topics for Grade VIII students. The purpose of this phase was to evaluate the effectiveness of the instructional model through pre-test and post-test assessments of students' cognitive performance. In the subsequent phase, a qualitative inquiry was conducted through in-depth interviews with six students and one teacher to examine further their learning experiences, perceptions, and challenges encountered during the instructional process. Finally, the quantitative and qualitative findings were integrated to provide a more comprehensive understanding of the enhancement of students' scientific literacy and their engagement with local cultural contexts. The purpose of this study was to investigate the improvement of science literacy through the use of the CRT approach, assisted by student worksheets. The research subjects were one experimental class of 30 students at a Junior high School in East Nusa Tenggara, through random sampling. The research design table is presented in Table 1. The steps involved in implementing CRT are illustrated in [Figure 1](#).

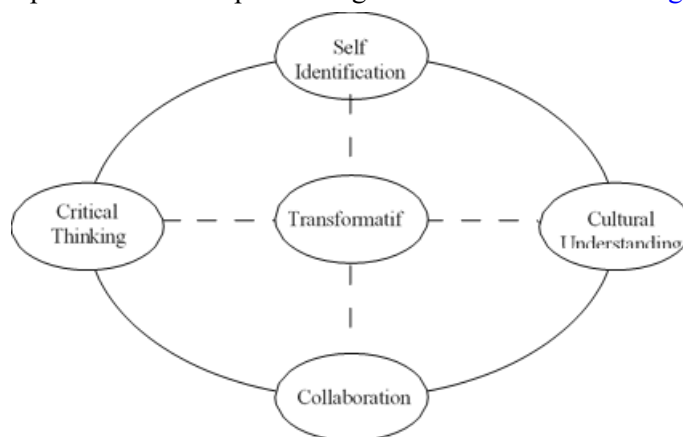


Figure 1. Indicators Cultural responsive Teaching

The research subjects were one experimental class of 30 students at a Junior high School in East Nusa Tenggara, through random sampling. The research design table is presented in Table 1.

Table 1. One-group pretest-posttest design

Class	Pretest	Treatment	Posttest
Experiment	O ₁	X _a	O ₂

Analyze the data obtained from conducting the N-gain test to determine the effectiveness of using the CRT approach assisted by student worksheets by examining the difference between the pretest and posttest scores. N-Gain categories are listed in Table 2.

Table 2. N-Gain Score

N-Gain Score	Category
$(\langle g \rangle) \geq 0,7$	High
$0,7 > (\langle g \rangle) \geq 0,3$	Moderate
$(\langle g \rangle) < 0,3$	Low

Analysis of the effectiveness of using the CRT approach, aided by student worksheets using paired sample T-Test analysis to test the hypothesis H₀ (if there is no effect of the CRT approach on science literacy) and H₁ (if there is an effect of the CRT approach on science literacy) and then analyzed using effect size with the effect size value category in Table 3.

Table 3. Effect size category

Effect size	Category
0,2	Small Effect Size
0,5	Medium Effect Size
0,8	Large Effect Size

RESULTS AND DISCUSSION

Interviews and observations were conducted to see the condition of the school and the learning process in the classroom. The results of observations and interviews showed that the level was still very low, with 50% of students not having reached the minimum competency in science literacy. Based on the results of interviews and observations, it is known that the education report data of Sabu Raijua Regency, East Nusa Tenggara in 2024 for education units at the Junior High School (SMP) level, literacy skills have not yet reached the minimum competency, where 29.18% percent of students still need exceptional guidance, 50.43% are categorized as lacking, 20.12% are categorized as proficient and only around 0.26% of students have abilities above the average minimum literacy competency. The report card in 2024 also shows the non-achievement of literacy competencies, where 60% of students have not achieved the minimum literacy competencies, where 2.22% still need exceptional guidance, 37.78% are categorized as lacking, 31.11% are categorized as proficient, and 8.89% are above the minimum competency average as measured by the national assessment in 2023 (Badan Pengembangan dan Pembinaan Bahasa, 2022; Kementerian Pendidikan, 2023). According to the results of teacher interviews at SMP in Sabu Tengah, science literacy remains very low because the current primary focus of literacy is on reading and numeracy, rather than science literacy. Although efforts have been made to improve literacy in this field, students often find it challenging to develop literacy skills. By applying the CRT approach, students can better interpret and understand science material, especially waves, vibrations, and light, in class VIII students of Junior High School in Sabu East, Nusa Tenggara, to improve science literacy.

The development results show that the culturally responsive Teaching-based Learner Worksheets designed to integrate local cultural contexts and scientific approaches succeeded in increasing students' involvement in the learning process. These learner worksheets not only contain scientific activities such as observation, data collection, and simple analysis, but also link science materials with local practices and knowledge relevant to students' daily lives. For example, on the topic of vibrations and waves, the worksheets highlight traditional local musical instruments as contextual media, thus encouraging students to understand scientific concepts

through their familiar cultural experiences. The limited trial results showed an increase in students' ability to interpret and use scientific evidence more systematically.

This discussion highlights that the CRT approach in the development of learner worksheets plays a crucial role in building bridges between scientific knowledge and students' cultural identities. Students become more active in expressing opinions, discussing, and solving problems because they feel valued and recognized for their diverse backgrounds within the learning process. Additionally, the worksheets are designed to foster science literacy skills, including the ability to explain phenomena scientifically, evaluate evidence-based information, and draw logical conclusions.

This study employed pretests and posttests before and after the treatment of the CRT approach, using a student worksheet with a maximum score of 10, conducted at one of the Junior High Schools in Sabu Tengah. The results of the normally distributed pretests and posttests were analyzed using the Shapiro-Wilk test. The data are presented in Table 4.

Table 4. Result of Shapiro-Wilk normality test for pre-test and post-test scores.

Variable	W. Statistic	p-value
Pre-Test	0.941	0.099
Post-Tes	0.944	0.116

Table 4 shows that the results of the normality test for the pretest and post-test scores indicate that they are typically distributed, with a p-value greater than 0.05 for both the pre-test and post-test science literacy questions. Analyzing pretest and posttest scores using N-Gain reveals the effectiveness of learning, as shown in Table 5, in terms of student learning outcomes.

Based on the results of the posttest and pretest, there is an increase in the average science literacy of students, as evidenced by the pretest results of 5.73, which have increased to 7.70. A comparison can be seen in the diagram in Figure 2.

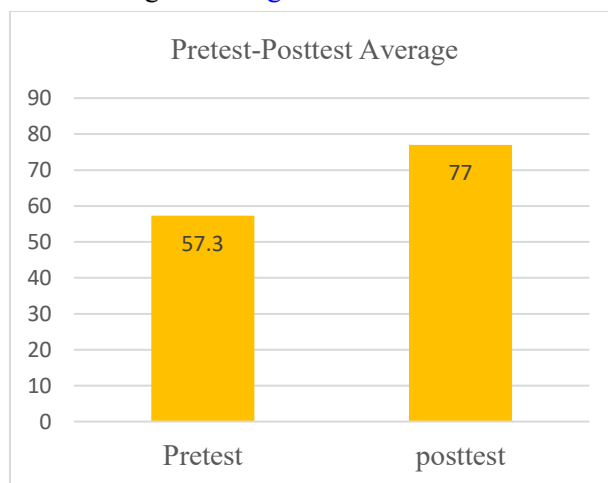


Figure 2. Results of the posttest and pretest

Table 5. N-Gain Score

	N	Minimum	Maximum	Pretest	Posttest	N-Gain
N-ain_Score	30	0	1	5.73	7.7	0.5153

Table 5 shows the average score of N-Gain $0.5153 < 0.7 \geq 0.3$, so it is in the medium category, where the CRT approach affects the improvement of students' science literacy. The analysis shows a notable improvement in students' performance after the intervention. The gain score of 0.5153 falls within the "moderate" category, indicating that the applied learning model made a positive contribution to students' progress. This suggests that the use of culturally responsive teaching, supported by worksheets, was effective in enhancing science literacy; however, there is still room for further optimization to achieve a higher level of improvement. The effect size test is shown in Table 6.

Table 6. Paired Sample T-Test

Data		Paired Differences		
		Std. Deviation	df	Effect Size
Pair 1	Pretest- Posttest	1.331	29	1.993657

The table above shows a p-value of $0.00 < 0.05$, so that H_0 is rejected and H_1 is accepted. The effect size value is $1.993657 > 0.8$, indicating a high influence on students' scientific literacy. The results of the paired sample t-test indicate a significance value (p-value) of $0.00 < 0.05$, leading to the rejection of the null hypothesis (H_0) and the acceptance of the alternative hypothesis (H_1). This confirms a significant difference between the pretest and posttest scores following the intervention. Furthermore, the effect size of 1.99 (>0.8) demonstrates a significant and powerful influence of the CRT approach on improving students' scientific literacy. These findings reinforce the conclusion that this instructional model is highly effective in enhancing learning outcomes.

Based on observations and interviews with students during the learning process, students were more active because the learning was related to cultural contexts that were thoroughly understood and commonly practiced by the community. Lengthy discussions did not bore the students because the topics were taken from their daily lives. Based on interviews with six students, it was found that they felt the learning process was easier to understand because it was linked to local culture. One student stated, "Learning has become more enjoyable because we can talk about things that are close to our daily lives." Other students said that "culture-based learning is delightful because the culture is not only useful for traditional ceremonies, but also in the learning process. The subject teachers who were interviewed also stated that culturally responsive teaching facilitates students' understanding of the discourse provided by educators, not just the discourse commonly encountered and rarely directly experienced by students.

Through the problems that occur, the CRT approach, aided by student worksheets through N-gain data, shows that there is an influence with a moderate category showing an average N-Gain score of $0.5153 < 0.7 \geq 0.3$, besides the Paired sample test shows a p-value < 0.05 , which can be concluded that the application of CRT has a significant effect on improving science literacy. The effect size test indicates an excellent influence on the application of the CRT approach, facilitated by the use of student worksheets. This is in line with research conducted by [Lestari et al. \(2021\)](#) which shows CRT can improve students' science literacy skills.

Learning that emphasizes the cultural context provides students with the ability to create a comfortable learning space and understand the material being studied, allowing the CRT approach, which is a culturally responsive learning approach in a relevant context, to foster an understanding of scientific concepts in students. This is in line with research conducted by [Rahmawati & Sastrapraja \(2017\)](#) dan [Simatupang \(2024\)](#) which shows a significant effect on the application of the CRT approach in learning.

The CRT approach, by referring to certain philosophies, methods, or principles, aims to improve learning approaches and enhance efficiency and effectiveness in achieving optimal educational results ([Muhammad & Seng Kang, 2017](#); [Ramdani et al., 2023](#)). Vibration and wave materials in class VIII junior high school can be integrated with cultural concepts, such as the Padoa dance, which is a cultural tradition of the Sabu tribe in East Nusa Tenggara, thereby engaging students in culturally responsive learning.

During the learning activities, observations showed an increase in student participation compared to previous meetings. Whereas previously only a few students were actively involved, after the implementation of the CRT model, more students felt encouraged to ask questions and participate in discussions. Student enthusiasm was also higher when the material was linked to cultural elements around them, as this made learning feel more real and relevant to their daily experiences.

The findings from interviews with six students were consistent with the observation results. The majority of students said that they found it easier to understand science concepts when the material was contextualized with the pedoa dance, which was familiar to them. One student said that learning was more enjoyable because they could discuss topics that were close to their lives.

Another student added that using culture-based worksheets helped them organize information and complete the questions given by the teacher.

Interviews with teachers also provided a supportive perspective. According to teachers, the implementation of CRT successfully increased student engagement, both in terms of classroom activity and their ability to connect science theory with real-life situations in their surroundings. Teachers also noted that, although a small number of students still required more intensive assistance, overall, this learning strategy was able to create a more conducive and effective learning environment.

Although there has been an overall increase in science literacy, many students still have not achieved proficiency. This may be due to several factors. First, significant differences in students' initial abilities mean that some students need more time to adjust to the new learning model. Second, low motivation to learn among some students is also an obstacle, as they tend to be passive and less enthusiastic about participating in group discussions. Third, external obstacles, such as a lack of learning support at home and limited access to additional learning resources, also affect student achievement. Additionally, this study has several limitations that should be noted. First, the limited research time of only one meeting meant that the learning model could not be optimally implemented. Second, the relatively small sample size (only two classes) means that the results of this study cannot be generalized widely.

The moderate level of improvement in science literacy suggests that the Culturally Responsive Teaching-based LKPD approach is practical, yet still requires further refinement. Modifications are needed in the LKPD design to make it more varied, additional learning time is required, and individual mentoring strategies are needed for students with learning difficulties. With these improvements, it is hoped that similar research results in the future can achieve a high level and reach a broader audience more evenly.

CONCLUSIONS AND SUGGESTIONS

Based on the findings, it can be concluded that the application of a culturally responsive teaching (CRT) approach assisted by science student worksheets significantly improved students' science literacy skills, as evidenced by the results of the N-gain test, t-test, and effect size analysis. The qualitative data from interviews and observations further supported this improvement, showing that before the intervention, students' science literacy levels were generally below the minimum competency standards, whereas after the implementation of the CRT-based worksheets, their performance and engagement increased noticeably. These results indicate that integrating local cultural contexts into science learning not only enhances cognitive achievement but also strengthens students' motivation and participation in the learning process.

In light of these outcomes, several recommendations can be made for future research and practice. Studies with a larger sample size and broader educational settings are needed to validate the effectiveness of CRT-based worksheets across different contexts. Furthermore, future investigations could explore the use of digital or electronic worksheets (e-LKPD) to improve accessibility, as well as extend the application of CRT to other subject areas such as mathematics and social studies. Comparative studies between CRT and other pedagogical models—such as Problem-Based Learning, Inquiry, or STEM approaches—would also provide a deeper understanding of which strategies are most effective in promoting scientific literacy and holistic student development.

REFERENCES

- Abraham, K., Penczynski, K., Monien, B. H., Bergau, N., Knüppel, S., & Weikert, C. (2023). Risks of misinterpretation of biomarker measurements in spot urine adjusted for creatinine—a problem especially for studies comparing plant based with omnivorous diets. *International*



- journal of hygiene and environmental health*, 249, 114142.
<https://doi.org/10.1016/j.ijheh.2023.114142>
- Badan Pengembangan dan Pembinaan Bahasa. (2022). *Laporan akhir kajian indeks pembangunan literasi masyarakat tahun 2022*.
https://ppid.kepriprov.go.id/resources/informasi_publik/27/KAJIAN_IPLM_2022.pdf
- Brian Priyangga, Q. M. I. L. D. N. (2023). *Pengembangan Komik dengan Pendekatan Culturally Responsive Teaching untuk Menumbuhkan Literasi Sains pada Kelas V SDN Kalicari 01 Semarang*. <https://jurnal.umnu.ac.id/index.php/kst/article/download/705/288/3355>
- Durasa, H., Sudiatmika, A., Subagia, I., & Studi Penelitian dan Evaluasi Pendidikan, P. (2022). *Analisis Kemampuan Literasi Sains Siswa Smp Pada Materi Pemanasan Global* (Vol. 12, Issue 1). <https://doi.org/https://doi.org/10.23887/jpepi.v12i1.930>
- Firdaus, H., Syafrizal, S., & Nulhakim, L. (2024). Improving learning quality through the implementation of electronic teaching materials. *Journal of Education and Learning*, 18(3), 727–733. <https://doi.org/10.11591/edulearn.v18i3.21362>
- Fitriah, L., Gaol, M. E. L., Cahyanti, N. R., Yamalia, N., Maharani, N., Iriani, I. T., & Surayanah, S. (2024). Pembelajaran Berbasis Pendekatan Culturally Responsive Teaching Di Sekolah Dasar. *JoLLA Journal of Language Literature and Arts*, 4(6), 643–650. <https://doi.org/10.17977/um064v4i62024p643-650>
- Fointuna, D. W., Kaluge, A. H., & Fernandez, A. J. (2019). Kategorisasi Kemampuan Literasi Matematika Siswa Smp Negeri Se-Kota Kupang Berbantuan Fuzzy Inference System Metode Mamdani. In *ASIMTOT: JURNAL KEPENDIDIKAN MATEMATIKA* (Vol. 1, Issue 1). <https://doi.org/10.30822/asimtot.v1i1.92>
- Gay, G. (2002). Preparing for Culturally Responsive Teaching. *Journal of Teacher Education*, Vol. 53. <https://doi.org/https://doi.org/10.1177/0022487102053002003>
- Giancoli, & Douglas C. (2016). *Physics: Principles with Applications, Global Edition*. <https://pre-med.jumedicine.com/wp-content/uploads/sites/12/2020/10/Giancoli-Physics-Principles-with-Applications-7th-c2014-txtbk-1.pdf>
- Hidayat, A. T., Muttakin, M., Mujtahid, Z., & Absa, M. (2024). PRAKTIKALITAS DAN EFEKTIVITAS APLIKASI SCIENCE IN AL QURAN (SCIQU) SEBAGAI MEDIA PEMBELAJARAN IPA BERBASIS ANDROID. *EDUPROXIMA (JURNAL ILMIAH PENDIDIKAN IPA)*, 6(3), 1077-1084.
<http://jurnal.stkipgritlungagung.ac.id/index.php/eduproxima>
- Kemendikbud. (2022). *Dimensi, Elemen, dan Subelemen Profil Pelajar Pancasila pada Kurikulum Merdeka 2*. <https://guru.kemendikdasmen.go.id/dokumen/74r6YnDzK3>
- Kementerian Pendidikan, K. R. dan T. (2023). *Laporan hasil asesmen nasional kabupaten Sabu Raijua tahun 2023*. <https://data.kemendikdasmen.go.id/publikasi/p/rapor-pendidikan-indonesia/rapor-pendidikan-indonesia-2025-kabupaten-sabu-raijua>
- Khasanah, I. M., Nuroso, H., & Pramasdyahsari, A. S. (2023). Efektivitas Pendekatan Culturally Responsive Teaching (CRT) untuk Meningkatkan Hasil Belajar Siswa Kelas II Sekolah Dasar. In *Edu Society: Jurnal Pendidikan, Ilmu Sosial, dan Pengabdian Kepada Masyarakat* (Vol. 3). <https://doi.org/10.56832/edu.v3i3.393>
- Kori'un, H. B. (2019). *Ke Sabu, Kita ke Raijua*. Kementerian Pendidikan dan Kebudayaan. https://rumahpusbin.kemdikbud.go.id/sastrawan3t/589_Hary_B_Koriun_Ke_Sabu_Kita_ke_Raijua.pdf
- Krasnoff, B. (2016). *Culturally responsive teaching: A guide to evidence-based practices for teaching all students equitably. Report, Region X Equity Assistance Center at Education Northwest*, Portland, March.

<https://educationnorthwest.org/sites/default/files/resources/culturally-responsive-teaching.pdf>

- Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, 32(3), 465-491.
<https://lmcreadinglist.pbworks.com/f/Ladson-Billings%20%281995%29.pdf>
- Lasminawati, E., Kusnita, Y., & Merta, W. (2023). Meningkatkan Hasil Belajar dengan Pendekatan Pembelajaran Culturally Responsive Teaching Model Problem Based Learning. In *JSER Journal of Science and Education Research* (Vol. 2, Issue 2).
<https://doi.org/https://doi.org/10.62759/jsr.v2i2.49>
- Lestari, S. H., Inabuy, V., Sutia, C., Maryana, O. F. T., & Hardanie, B. (2021). *Buku Panduan Guru SMP KELAS VIII* (Jilid 2). Kementerian Pendidikan, Kebudayaan, riset dan teknologi.
<https://static.buku.kemdikbud.go.id/content/pdf/bukuteks/kurikulum21/IPA-BG-KLS-VIII.pdf>
- Muhammad, B., & Sengkang, P. (2017). *Pendekatan pembelajaran*. Sengkang: Lampena Intimedia. <https://www.researchgate.net/publication/326671091>
- Muhlis, Raksun, A., Putu Artayasa, I., Hadiprayitno, G., & Sukri, A. (2024). Developing Context-Based Teaching Materials and their Effects on Students' Scientific Literacy Skills. In *Pegem Journal of Education and Instruction* (Vol. 14, Issue 1).
<https://www.pegegog.net/index.php/pegegog/article/download/2395/826/14350>
- Muskania, R. T., Maksum, A., & Astra, I. M. (2024). A Qualitative Study of Teacher's Perspective about Digital STEM-PjBL Teaching Material Based on Local Wisdom to Improve Scientific Literacy. *Pegem Journal of Education and Instruction*, 14(2).
<https://doi.org/10.47750/pegegog.14.02.11>
- Negoro, R. A., Rusilowati, A., & Aji, M. P. (2023). Scratch-Assisted Waves Teaching Materials: ICT Literacy and Students' Critical Thinking Skills. *Journal of Turkish Science Education*, 20(1), 189–210. <https://doi.org/10.36681/tused.2023.011>
- OECD. (2019). *PISA 2018 Assessment and Analytical Framework*. OECD.
<https://doi.org/10.1787/b25efab8-en>
- OECD. (2023a). *PISA 2022 Results (Volume I)*. OECD. <https://doi.org/10.1787/53f23881-en>
- OECD. (2023b). *PISA 2025 Science Framework*.
<https://doi.org/https://doi.org/10.1787/8d3b6cfa-en>
- Paiticen, M., Mujiastuti, R., & Rusilowati, A. (2024, May). Peningkatan Literasi Sains Siswa Menggunakan Pendekatan TARL Berbantuan E-LKPD di SMPN 24 Semarang. In *Prosiding Seminar Nasional Pendidikan dan Penelitian Tindakan Kelas* (pp. 1073-1082).
<https://proceeding.unnes.ac.id/snpptk/article/view/3239>
- Rahmawati, Y., & Ridwan, A. (2017). Empowering students' chemistry learning: The integration of ethnochemistry in culturally responsive teaching. *Chemistry: Bulgarian Journal of Science Education*, 26(6), 813-830. <https://www.researchgate.net/publication/321870631>
- Ramdani, N. G., Fauziyyah, N., Fuadah, R., Rudiyo, S., Septiyaningrum, Y. A., Salamatussa'adah, N., & Hayani, A. (2023). Definisi Dan Teori Pendekatan, Strategi, Dan Metode Pembelajaran. *Indonesian Journal of Elementary Education and Teaching Innovation*, 2(1), 20. [https://doi.org/10.21927/ijeeti.2023.2\(1\).20-31](https://doi.org/10.21927/ijeeti.2023.2(1).20-31)
- Rohmah, I. L., & Hidayati, S. N. (2021). Analisis literasi sains peserta didik SMPN 1 Gresik. *PENSA: E-Jurnal Pendidikan Sains*, 9(3), 363-369.
<https://ejournal.unesa.ac.id/index.php/pensa>
- Rosyid, A., Mubin, F., Binamadani, S., & Al-Hikmah Jakarta, S. (2024). Pembelajaran Abad 21: Melihat Lebih Dekat Inovasi Dan Implementasinya Dalam Konteks Pendidikan Indonesia.



- In *Fatkhul Mubin Tarbawi* (Vol. 7, Issue 1).
<https://pdfs.semanticscholar.org/e872/af172fca9afb6afa94a620a46586a1c7880f.pdf>
- Schirmer, B. R., & Lockman, A. S. (2022). Culturally Responsive Teaching in an Undergraduate Online General Education Course. In *Online Learning Journal* (Vol. 26).
<https://files.eric.ed.gov/fulltext/EJ1374269.pdf>
- Seitz, P., & Hill, S. L. (2021). Cognition in 21st century skills: A mixed methods study: Cognition in 21st Century Skills. *International Journal of Curriculum and Instruction*, 13(3), 2232-2252. <https://files.eric.ed.gov/fulltext/EJ1312604.pdf>
- Serway, R. A., & Jewett, J. W. (2014). *Schematic linear or rotational motion directions Dimensional rotational arrow Enlargement arrow Springs*. Boston: Brooks/Cole
<https://www.lehman.edu/faculty/anchordoqui/SJ1.pdf>
- Setyowati, B. E., Indriyani, S., & Dewi, N. R. (2023, July). Peningkatan Keterampilan Literasi Sains Menerapkan Problem Based Learning Berbasis Culturally Responsive Teaching Pada Kelas VII di SMP Negeri 2 Ambarawa. In *Proceeding Seminar Nasional IPA*.
<https://proceeding.unnes.ac.id/snipa/article/view/2305/1788>
- Simatupang, P. N. (2024). Meningkatkan Kesadaran Budaya Dalam Pendekatan CRT (Culturally Responsive Teaching) Pada Pembelajaran Sejarah Di Kelas X 1 SMA Negeri 1 Medan Tahun Pelajaran 2023/2024. In *ALACRITY: Journal Of Education* (Vol. 4).
<https://doi.org/https://doi.org/10.52121/alacrity.v4i1.250>
- Sugiyono. (2013). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. <https://digilib.stekom.ac.id/assets/dokumen/ebook/.pdf>
- Turiman, P., Omar, J., Daud, A. M., & Osman, K. (2012). Fostering the 21st Century Skills through Scientific Literacy and Science Process Skills. *Procedia - Social and Behavioral Sciences*, 59, 110–116. <https://doi.org/10.1016/j.sbspro.2012.09.253>
- Xu, S. R., & Zhou, S. N. (2022). The Effect Of Students' Attitude Towards Science, Technology, Engineering, And Mathematics On 21st Century Learning Skills: A Structural Equation Model. *Journal of Baltic Science Education*, 21(4), 706–719.
<https://doi.org/10.33225/jbse/22.21.706>
- Young, H., & Freedman, R. A. (2012). *Sears and zemansky's University Physics with Modern Phisics*. San Francisco: Pearson Education. <https://kdl.kogistate.gov.ng/wp-content/uploads/2023.pdf>
- Zulaiha, F., & Kusuma, D. (2021). Analisis Kemampuan Literasi Sains Peserta didik SMP di Kota Cirebon. *Jurnal Pendidikan Fisika Dan Teknologi*, 7(2), 190–201.
<https://doi.org/10.29303/jpft.v7i2.3049>