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IMPLEMENTATION OF CULTURALLY RESPONSIVE TEACHING TO IMPROVE SCIENTIFIC EXPLANATION SKILLS OF JUNIOR HIGH SCHOOL STUDENTS

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Abstrak

Scientific explanation is a crucial skill in science learning as it enables students to explain related phenomena scientifically through claims, evidence, and reasoning. However, 8th-grade students' performance at SMP Sriwedari Malang in terms of scientific explanation skills is still insufficient. This research aimed to describe how students' scientific explanation skills were enhanced after experiencing the Culturally Responsive Teaching (CRT) approach. Employing a one-group pretest-posttest design, the research involved seven eighth-grade students at SMP Sriwedari Malang in the 2024/2025 academic year. Data were collected through essay tests aligned with three indicators, claims, evidence, and reasoning. The data analyzed using N-gain formula and the parametric paired sample t-test. The results show an increase in the average score from 55.10 (pretest) to 83.93 (posttest). The N-gain score of 0.65, which falls into the medium category, and a paired sample t-test significance value of 0.004, confirms the effectiveness of this approach. These findings indicates that the Culturally Responsive Teaching (CRT) approach effectively improves lower secondary school students' scientific explanation skills. The study contributes theoretically and practically by highlighting the significance of integrating local cultural context into science learning to foster 21st-century skills.

Keywords: Culturally Responsive Teaching, scientific explanation, science learning, secondary school students'

Abstract. Kemampuan *scientific explanation* merupakan keterampilan yang penting dalam pembelajaran IPA karena menuntun peserta didik untuk dapat menjelaskan fenomena melalui klaim, bukti, dan penalaran. Nyatanya, hasil observasi di SMP Sriwedari Malang menunjukkan keterampilan tersebut masih rendah. Penelitian ini bertujuan untuk mendeskripsikan peningkatan keterampilan *scientific explanation* siswa setelah mengikuti pembelajaran dengan pendekatan *Culturally Responsive Teaching (CRT).* Penelitian ini menggunakan desain *one-group pretest-posttest* dengan subjek tujuh siswa kelas VIII tahun ajaran 2024/2025. Data dikumpulkan melalui tes uraian yang berorientasi pada indikator klaim, bukti, dan penalaran, kemudian dianalisis menggunakan uji *N-gain* dan uji parametrik *paired sample t-test*. Hasil penelitian menunjukkan rata-rata skor meningkat dari 55,10 pada pretest menjadi 83,93 pada posttest dengan N-gain sebesar 0,65 (kategori sedang) serta nilai signifikansi *paired sample t-test* sebesar 0,004. Temuan ini mengindikasikan bahwa pendekatan CRT efektif dalam meningkatkan keterampilan *scientific explanation* siswa SMP. Penelitian ini memberikan kontribusi teoretis dan praktis dengan menegaskan pentingnya integrasi konteks budaya lokal dalam pembelajaran IPA untuk memperkuat keterampilan abad ke-21.

Kata-kata Kunci: Culturally responsive teaching, scientific explanation, pembelajaran IPA, siswa SMP

Background

Natural Science (IPA) is a field of study that not only focuses on understanding information regarding facts and concepts but also involves the process of scientific discovery (Sujana, 2014). Natural science education itself plays a crucial role in developing students' higher-order thinking skills in the 21st century, such as critical thinking, *problem-solving*, and scientific literacy. Mastering science literacy is essential for the public (Li & Go, 2021). According to the 2023 PISA results, Indonesia remains ranked 68th out of 81 countries with a score of 398 (OECD, 2023). These results indicate that Indonesian students' critical thinking and science literacy skills are still in the low category.

Science literacy is the ability to use scientific knowledge to explain phenomena and draw conclusions from evidence (Rahmania et al., 2018). This skill is vital for making decisions about the natural world and solving daily problems. This explanation certainly reinforces the fact that teachers should design learning experiences that build literacy through investigations, encouraging students to develop scientific explanations (Ningthias et al., 2024). Jannah et al. (2023) highlight that scientific explanation skills can be developed through science learning.

Scientific explanation skills allow students to logically answer cause-and-effect questions about natural phenomena by offering logical reasoning (Chin & Brown, 2000). These ability to provide scientific explanations involves a thinking process that enables a person to solve a problem based on concrete evidence and supported by arguments, thereby allowing students to draw a conclusion (Wijayanto et al., 2020). Scientific explanation skills can be viewed as a primary goal of the inquiry process aimed at understanding natural phenomena based on scientific knowledge (Rojikin et al., 2022). Wallace (2004) explain that scientific explanation skills have three aspects: claims, evidence, and reasoning.

Scientific explanation skills are crucial for students (Yanti et al., 2021). This is because these skills help students explain various phenomena scientifically (Nawani et al., 2017). Developing scientific explanation skills regarding phenomena is one of the primary objectives in science learning (Nawani et al., 2019). Through these scientific explanation skills, students will be guided to analyze and interpret data based on their existing scientific knowledge (Jannah et al., 2023). It is important for students to possess scientific explanation skills when explaining a phenomenon because these skills allow them to define scientific concepts based on acquired knowledge and evidence and can enhance their understanding in accordance with the underlying theory (Hernita et al., 2021).

Despite the recognized importance of scientific explanation skills, Indonesian students show slow progress in this area (Jannah et al., 2023). A study conducted in Surakarta found that only 17.6% of students were able to answer questions requiring in-depth explanations of the processes or reasons behind a phenomenon (Laksmi et al., 2021). Sadler (2004, cited in Jannah et al., 2023) noted that students in junior high school still struggle to produce high-quality scientific explanations. Observations and analysis of 8th-grade students at SMP Sriwedari Malang further indicate a lack of reasoning in their responses. Students are still not accustomed to questions requiring reasoning, and the answers provided by students still fail to adequately explain the concepts and their cause-and-effect relationships. Most of students struggling to articulate scientific claims, evidence, and reasoning when studying phenomena.

To address the lack of *scientific explanation* skills, certain solutions have been implemented. Research conducted by Muliardi et al. (2018) indicates that worksheets can serve as teaching materials to enhance students' scientific explanation skills. Studies by Rojikin et al. and Mardhiyyah et al. in 2022 have also developed e-modules to improve students' *scientific explanation* skills in junior high school science learning. However, these materials tend to be limited when they only offer questions and do not include activities for practicing scientific explanations. Therefore, an effective learning approach is needed to provide students to develop their scientific explanation.

One learning approach that can be implemented is Culturally Responsive Teaching (CRT). Culturally Responsive Teaching (CRT) integrates cultural elements into the learning process, whether through practices employed by teachers, affective understanding, or the introduction of local cultural values in each region (Aronson & Laughter, 2016). Culturally Responsive Teaching approach is part of contextual learning aimed at enhancing students' interest in learning while fostering the development of 21st-century skills (Azis et al., 2024). Culturally Responsive Teaching approach will assist students in their learning process. Mandasari et al. (2024) state in their research that through Culturally Responsive Teaching

approach, students become more actively engaged in learning when given the opportunity to share experiences related to the subject matter. The implementation of Culturally Responsive Teaching is also intended to foster students' critical awareness regarding issues and events occurring in their environment (Tanase, 2021). Smith et al (2022) explain that the Culturally Responsive Teaching approach serves as a means to engage students in reasoning about data and their understanding. Thus, the connection between science material and the things around students will enable them to develop their scientific explanation skills.

However, research examining the application of the Culturally Responsive Teaching approach to improve scientific explanation skills in junior high school science learning in Indonesia remains very limited. Therefore, this study will explore the Culturally Responsive Teaching approach as a relevant alternative solution for students in Indonesia in an effort to improve *scientific explanation* skills in science education at the junior high school level.

Given this context, the research question is: How the implementation of the Culturally Responsive Teaching approach can improve students' *scientific explanation* skills in junior high school science learning. This study aims to describe the improvement in students' scientific explanation skills after learning science using the CRT approach.

Method

This study used a pre-experimental design, specifically a *one-group pretest-posttest design*. The study involved a single group of participants and did not include a control group for comparison (Sarifah & Nurita, 2023). The *one-group pretest-posttest* research design involves administering a pretest to the research subjects to determine their initial abilities, followed by the application of an intervention, and concluding with a posttest (Muhandis & Riyadi, 2023). By using this research design, the impact of the intervention can be more clearly identified because the author can compare the students' conditions before and after the intervention. This design was chosen due to the limited number of students, so that the study would focus on observing changes in students' abilities before and after the intervention.

The study used quantitative descriptive analysis to identify, analyze, and assess improvements in the scientific explanation skills of 8th-grade students before and after implementing Culturally Responsive Teaching approach at SMP Sriwedari Malang. This study is exploratory in nature; therefore, the results obtained are not intended for broad generalization but rather to provide an initial overview of the potential for applying the CRT approach in enhancing scientific explanation skills in science learning.

This study involved 7 eighth-grade students at SMP Sriwedari Malang, consisting of 3 female students and 4 male students. The number of research subjects was relatively small due to the limited number of eighth-grade students at SMP Sriwedari Malang.

This experimental study took place in May 2025 during the second semester of the 2024–2025 academic year. SMP Sriwedari Malang was selected because the school agreed to participate in the study, implements the Merdeka curriculum, and had not previously applied Culturally Responsive Teaching approach in its science instruction to enhance students' scientific explanation skills.

Science learning activities for 8th-grade students at SMP Sriwedari, using the CRT approach to improve students' scientific explanation skills, took place over two sessions. The material taught was "Earth's Structure and Development," specifically the sub-topic "Earthquakes." Before the learning activities began, a pretest was administered to assess students' initial abilities to provide scientific explanations. Following this, the 8th-grade class engaged in learning activities using the Culturally Responsive Teaching (CRT) approach. In the first session, students understood the phenomenon of earthquakes through personal experiences, watched videos of earthquake events in Malang and Mojokerto, and engaged in critical discussions to answer questions on the worksheet using the Claim-Evidence-Scientific Reasoning format, concluding with identifying appropriate actions to take during an earthquake. In the second session, students were guided to design earthquake-resistant buildings inspired by traditional house structures. Prior to this, the author provided an explanation of several traditional Indonesian house structures that are earthquake-resistant. Then, students selected one traditional house as inspiration, created a design sketch of their own house, and explained the building components supporting their earthquake-resistant design using the Claim-Evidence-Scientific Reasoning format.

The instruments used in this study consisted of pretest and posttest sheets regarding scientific explanation skills. The scientific explanations skills test consisted of 4 long-answer questions. The scientific explanations skill test was oriented toward three indicators, as outlined by Wallace (2004): claims, evidence, and scientific reasoning.

Data collection techniques used documentation and tests. Tests were administered to assess scientific explanation ability. Documentations served as supporting data during the learning process using Culturally Responsive Teaching approach.

The pretest and posttest results were used to measure improvement in students' scientific explanation skills, using N-gain as the analytical technique.

In addition, prior to conducting further tests, the Shapiro-Wilk normality test was performed. The Shapiro-Wilk normality test was chosen to assess the distribution of random data in a sample of fewer than 50 observations (Sudirman et al., 2023). The data are

considered normally distributed if the p-value is greater than 0.05. The results of the Shapiro-Wilk normality test are used to determine the appropriate statistical test (Saputra & Gunasti, 2026). If the data are normally distributed, a parametric paired-sample t-test is performed. The paired-samples t-test is used to compare the means of two variables within the same group (Muhid, 2019). If the data are not normally distributed, the nonparametric Wilcoxon test will be conducted (Saputra & Gunasti, 2026). Next, hypothesis testing is performed. If the significance level is less than 0.05, the hypothesis that students' scientific explanation abilities differ before and after learning using Culturally Responsive Teaching approach in science learning is supported (Muhid, 2019).

Results and Discussion

Result

This study was designed to determine improvements in 8th-grade students' scientific explanation skills in science learning after receiving a treatment involving the implementation of the Culturally Responsive Teaching (CRT) approach. Based on observations and analyses of students' worksheet scores from previous sessions, it was found that the scientific explanation ability of 8th-grade students at SMP Sriwedari Malang remained well below expectations. The students' scientific explanations remained low. This was further supported by the pretest results, which indicated that the scientific explanation skills of the 8th-grade students at SMP Sriwedari Malang were still below the minimum passing criteria.

After the students participated in two sessions of learning activities using the CRT approach, *a post-test* was administered. The *pretest* and *posttest* scores were used to measure the improvement in the scientific explanation skills of the 8th-grade students at SMP Sriwedari following the intervention. The students' test scores on the scientific explanation test are shown in Table 1.

Table 1. Pretest dan Posttest Score for Scientific Explanation Skills

Scientific Explanation Indicators	Score	
	Pretest	Posttest
Claim	59,93	85,71
Evidence	46,43	78,57
Scientific Reasoning	58,93	87,50
Average	55,10	83,93

The following figure illustrates the improvement in scientific explanation skills from the pretest to the posttest, as shown in Table 2.

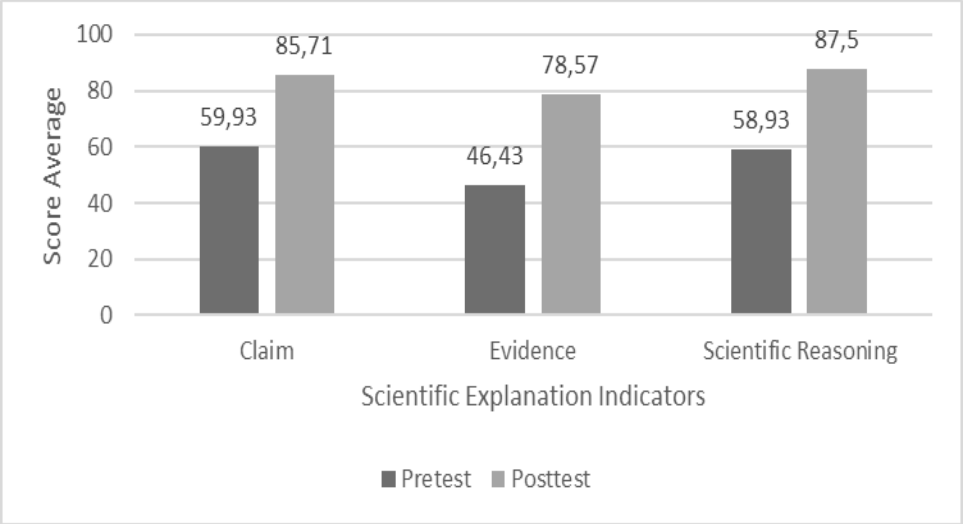

Figure 1. Graph of Improvement in Scientific Explanation Skill

Based on Table 2, the average pretest scores for 8th-grade students' scientific explanations across each indicator remained low: 59.93 for the claim indicator, 46.43 for the evidence indicator, and 58.93 for the scientific reasoning indicator. Nevertheless, there was a significant improvement in the average post-test scores for scientific explanation ability, specifically: the claim indicator at 85.71, the evidence indicator at 78.57, and the scientific reasoning indicator at 87.50.

The pretest and posttest scores were also analyzed using the N-gain test to determine the extent of the improvement in students' scientific explanation skills. The results of the N-gain analysis are shown in Table 2.

Table 2. Result of the N-gain Analysis of the Scientific Explanation Indicator

Scientific Explanation Indicator	N-gain	Criteria
Claim	0,64	Medium
Evidence	0,60	Medium
Scientific Reasoning	0,70	Medium
Average	0,65	Medium

The results of the N-gain analysis show that the overall average N-gain across all indicators of scientific explanation is 0.65, placing it in the medium category. The indicator with the lowest N-gain result was the evidence indicator at 0.60, classified as medium, while the indicator with the highest N-gain result was the scientific reasoning indicator at 0.70, also classified as medium.

Next, a Shapiro-Wilk normality test was conducted in Microsoft Excel to determine whether the data were normally distributed. The Shapiro-Wilk normality test results showed p-values of 0.817 for the pre-test data and 0.836 for the post-test data. Both values are above 0.05, indicating that the data are normally distributed. Therefore, a parametric paired-samples t-test in Microsoft Excel can be used to determine whether the difference between

pretest and posttest scores is significant. The results of *the paired-sample t-test* analysis are shown in Table 4.

The results of the statistical test in Table 4 show a significance value of 0.004. This significance value is less than 0.05 (0.004<0.05). Since the significance value is less than 0.05, H_0 is rejected, and H_1 is accepted (Muhid, 2019). Thus, it can be concluded that students' scientific explanation skills improved after exposure to the culturally responsive teaching approach. Therefore, the intervention administered has a significant effect on improving students' scientific explanation skills in science learning.

Table 4. Results of the Paired Sample t-test for the Pretest dan Posttest

	Pretest	*Posttest*
Mean	55,097	83,927
Variance	56,583	22,321
Observations	3,000	3,000
Pearson Correlation	0,967	
Hypothesized Mean Difference	0,000	
df	2,000	
t Stat	-15,664	
P(T<=t) one-tail	0,002	
t Critical one-tail	2,920	
P(T<=t) two-tail	0,004	
t Critical two-tail	4,303	

Although the research results indicate an improvement in scientific explanation skill following the application of the culturally responsive teaching approach, this study has limitations due to its small sample size of 7 students. Therefore, the findings are exploratory and require further research with a larger sample to yield stronger results that can be more broadly generalized.

Discussion

Based on the results, the indicator of scientific explanation skills that showed the greatest improvement was scientific reasoning, while the indicator that showed the least improvement was evidence. The differences in the level of improvement across indicators suggest that the culturally responsive teaching approach has varying impacts on each indicator. Prior knowledge and experience play a crucial role in scientific explanation skill (Schoenherr & Thomson, 2021). Here, students do not rely solely on logic but also on prior knowledge to understand and evaluate their scientific explanations.

For the scientific reasoning indicator, students were able to explain scientific reasoning using well-supported evidence after being trained through worksheets that implemented the Culturally Responsive Teaching (CRT) approach. Through reasoning, students can provide

scientific justifications by correlating claims with the evidence they have previously explained (Rojikin et al., 2022). Regarding the reasoning indicator, students provide a rationale for presenting the evidence, thereby supporting the selected claim in accordance with scientific principles. This occurs because the CRT approach connects learning materials to cultural contexts and real-life experiences, making it easier for students to construct scientific cause-and-effect relationships. Lasminawati (2023) explains that learning through the culturally responsive teaching approach connects the material to issues relevant to daily life. Thus, teachers can effectively facilitate students' understanding (Athallah et al., 2025).

The indicator of scientific explanation skill that showed the second-highest improvement was the claim indicator. Regarding the claim indicator, students were able to explain claims effectively after being trained using worksheets that implemented the culturally responsive teaching approach. The claim indicator showed significant improvement, as students demonstrated strong comprehension of the material (Rojikin et al., 2022). This improvement may be attributed to the culturally responsive teaching approach, which helps students deeply understand concepts by connecting the material to real-world experiences, thereby enabling them to formulate appropriate claims. Findings from a study by Tanase (2021) also indicated that the culturally responsive teaching strategy enhances the relevance of learning. This, of course, can improve conceptual understanding, which serves as the foundation for formulating scientific claims.

The indicator with the lowest improvement in scientific explanation ability is the evidence indicator. Nevertheless, the improvement in the evidence indicator remains positive, as it has increased. This indicates that the culturally responsive teaching approach has a positive impact on students' ability to identify scientific evidence (Rojikin et al., 2022). The relatively low improvement compared to other scientific explanation indicators may be due to students' still suboptimal ability to analyze and interpret data effectively. This aligns with research by Srithep et al. (2017), which noted that students still do not provide sufficient evidence because they tend not to utilize available data to its fullest potential.

A paired-samples t-test indicates a significant difference in students' scientific explanation skills before and after instruction using the culturally responsive teaching approach. These results indicate that implementing the culturally responsive teaching (CRT) approach can improve students' scientific explanation skills. This is because the culturally responsive teaching approach connects science material to students' real-life contexts, thereby encouraging them to engage more actively in the learning process (Sya'bana et al., 2024). Students' active engagement stems from learning activities that are more relevant to their daily lives; their participation makes these activities more meaningful, enabling them to

better explain the scientific reasoning behind their answers and the supporting evidence previously discussed.

The results of this study have practical implications for science learning in schools, particularly at the junior high school level. In this context, teachers serve as facilitators, mentors, and bridges between science and the culture present in students' daily lives by understanding students' backgrounds and using contexts relevant to their lives (Smith et al., 2022). By doing so, teachers can help students understand concepts more deeply and enhance their ability to provide scientific explanations.

This study certainly has several limitations. The relatively small sample size—due to the limited number of students at the school where the research was conducted—means the findings cannot yet be widely generalized and are exploratory. Nevertheless, this study still contributes to the development of science learning at the junior high school level by applying the Culturally Responsive Teaching (CRT) approach in Indonesia.

Conclusion

Based on the results and discussion outlined above, the author concludes that implementing the Culturally Responsive Teaching (CRT) approach can enhance 8th-grade students' scientific explanation skills in science learning, particularly in terms of the indicators of scientific explanation*:* claims, evidence, and reasoning. This improvement indicates that integrating local cultural contexts into science learning is crucial for fostering students' active engagement and developing their scientific thinking skills. From a practical perspective, these findings offer science teachers insights into designing instructional strategies that connect scientific concepts with students' experiences and cultural backgrounds, thereby making the learning process more relevant and meaningful. Theoretically, this study contributes to expanding the body of research on the application of the Culturally Responsive Teaching (CRT) approach in science learning in Indonesia. Therefore, future research is recommended to involve a larger sample size, employ an experimental design with a control group, and examine additional indicators of scientific explanation to achieve a more comprehensive understanding and stronger generalizations.

References

Al Muhandis, M. A., & Riyadi, A. (2023). Analisis Efektivitas Customer First Quality First Approach Pada Training Quality Dojo Dengan Metode Quasi Eksperimen One Group Pretest Posttest Design. *Journal of Applied Multimedia and Networking*, *7*(2), 98-106. https://doi.org/10.30871/jamn.v7i2.6931

Aronson, B., & Laughter, J. (2016). The theory and practice of culturally relevant education: A synthesis of research across content areas. *Review of educational research*, *86*(1), 163-206. https://doi.org/10.3102/0034654315582066

Athallah, N. L. N., Copriady, J., & Anwar, L. (2025). E-LKPD berbasis culturally responsive transformative teaching menggunakan liveworksheets pada materi reaksi redoks. *Jurnal Pendidikan Matematika Dan Sains*, *13*(2), 296-310. https://doi.org/10.21831/jpms.v13i2.86707

Azis, I. S., Maharani, S. D., & Indralin, V. I. (2024). Implementation of differentiated learning with a Culturally Responsive Teaching approach to increase students' interest in learning. *Jurnal Elementaria Edukasia*, *7*(2), 2750-2758. https://doi.org/10.31949/jee.v7i2.9348

Chin, C., & Brown, D. E. (2000). Learning in science: A comparison of deep and surface approaches. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, *37*(2), 109-138. https://doi.org/10.1002/(SICI)1098-2736(200002)37:2<109::AID-TEA3>3.0.CO;2-7

Hajaroh, S., & Raehanah. (2021). *Statistik Pendidikan (Teori & Praktik)*. Mataram: Penerbit Sanabil.

Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American journal of Physics*, *66*(1), 64-74. https://doi.org/10.1119/1.18809

Hernita, S. K. Handayanto, E. Supriana. (2021). Eksplorasi scientific explanation berdasarkan tingkat kemampuan peserta didik. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan,* *6*(5), 687-691. Retrieved from https://www.neliti.com/publications/479726/eksplorasi-scientific-explanation-berdasarkan-tingkat-kemampuan-peserta-didik

Jannah, A. W., Wahyuni, S., & Rusdianto, R. (2023). Pengembangan e-book ipa berbasis flip pdf professional untuk meningkatkan kemampuan scientific explanation siswa SMP. *EDUSAINTEK: Jurnal Pendidikan, Sains dan Teknologi*, *10*(1), 259-275. https://doi.org/10.47668/edusaintek.v10i1.517

Laksmi, M. L., Sari, D. P., Rinanto, Y., & Sapartini, R. R. (2021). Implementation of Problem Based Learning to Increase Scientific Explanation Skill in Biology Learning about the Environment. *Journal of Learning for Development*, *8*(3), 532-540. Retrieved from https://eric.ed.gov/?id=EJ1325054

Lasminawati, E., Kusnita, Y., & Merta, I. W. (2023). Meningkatakan Hasil Belajar dengan Pendekatan Pembelajaran Culturally Responsive Teaching Model Problem Based Learning. *Journal of Science and Education Research*, *2*(2), 44-48. https://doi.org/10.62759/jser.v2i2.49

Li, Y., & Guo, M. (2021). Scientific literacy in communicating science and socio-scientific issues: Prospects and challenges. *Frontiers in Psychology*, *12*, 758000. https://doi.org/10.3389/fpsyg.2021.758000

Nawani, J., Kotzebue, L., Rixius, J., Graml, M., & Neuhaus, B. J. (2018). Teachers' use of focus questions in german biology classrooms: A video-based naturalistic study. *International Journal of Science and Mathematics Education*, *16*, 1431-1451. https://doi.org/10.1007/s10763-017-9837-z

Nawani, J., von Kotzebue, L., Spangler, M., & Neuhaus, B. J. (2019). Engaging students in constructing scientific explanations in biology classrooms: a lesson-design model. *Journal of Biological Education*. https://doi.org/10.1080/00219266.2018.1472131

Ningthias, D. P., Listantia, N., & Sakaroni, R. (2024). Melatih Scientific Explanation Siswa melalui Learning Cycle 5E berkonteks Socio-Scientific Issues (SSI). *Indonesian Journal of Educational Science (IJES)*, *7*(1), 70-80. Retrieved from https://ojs.unsulbar.ac.id/index.php/ijes/article/view/4562

Mandasari, J., Titin, T., & Juniardi, D. (2024). Pengaruh pendekatan CRT dalam meningkatkan hasil dan motivasi belajar siswa. *EKSAKTA: Jurnal Penelitian dan Pembelajaran MIPA*, *9*(1), 81-86. http://dx.doi.org/10.31604/eksakta.v9i1.81-86

Mardhiyyah, L., Supeno, S., & Ridlo, Z. R. (2022). Development of e-modules to improve scientific explanation skills in science learning for junior high school students. *Jurnal Pendidikan MIPA*, *23*(1), 34-11. http://dx.doi.org/10.23960/jpmipa/v23i1.pp34-44

Mardhiyyah, L., Habiddin, H., & Rudiyanto, R. (2025). The Role of Culturally Responsive Teaching (CRT) in Contextual Teaching and Learning to Improve Students' Scientific Explanation Skills. *J-PEK (Jurnal Pembelajaran Kimia)*, *10*(1), 50–57. https://doi.org/10.17977//um026v10i12025p50

McKoy, C. L., & Lind, V. R. (2022). *Culturally responsive teaching in music education: From understanding to application*. Routledge.

Muhid, A. (2019). *Analisis Statistik 5 Langkah Praktis Analisis Statistik dengan SPSS for Windows*. Sidoarjo: Penerbit Zifatama Jawara.

Muliardi, M. W. R., Supeno, S., & Bektiarso, S. (2018). Lembar kerja siswa scientific explanation untuk melatihkan kemampuan penjelasan ilmiah siswa SMA dalam pembelajaran fisika. In *Prosiding Seminar Nasional Pendidikan Fisika* (Vol. 3, No. 1, pp. 33-38). Retrieved from https://jseahr.jurnal.unej.ac.id/index.php/fkip-epro/article/view/7366

Mumtaz, S., Salim, F. N., & Ali, S. (2025). Impact of Integrated Curriculum on Students' Learning Outcomes: Experimental Evidence from District Peshawar, Pakistan. *ASSAJ*, *4*(02), 3951-3962. https://doi.org/10.5281/zenodo.18522751

PISA 2022 Results (Volume I). (2023). OECD. https://doi.org/10.1787/53f23881-en

Rahmania, S., Miarsyah, M., & Sartono, N. (2018). The Difference Scientific Literacy ability of Student having Field Independent and Field Dependent Cognitive style. *Biosfer: Jurnal Pendidikan Biologi*, *8*(2), 27–34. https://doi.org/10.21009/biosferjpb.8-2.5

Rojikin, M., Rasyid, R. Z., & Supeno, S. (2022). Development of E-Modules to Improve Scientific Explanation Ability of Students in Science Learning on Digestive System Materials. *SEJ (Science Education Journal)*, *6*(1), 1-21. https://doi.org/10.21070/sej.v6i1.1618

Saputra, D. A., & Gunasti, A. (2026). ANALISIS UJI BEDA BERPASANGAN ANTARA MOBIL PENUMPANG B DAN C DI JL. PB SUDIRMAN-JL. DAHLIA MENGGUNAKAN METODE WILCOXON. *Jurnal Media Akademik (JMA)*, *4*(1). https://doi.org/10.62281/etfwxp25

Safirah, A. D., Nasution, N., & Dewi, U. (2024). Analysis of the development needs of HOTS-based electronic student worksheets with culturally responsive teaching approach in elementary schools. *IJORER: International Journal of Recent Educational Research*, *5*(1), 243-256. https://doi.org/10.46245/ijorer.v5i1.533

Sarifah, F., & Nurita, T. (2023). Implementasi model pembelajaran inkuiri terbimbing untuk meningkatkan keterampilan berpikir kritis dan kolaborasi siswa. *PENSA: E-Jurnal Pendidikan Sains*, *11*(1), 22-31. Retrieved from https://ejournal.unesa.ac.id/index.php/pensa/article/view/46474

Schoenherr, J. R., & Thomson, R. (2021). Persuasive features of scientific explanations: Explanatory schemata of physical and psychosocial phenomena. *Frontiers in Psychology*, *12*, 644809. https://doi.org/10.3389/fpsyg.2021.644809

Septiani, D. A., Andayani, Y., & Astuti, B. R. P. (2024). Penerapan Model Problem Based Learning Terintegrasi Culturally Responsive Teaching untuk Meningkatkan Hasil

Belajar Kimia. *Didaktika: Jurnal Penelitian Tindakan Kelas*, *2*(1), 29-36. https://doi.org/10.63757/jptk.v2i1.16

Smith, T., Avraamidou, L., & Adams, J. D. (2022). Culturally relevant/responsive and sustaining pedagogies in science education: theoretical perspectives and curriculum implications. *Cultural Studies of Science Education*, *17*(3), 637-660. https://doi.org/10.1007/s11422-021-10082-4

Srithep, C., Junprasert, T., Silprasit, K., & Dahsah, C. (2017). High School Science Students' Difficulties in Constructing Scientific Explanations in Biology. In *Conference Proceedings. New Perspectives in Science Education* (p. 477). libreriauniversitaria. it Edizioni. Retrieved from https://conference.pixel-online.net/files/npse/ed0006/FP/3466-SERA2226-FP-NPSE6.pdf

Sudirman, Lembang, S. T., Kondolayuk, M. L., Andinny, Y., Vonnisye, Marlinda, N. L. P. M., Kartini, K. P., Nursa'adah, F. P., Juniawan, I. P. P. M. E., Sukmawati, R., Purwanti, P., Rosa, N. M., Seruni, Indrawati, F., Suryati, K., Anggereni, S., Safitri, P. T., Damayanti, I. D., Indrayana, I. P. T., & Thana, D. P. (2023). Statistika Pendidikan. Bandung: Penerbit Media Sains Indonesia.

Sujana, A. (2014). Dasar-Dasar IPA: Konsep dan Aplikasinya. Bandung: UPI PRESS.

Sya'bana, M., Hariyono, E., & Maharani, T. D. (2024). Pengaruh Pendekatan Culturally Responsive Teaching Terhadap Keaktifan dan Hasil Belajar IPA. *SCIENCE: Jurnal Inovasi Pendidikan Matematika dan IPA*, *4*(2), 74-88. https://doi.org/10.51878/science.v4i2.2965

Tanase, M. F. (2021). Culturally Responsive Teaching in Urban Secondary Schools. *Education and Urban Society*, *54*(4), 363-388. https://doi.org/10.1177/00131245211026689

Wallace, C. S. (2004). Framing new research in science literacy and language use: Authenticity, multiple discourses, and the "Third Space". *Science Education*, *88*(6), 901-914. https://doi.org/10.1002/sce.20024

Whatoni, A. S., Anwar, Y. A. S., & Namira, D. (2024). Penerapan pendekatan culturally responsive teaching untuk meningkatkan hasil belajar dan minat belajar kimia peserta didik. *DIDAKTIKA: Jurnal Penelitian Tindakan Kelas*, *2*(1), 22-28. https://doi.org/10.63757/jptk.v2i1.13

Wijayanto, T., Supeno, S., & Bektiarso, S. (2020). Pengaruh model inkuiri terstruktur terhadap kemampuan scientific explanation siswa dalam pembelajaran fisika di SMA. *JPFT (Jurnal Pendidikan Fisika Tadulako Online)*, *8*(2). Retrieved from https://repository.unej.ac.id/handle/123456789/108587

Yanti, A. F., Riandi, R., & Supriatno, B. (2021). Analisis kemampuan scientific explanation siswa pada materi sistem pencernaan manusia menggunakan model explanation oriented lesson design. *Assimilation: Indonesian Journal of Biology Education*, *4*(2), 58-64. https://doi.org/10.17509/aijbe.v4i2.41481