



Research Article

The Effectiveness of A or Code-Assisted Water Cycle Diorama Augmented Reality in Improving the Cognitive Learning Outcomes of Grade V Students at Gamping State Elementary School

Shafira^{1*}, Suryandari², An-Nisa Apriani³, Ismanto⁴

1,2,3,4 Elementary School Teacher Education, Faculty of Teacher Training and Education, Alma Ata University, Yogyakarta, Indonesia Department of Educational

Article Info

Article history:

Received : October 06, 2025

Revised : October 22, 2025

Accepted : December 05, 2025

Available online : January 30, 2026

Keywords:

Diorama, QR Code, Augmented Reality, Cognitive Learning Outcomes, IPAS, Water Cycle

Abstract

Observation results in grade V of Gamping Public Elementary School on March 14, 2025 showed that science learning was still less than optimal. As many as 8 out of 20 students had not reached the KKM of 70, and their cognitive abilities tended to stop at the C1 (remembering) domain, not yet developing to C2 (understanding), C3 (applying), or C4 (analyzing). This study aims to determine the effectiveness of the Water Cycle Diorama assisted by QR Code Augmented Reality in improving students' cognitive science learning outcomes. This diorama media is designed to help students understand the concept of the water cycle through real, contextual and interactive visualizations, so it is expected to improve their cognitive learning outcomes. This research uses a quantitative research type with a descriptive design. one group pretest and posttest. The research subjects were fifth grade students of SDN Gamping Teknik and the data collection instruments were in the form of learning observation sheets, tests (pretest and posttest). Data validation techniques include content validity tests and empirical validity (content validity tests, reliability, level of difficulty of questions, discrimination power. The data analysis techniques used are normality, and hypothesis testing (t-test and N-Gain) through the SPSS Version 25 program. The results of the t-test in the t-test column for Equality of Means if the Sig. (2-tailed) value is > 0.05 then H_a is rejected and H_0 is accepted, meaning there is no significant difference between the results pretest And posttest. On the other hand, if the Sig. (2-tailed) value is < 0.05 then H_a is accepted and H_0 is rejected, which means there is a significant difference between the pretest and posttest results. In other words, the use of the Water Cycle Diorama based on QR Code Augmented Reality has a significant influence on improving students' cognitive learning outcomes in science. The results of the study showed that the water cycle diorama learning media assisted by QR Code Augmented Reality was proven effective in improving the cognitive learning outcomes of fifth grade students of Gamping Elementary School in science learning. This was proven by the results of the t-test calculation which showed a significance value (2-tailed) of $0.000 < 0.005$ which means there was a difference between the pretest and posttest results after learning using the water cycle diorama assisted by QR Code Augmented Reality. In addition, the results of the N-Gain calculation of 0.365870 showed that the increase in learning outcomes was in the moderate category. Thus, the QR Code Augmented Reality assisted diorama media was effectively used in learning to improve the cognitive learning outcomes of fifth grade students of elementary school on the water cycle material.

© 2026 IJCAR. All rights reserved

Introduction

Education is a crucial part of a person's life because it fosters cognitive, affective, and psychomotor development, creating a quality generation. A quality generation is able to adapt to its environment and face various challenges (Muchtar et al., 2023). According to Dayana et al. (2021), education serves to develop students' potential, focusing not only on learning outcomes but also on the process of understanding the material.

The curriculum is the heart of education because it encompasses learning plans and experiences to achieve learning objectives. One of the latest innovations is the Independent Curriculum, which emphasizes learning based on students' interests and talents and encourages independent learning (Komalasari, 2023). In line with curriculum changes, the learning approach has also shifted from teacher-oriented to student-oriented, where students are more active in the learning process (Sunarno & Suryandari, 2016). This approach aligns with the principles of the Independent Curriculum and the demands of the Society 5.0 era, which emphasizes the integration of technology in education (Abidah, 2022).

One innovation to address the challenges of the Society

5.0 era is the use of virtual laboratories, which facilitate learning through digital platforms (Suryandari et al., 2022). Virtual laboratories help students conduct digital experiments without having to be in a physical lab, making learning more practical and safe (Hikmah, 2020). This medium also helps students understand scientific concepts through interactive experiences (Ramadhani, 2021). In learning Natural and Social Sciences (IPAS), virtual laboratories can visualize abstract material such as the water cycle more clearly (Abidah, 2022).

One form of virtual laboratory is Augmented Reality (AR), which combines real and virtual objects to create interactive learning (Ekayogi, 2023). Augmented Reality helps students understand complex concepts through engaging visualizations, increasing interest and learning outcomes (Simarona et al., 2024). However, the use of Augmented Reality in learning is still limited. One type of AR that can be used is QR Code Augmented Reality, which makes it easier for teachers to deliver material using limited media (Sugiana & Muhtadi, 2019).

Besides technology, traditional media Dioramas, such as dioramas, are also effective in aiding student understanding through three-dimensional visualization (Maulana & Syafrina,

¹ Corresponding author.

E-mailaddress: 211300260@almaata.ac.id (Shafira)

2022). However, conventional dioramas have limitations in interactivity. To address this, implementing QR Code Augmented Reality into dioramas is an innovative solution (Seftriana, 2020). The QR Code-assisted AR water cycle diorama not only visualizes concepts realistically but also enhances students' interest and cognitive learning outcomes.

In science learning, understanding abstract concepts such as the water cycle is often difficult due to the lack of interactive media (Sunami & Aslam, 2021). Observations at Gamping Public Elementary School showed that 8 out of 20 fifth-grade students had not yet achieved the Minimum Competency (KKM) (70), with cognitive abilities still at level C1 (remembering) in Bloom's taxonomy. Monotonous learning and the lack of use of technology-based media contributed to the low learning outcomes.

Based on these problems, this study aims to test the effectiveness of a water cycle diorama assisted by QR Code Augmented Reality in improving the cognitive learning outcomes of fifth-grade elementary school students in science. It is hoped that this study can provide innovative solutions to improve students' understanding and learning outcomes.

Methodology

The type of research used in this study is quantitative research. This research is categorized as a quantitative method with an experimental approach, which aims to test the effectiveness of the water cycle diorama assisted by QR Code Augmented Reality in improving the cognitive learning outcomes of fifth grade elementary school students in science. This research was conducted by providing treatment in the form of learning using a QR Code Augmented Reality assisted diorama, then measuring the results through a pretest and posttest to determine any changes in student learning outcomes.

In this experimental study, the independent variable is the learning media in the form of a QR Code Augmented Reality-assisted diorama, while the dependent variable is the cognitive learning outcomes of fifth-grade elementary school students in science. This study did not use a control group, but instead implemented a one-group pretest-posttest design, where the sample students were given a pretest before learning, then given treatment (learning with a QR Code Augmented Reality-assisted diorama), and their posttest results were measured after learning.

Table 1 Research Design

Class	Pretest	Treatment	Posttest
Class V	O1	X	O2

(Yuli & Astuti, 2018).

Information:

Class V : Classes that make research

O1 : Conduct a pretest before treatment

X : Treatment using Assisted Dioramas
QR Code Augmented Reality

O2 : Conduct a Posttest after it is done treatment

Result

This research was conducted in the fifth grade of Gamping State Elementary School in the even semester of the 2024/2025 academic year, with a total of 20 students. The purpose of this study was to determine the effectiveness of the Water Cycle Diorama media Assisted by QR Code Augmented Reality in improving students' cognitive learning outcomes in science learning. The instrument used was a multiple-choice test of 20 questions given in two stages, namely a pretest before treatment and a posttest after treatment.

The learning outcome data obtained from the pretest and posttest were analyzed to determine the improvement in student learning outcomes and the significance of the differences in scores before and after using QR-assisted diorama media. *Augmented Reality code* To determine the differences in student learning outcomes before and after treatment, a paired sample t-test was conducted.

Table 2 Test results Paired Sample t-Test

Variables	N	df	t hitung	Sig.(2-tailed)
Pretest and Posttest	20	19	-14,673	0,000

Based on the table above The results of the t-test calculation show that the 2-tailed significance value is 0.000, < 0.005. Since the average posttest score is higher than the pretest, it can be concluded that there is a difference between students' pretest and posttest scores. This indicates a significant influence after treatment using the water cycle diorama media assisted by QR Code Augmented Reality.

In addition to the t-test, analysis of learning outcome improvements was also carried out using the N-Gain calculation.

Table 3 N-Gain Test

Variables	N	Minimum	Maximum	Mean	Standard Deviation
N-Gain Score	20	0.17	0.60	0.3659	0.11545
N-Gain Percentage	20	16.67	60.00	36,5870	11,54521

Based on the analysis results, the average N-Gain value obtained was 36.5870, which is in the moderate category. This indicates that the applied learning media is quite effective in improving student learning outcomes.

Discussion

This research aims to determine the effectiveness of the Water Cycle Diorama media assisted by QR Code Augmented Reality (AR) on the cognitive learning outcomes of fifth-grade elementary school students. The research results indicate an increase in learning outcomes after students received treatment using the media. This is evidenced by the average N-Gain value of 36.5870%, which falls into the medium category. This means that the use of the Water Cycle Diorama assisted by QR Code Augmented Reality is able to improve student learning outcomes, although its effectiveness has not reached the high category. These results indicate that interactive visual learning media can help students understand abstract concepts, such as the water cycle.

The results of this study also show an increase in student achievement in the cognitive domain based on Bloom's Taxonomy. Before the treatment, students' abilities tended to be at the C1 level (remembering), meaning they could only mention the sequence of the water cycle process without understanding the deeper meaning. After learning using the Water Cycle Diorama assisted by QR Code Augmented Reality, students' abilities began to develop into the C2 (understanding) and C3 (applying) domains. This is evident from the students' ability to explain the relationships between processes, such as linking evaporation to cloud formation (condensation), and applying the concept of the water cycle in new situations, for example, when asked to explain the reason for drought in an area. The increase in the C4 domain (analyzing) is still limited because some students have difficulty comparing data and drawing more complex

conclusions. This condition is in accordance with the average N-Gain which is in the medium category, so the development of learning strategies that emphasize higher-order thinking skills is still needed.

The results of this study are in line with the findings of Pratiwi (2022), which prove that the use of diorama media in science learning can improve the learning outcomes of fifth-grade students at SD Negeri Gamping. Diorama media is able to visualize the process of the groundwater cycle so that students can more easily understand abstract concepts. Similar findings were also found by Jannah et al. (2023), which shows that the use of diorama media has a positive effect on the science learning outcomes of fifth-grade students at SD Negeri Gamping. The research confirms that dioramas can be an effective medium because they provide concrete and interesting learning experiences, thus motivating students to be more active in the learning process.

However, the effectiveness obtained is still in the medium category. This can be influenced by several conditions during the learning process. Limited learning time means that students do not have enough opportunity to explore the media in more depth. In addition, the diverse initial abilities of students also affect the achievement of learning outcomes, because some students still have difficulty understanding the material even though it has been presented through visual media. Unconducive learning environment conditions, such as limited devices and technical disturbances in the use of QR Codes and Augmented Reality, also become obstacles. In addition, some students are still not familiar with the use of digital technology in learning activities, so it takes longer to adapt.

In addition, the role of the teacher is also very important in supporting the success of learning. Visual and interactive media can indeed attract students' attention, but in-depth understanding still requires explanation and direction from the teacher. This is in line with Arsyad's (2019) opinion that learning media functions as a tool, not as a substitute for the teacher's role.

Based on the research results, the use of QR Code Augmented Reality-based Water Cycle Diorama has proven effective in improving students' cognitive learning outcomes in the medium category. This media is suitable for introducing initial concepts in an interesting way, but further development is still needed to strengthen students' understanding in more depth. In further research, the use of this media can be supported by more adequate time allocation, the availability of complete devices, and integration with active learning strategies, so that its effectiveness can be improved.

Conclusion and Recommendation

Based on the results of the research, it can be concluded that the Water Cycle Diorama media Augmented Reality QR Code Assisted is effective in improving learning outcomes cognitive students in grade V of Gamping State Elementary School in social studies subjects. This Proven through:

1. The results of the t-test, which show a significance value (2-tailed) of $0.000 < 0.05$, so that H_0 is rejected and H_1 is accepted. Thus, there is a difference significant between pretest and posttest scores after learning using water cycle diorama media assisted by QR Code Augmented Reality.
2. The result of the calculation of N-Gain, which reached 0.365870 or 36.58% and Included in the medium category. This shows that the use of Diorama QR Code Augmented Reality-assisted Water Cycle is able to provide improvement in students' cognitive learning outcomes, even though its effectiveness has not yet reached On the other hand, the Senate will not be able.

3. Judging from the cognitive realm of Bloom's Taxonomy, students' abilities are not only stops at the C1 level (remembering), but begins to progress towards C2 (understand) and C3 (apply). However, the improvement on C4 (Analyze) is still limited so it requires an advanced learning strategy which puts more emphasis on high-level thinking skills.

Thus, this study proves that the use of Water Cycle Diorama media assisted by QR Code Augmented Reality is effectively used in IPAS learning to help students understand abstract material, especially water cycles. However, the level of effectiveness obtained is still in the medium category, so further development is needed so that the improvement of students' cognitive learning outcomes can reach the high category.

Based on the results of this study, several areas need improvement and follow-up. Therefore, the researchers offer several suggestions, summarized as follows:

1. The water cycle diorama media assisted by QR Code Augmented Reality has been proven effective in improving students' cognitive learning outcomes in science, so this media can be used as a learning innovation that is suitable for implementation in delivering water cycle material in grade V of elementary school.
2. Further researchers are advised to develop and study this media on other materials, different levels, or with a more creative and contextual approach in order to obtain broader and deeper results.
3. Teachers are expected to be able to understand and implement water cycle diorama media assisted by QR Code Augmented Reality as a form of learning media innovation that is interesting, interactive, and able to help students understand abstract concepts more easily.
4. This research is expected to increase knowledge about learning media and become reference material for others who want to conduct similar research in the future.

References

- Abidah, Aklima, & Abdul Razak. 2022. "Tantangan Guru Sekolah Dasar Dalam Menghadapi Era Society 5.0." *Jurnal Ilmiah Profesi Pendidikan* 7 (2c): 769–776. <https://doi.org/10.29303/jipp.v7i2c.498>.
- Agustina, Shofia, Enjang Yusuf Ali, & Ali Ismail. 2025. "Pengembangan Media Diorama Siklus Air Untuk Materi IPA Di Sekolah Dasar." *Jurnal Ilmiah Pendidikan Madrasah Ibtidaiyah* 9 (2). <https://doi.org/10.35931/am.v9i2.4748>.
- Ahmadi, Imam. 2021. "Tafsir Ekologi: Dikursus Hidrologi Dalam Al-Qur'an." *SINDA: Comprehensive Journal of Islamic Social Studies* 1 (3): 175–179. <https://doi.org/10.28926/sinda.v1i3.205>
- Amalia, Nabila, Lukman Hakim, & Noviati. 2024. "Pengaruh Media Diorama Siklus Terhadap Hasil Belajar Siswa SD Kelas V." *BADA'A: Jurnal Ilmiah Pendidikan Dasar* 6 (1): 60–72. <https://doi.org/10.37216/badaa.v6i1.1046>.
- Anggraeni, Reni, & Farida Istanah. 2017. "Pergunaan Media Diorama Untuk Meningkatkan Hasil Belajar IPA Tentang Daur Air Di Sekolah Dasar." *Jurnal Pendidikan Guru Sekolah Dasar* 5 (3).
- Ani Daniyati, Ismy Bulqis Saputri, Ricken Wijaya, Siti Aqila Septiyani, and Usep Setiawan. 2023. "Konsep Dasar Media Pembelajaran." *Journal of Student Research (JSR)* 1 (1): 282–294.
- Arfandi, A. 2020. Pemanfaatan Media Pembelajaran Dalam Meningkatkan Kualitas Pembelajaran PAI di sekolah. *Edupeedia: Jurnal Studi Pendidikan dan*

- Pedagogi Islam*, 5(1), 65–77.
<https://doi.org/10.35316/edupedia.v5i1.882>
- Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Handbook I: cognitive domain. *New York: David McKay*, 483-498.
- Budiani, Lia Sri, Astri Sutisnawati, & Luthfi Hamdani Maula. 2023. "Meningkatkan Keterampilan Menulis Karangan Deskripsi Melalui Penggunaan Media Diorama Di Sekolah Dasar." *Jurnal Educatio FKIP UNMA* 9 (2): 1011–16.
<https://doi.org/10.31949/educatio.v9i2.4865>.
- Budiarti, Leni, Trikinasih Handayani, Pramudya Cahyandaru, & Dewi Partini. 2022. "Upaya Meningkatkan Hasil Belajar IPA Melalui Metode Demonstrasi Pada Materi Siklus Air Di Kelas V Sekolah Dasar." *Jurnal Ilmiah Profesi Guru (JIPG)* 3 (2): 91–96.
<https://doi.org/10.30738/jipg.vol3.no2.a12656>.
- Burhanudin, Eni Suraida, & Sutomo. 2022. "Validitas Instrumen Penilaian Kemandirian Model Self-Assessment Pada Siswa Sekolah Dasar." *Seminar Nasional 100 Tahun Tamansiswa* 1 (1): 43–47.
- Ekayogi, I Wayan. 2023. "Penerapan Problem Based Learning Berbantuan Media Augmented Reality Untuk Meningkatkan Hasil Dan Kemandirian Belajar." *Jurnal Didaktika Pendidikan Dasar* 7 (1): 181–196.
<https://doi.org/10.26811/didaktika.v7i1.1126>.
- Fachrurrazi, A. 2020. Pemanfaatan dan pengembangan media berbasis teknologi informasi untuk pembelajaran. *Buana Pendidikan: Jurnal Fakultas Keguruan dan Ilmu Pendidikan*, 6(11), 21–29.
<https://doi.org/10.36456/bp.vol6.no11.a1088>
- Arsyad, Azhar. "Media pembelajaran, edisi 1." Jakarta: PT. Raja Grafindo Persada 36 (2002)
- Fadilah, Aisyah, Kiki, Rizki Nurzakiah, Nasywa Atha, Usep Setiawan Sulis & Putri Hidayat. 2023. "Pengertian Media, Tujuan, Fungsi, Manfaat & Urgensi Media Pembelajaran STAI DR. KHEZ Muttaqien Purwakarta." *Journal of Student Research (JSR)* 1 (2): 1–17.
- Fakhri Ramadhan, Muhammad, Rusydi A Siroj, Muhammad Win Afgani, Uin Raden Fatah Palembang, Jl K H Zainal Abidin Fikri, Kec Kemuning, Kota Palembang, & Sumatera Selatan. 2024. "Validitas and Reliabilitas." *Journal on Education* 06 (02): 10967–10975.
- Fintarre, Delvia Luce, Mumun Nurmilawati, Universitas Nusantara, & PGRI Kediri. 2023. "Analisis Kebutuhan Media Pembelajaran Diorama Pada Materi Siklus Hidrologi Di Kelas V SDN Blabak 3." *Seminar Nasional Pendidikan Dan Pembelajaran Ke 6*.
- Firda, Olyvia, Rizqi Amanda, & Farida Istianah. 2022. "Pengembangan Media RA (Diorama Siklus Air) Pada Mata Pelajaran Ilmu Pengetahuan Alam Pengembangan Media Rasi (Diorama Siklus Air) Pada Mata Pelajaran "Ilmu Pengetahuan Alam Pada Materi Siklus Air Siswa Kelas V Sekolah Dasar." *Jurnal Pendidikan Guru Sekolah Dasar* 10 (7): 1629–1639.
- Gestiari, Farisa, & Wahyuningsih Devi. 2022. "Perbandingan Kondisi Kesehatan Perusahaan Pada Masa Sebelum Dan Selama Pandemi Covid-19 Dengan Menggunakan Altaman Z-Score." *JES: Jurnal Ekonomi STIEP* 7 (2).
- Hanifah, Hurin, Nur Imansyah, Abdul Zain, Jurusan Teknik Informatika, Sekolah Tinggi, and Teknologi Bontang. 2023. "Implementasi Augmented Reality Dalam Game Edukasi Berbasis Android." *Jurnal Sains Dan Sistem Teknologi Informasi (SANDI)* 5 (1).
- Hasan, Muhammad, MPd Milawati, MPd Darodjat, & MAg DrTuti Khairani Harahap. 2021. *Makna Peran Media Dalam Komunikasi Dan Pembelajaran | i Media Pembelajaran*.
- Hikmah, & Muslimah. 2021. "Validitas Dan Reliabilitas Tes Dalam Menunjang Hasil Belajar PAI." *In Proceedings of Palangka Raya International and National Conference on Islamic Studies (PINCIS)* 1 (1).
- Hikmah, Nur, Nanda Saridewi, & Salamah Agung. 2020. "Penerapan Laboratorium Virtual Untuk Meningkatkan Pemahaman Konsep Siswa." *Jurnal Kimia Dan Pendidikan* 2 (2): 186–195.
- Ihsan, Helli. 2015. "Validitas Isi Alat Ukur Penelitian : Konsep Dan Panduan Penilaiannya." *Pedagogia : Jurnal Ilmu Pendidikan* 13 (3): 173–179.
- Jannah, Roudhotul, Yasir Arafat, & Eni Heldayani. 2023. "Pengaruh Penggunaan Media Diorama Terhadap Hasil Belajar IPA Siswa Kelas V SD." *Didaktik : Jurnal Ilmiah PGSD FKIP* 9 (3).
- Komalasari, Mahilda Dea, & Apriani An-Nisa. 2023. "Integration Of The Living Values Duction Program (LVEP) In The Merdeka Curriculum." *Elementary School* 10 (1): 61–69.
- Leoni Indahsari, st, & nd Sumirat. 2023. "Implementasi Teknologi Augmented Reality Dalam Pembelajaran Interaktif Implementation of Augmented Reality Technology in Interactive Learning: A Comprehensive Journal Article." *Jurnal Komunikasi Dan Media Pendidikan* 1 (1): 7–11.
<https://journals.ldpb.org/index.php/cognoscere>.
- Magdalena, Ina, Amilanadzma Hidayah, & Tiara Safitri. 2021. "Analisis Kemampuan Peserta Didik Pada Ranah Kognitif, Afektif, Psikomotorik Siswa Kelas II B SDN Kunciran 5 Tangerang." *Jurnal Pendidikan Dan Ilmu Sosial*. Vol. 3.
<https://ejournal.stitpn.ac.id/index.php/nusantara>.
- Maulana, Agus, and Alfiati Syafrina. 2022a. "Pengaruh Media Diorama Terhadap Hasil Belajar Siswa Pada Materi Siklus Air Di Kelas V SDN Banda Aceh." *Jurnal Ilmiah Mahasiswa: Elementary Education Research Bulan* 7 (4): 136–142.
<http://www.jim.unsyiah.ac.id/pgsd/index>.
- Mayuni, Siti, Nana Hendracipta, A Syachruji, Pendidikan Guru Sekolah Dasar, & Universitas Sultan Ageng Tirtayasa. 2024. "Pengembangan Medi Pembelajaran Diorama Pada Materi Upaya Pelestarian Lingkungan Untuk Peserta Didik Di SDN Pangintungan." *Jurnal Holistika* 7 (2): 147–54.
- Muchtar, Fitriani, Erma Suryani Sahabuddin, & Sayidiman, and Artikel Info Abstrak. 2023. "Pengaruh Penggunaan Media Diorama Terhadap Hasil Belajar Siswa Pada Muatan IPA Kelas V SD Inpres Unggulan Toddopuli Makassar." *Jurnal Metafora Pendidikan* 1 (1): 81.
<http://www.journal.arthamaramedia.co.id/index.php/jmp>.
- Mustafa Setya Pinton, Gusdiyanto Hafidz, Victoria Andif, Ndaru Kukuh Masgumelar, Hanik Maslacha, Dedi Ardiyanto, Hendra Arya Utama, et al. 2022. *Metodologi Penelitian Kuantitatif, Kualitatif, Dan Penelitian Tindak Kelas Dalam Pendidikan Olahraga*. Jawa Timur : Insght Mediatama

- Mustaqim, Ilmawan. 2020. "Pemanfaatan Augmented Reality Sebagai Media Pembelajaran." *Jurnal Pendidikan Teknologi Dan Kejuruan* 13 (2): 174.
- Nafiati, & Dewi Amaliah. 2021. "Revisi Taksonomi Bloom: Kognitif, Afektif, Dan Psikomotorik." *Humanika* 21 (2): 151–172. <https://doi.org/10.21831/hum.v21i2.29252>.
- Naimnule, Lusya, Vinsensius Oetpah, Vinsensia Uliya, Rita Sila Pendidikan, Biologi-Universitas Timor, Jalan Jenderal, & Sudirman Kefamenanu. 2020. "Peningkatan Aktivitas Dan Hasil Belajar Kognitif Siswa Melalui Penerapan Model Pembelajaran *Think Talk Write* (TTW) Di SMUK." *Jurnal Pendidikan* 1 (10): 2050–2053.
- Nanda Faradita, Meirza. 2018. "Pengaruh Metode Pembelajaran Type Talking Stick Terhadap Hasil Belajar IPA Pada Siswa Kelas 4 Sekolah Dasar." *Jurnal Bidang Pendidikan Dasar (JBPD)* 2 (1A). <http://ejournal.unikama.ac.id/index.php/JBPD>.
- Nistrina, Khilda. 2021. "Penerapan Aumented Reality Dalam Media Pembelajaran." *Jurnal Sistem Informasi, J-SIKA* 03 (01).
- Nur Fadilah Amin; Sabaruddin Garancang; & Kamaluddin Abunawas. 2023. "Konsep Umum Populasi Dan Sampel Dalam Penelitian." *Jurnal Kajian Islam Kontemporer* 14 (1): 15–31.
- Nur Salsabila Atria, D. Syamsiah, & Harniaty. 2024. "Penerapan Media Pembelajaran Berbasis Augmented Reality (AR) Untuk Hasil Belajar Siswa Kelas V." *Pinisi Journal PGSD* 4 (2): 743–747.
- Nurhalimah, Sri, Yunin Hidayati, Irsad Rosidi, & Wiwin, and Puspita Hadi. 2022. "Hubungan Antara Validitas Item Dengan Daya Pembeda Dan Tingkat Kesukaran Soal Pilihan Ganda PAS." *Jurnal Natural Science Educational Research* 4 (3): 2654–4210.
- Nurhayati, R, & Aulia Nur Tanzila. 2020. "Konsep Dasar Media Pembelajaran." *Journal of Islamic Education at Elementary School JIEES* 1 (1): 38–46.
- Nurlindayani, Ellen, Setiono Setiono, & Suhendar Suhendar. 2020. "Profil Hasil Belajar Kognitif Siswa Dengan Metode *Blended Learning* Pada Materi Sistem Pernapasan Manusia." *Jurnal Ilmiah Pendidikan Bilogi* 7 (2): 55–62. <https://doi.org/10.22437/bio.v7i2.12813>.
- Pagarra Ahmad Syawaluddin, Wawan Krismanto, & Sayidiman, Hamzah. 2022. *Media Pembelajaran*. Edited by S.Ds. Pradana Rafli Muhammad.
- Pratiwi, Yuliana. 2022. "Penggunaan Media Pembelajaran Diorama Siklus Air Tanah Pada Peserta Didik Kelas V SD Negeri Banaran 04." *Kalam Cendekia : Jurnal Ilmiah Kependidikan* 10 (2).
- Purwanto, & Agung, SMK Widya Mandala Tambak. 2018. "Meningkatkan Keaktifan Dan Hasil Belajar Sistem Kelistrikan Kendaraan Ringan Dengan Penerapan Model Pembelajaran *Discovery Learning*." *Jurnal Taman Vokasi* 6 (1). <http://jurnal.ustjogja.ac.id/index.php/tamanvokasi>.
- Qori Al Hafid, Nurwahyuni Atip, & Priyanta Edi. 2023. "Penerapan Model Pembelajaran *Two Stay Stray* Untuk Meningkatkan Motivasi Dan Hasil Belajar Siswa Di SMA." *Prosiding Seminar Nasional Pendidikan Profesi Guru* 1 (2): 3846–3857.
- Ramadhani, Putri, Siska Alicia Farma, Sadiatul Fuadiyah, & Yogica Relsas. 2021. "Laboratorium Virtual Sebagai Langkah Memaksimalkan Skill Keterampilan Siswa *Virtual Laboratory as a Step to Maximize Student Skills*." *Prosiding Seminar Nasional Biologi* 1 (1): 791–798. <https://doi.org/10.24036/prosemnasbio/voll/102>.
- Rasyid Karo-Karo, & Isran S 2018 "Manfaat Media Dalam Pembelajaran". *AXIOM: Jurnal Pendidikan dan Matematika*, 7(1), 2087–8249. <https://doi.org/10.30821/axiom.v7i1.1778>
- Rohmawati, & Lia. 2019. "Efektivitas Pembelajaran Dengan Media Diorama Berbasis Kearifan Lokal Subtema Keunikan Daerah Tempat Tinggalku Kelas IV SDN Pandanan." *Journal of Teaching in Elementary Education* 3 (2).
- Rahmawati, N., & Rodliyah, I. 2024. Analisis validitas instrumen lembar kerja peserta didik bermuatan nilai-nilai Islam berbasis problem based learning pada materi himpunan kelas VII. *Discovery : Jurnal Ilmu Pengetahuan*, 9(2), 1–7. <https://doi.org/10.33752/discovery.v9i2.6281>
- Romdona, Siti, Silvia Senja Junista, & Ahmad Gunawan. 2025. "Teknik Pengumpulan Data : Observasi, Wawancara Dan Kuesioner." *Jurnal Ilmu Sosial Ekonomi Dan Politik* 3 (1): 39–47. <https://samudrapublisher.com/index.php>.
- Rosita, Esi, Wahyu Hidayat, & Wiwin Yuliani. 2021. "Uji Validitas Dan Reliabilitas Kuesioner Perilaku Prososial." *Fokus (Kajian Bimbingan & Konseling Dalam Pendidikan)* 4 (4): 279. <https://doi.org/10.22460/fokus.v4i4.7413>.
- Rozie, Fachrur, Pendidikan Guru, & Sekolah Dasar. 2018. "Persepsi Guru Sekolah Dasar Tentang Penggunaan Media Pembelajaran Sebagai Alat Bantu Pencapaian Tujuan Pembelajaran." *Widyagodik* 5 (2).
- Rusfikadewi Cestya Nurba'id, A., Zumrotin, N., Maria, M., Khoirotun Nisyak, H., Lailatul, S., Mutmainah, R., Ghurri, A., Andriana, L. M., & Wahyu Ningsih, A. 2024. Penerapan Paired T-Test pada Penelitian Farmasi (*Application of Paired T-Test in Pharmaceutical Research*). *Jurnal Farmasi dan Farmakoinformatika*, 2(2), 146-153 <https://doi.org/10.35760/jff.2024.v2i2.10072>
- Safira, Ifa, Abdurrachman Rahim, & Pricilia Indah Palangi. 2022. "Efektivitas *Augmented Reality* (AR) In *Elementary School Science Learning Concept*." *Klasikal: Journal of Education, Language Teaching and Science* 4 (3): 2656–9914.
- Salsabila, Bella, Ahmad Akhyar, Agung Setiawan, Detri Amelia Chandra, Program Studi Pendidikan Teknologi Informasi, Sekolah Tinggi Keguruan & Ilmu Pendidikan Rokania, Jl KM Raya Pasir Pengaraian, Rambah Samo, and Rokan Hulu. 2023. "Pemanfaatan Augmented Reality (AR) Sebagai Media Pembelajaran Kelas VII SMPN 1 Rambah." *Journal on Education* 06 (01): 856–863.
- Saputri Dian Syafitri Chani. 2020. "Penggunaan *Augmented Reality* Untuk Penguasaan Kosa Kata Dan Hasil Belajar." *Jurnal Ilmiah Teknik Informatika Dan Sistem Informasi* 6 (1).
- Sari, Indah Purnama, Ismail Hanif Batubara, Al Hamidy Hazidar, & Mhd Basri. 2022. "Pengenalan Bangun Ruang Menggunakan Augmented Reality Sebagai Media Pembelajaran." *Hello World Jurnal Ilmu Komputer* 1 (4): 209–215. <https://doi.org/10.56211/helloworld.v1i4.142>.
- Sari, Mawar, Rizky Khaliza, Siti Maulidiyah, Nabila Gusti Zahra, Program Studi Pendidikan Guru Sekolah Dasar, & Fakultas Keguruan dan Ilmu Pendidikan. 2024. "Meningkatkan Keaktifan Belajar Siswa Pada Pembelajaran IPA Melalui Pemanfaatan Media Diorama" 18 (1): 193–204.

- Sari, Mutia, Habibur Rachman, Noni Juli Astuti, Muhammad Win Afgani, & Rusdy Abdullah Siroj. 2022. "Explanatory Survey Dalam Metode Penelitian Deskriptif Kuantitatif." *Jurnal Pendidikan Sains Dan Komputer* 3 (01): 10–16. <https://doi.org/10.47709/jpsk.v3i01.1953>.
- Seftriana, Anita, Sarah Wulan, & Nur Hasanah. 2020. "Pengembangan Media Pembelajaran Diorama Siklus Air Pada Mata Pelajaran IPA." *Prosiding Seminar Nasional Pendidikan STKIP Kusuma Negara III*, 21–30.
- Simarona, Nuri, Agus Elpin, & Yohanes Bahari. 2024. "Analisis Penerapan Augmented Reality Dalam Meningkatkan Efektifitas Pembelajaran Sains Di Era Digital." *Journal of Education* 4 (3): 2775–4138.
- Siroj A Rusydi, Afgani Win, Fatimah, Septaria Dian, Gebriella Zahira, & Salsabilla. 2024. "Metode Penelitian Kuantitatif Pendekatan Ilmiah Untuk Analisis Data." *Jurnal Reviw Pendidikan Dan Pengajaran* 7 (3): 2655–6022.
- Solecha, Solecha, & Cecep Sumarna. 2023. "Pengaruh Kompetensi Guru Dan Budaya Sekolah Dalam Meningkatkan Hasil Belajar Siswa Pendidikan Agama Islam Di Sekolah Dasar." *Jurnal Madinsika Manajemen Pendidikan Dan Keguruan* 5 (1): 39–47. <https://doi.org/10.31949/madinasika.v5i1.7210>.
- Sugiana, Dian, & Dedi Muhtadi. 2019. "Augmented Reality Type QR Code: Pengembangan Perangkat Pembelajaran Di Era Revolusi Industri 4.0." *Prosiding Seminar Nasional & Call For Papers*. www.dosenpendidikan.com.
- Sunami, Mayang Ayu, & Aslam Aslam. 2021. "Pengaruh Penggunaan Media Pembelajaran Video Animasi Berbasis Zoom Meeting Terhadap Minat Dan Hasil Belajar IPA Siswa Sekolah Dasar." *Jurnal Basicedu* 5 (4): 1940–1945. <https://doi.org/10.31004/basicedu.v5i4.1129>.
- Suryandari, Sunarno Widha, & Suparmi. 2016. "Pengembangan Media Pembelajaran Menggunakan Video Dokumenter Berbasis Inquiri Terbimbing Berorientasi Pada Motivasi Belajar Siswa." *Jurnal Inquiri* 5 (1): 85–94. <http://jurnal.fkip.uns.ac.id/index.php/sains>.
- Suryandari, Suryandari, Meyninda Destiara, & Suwito Singgih. 2022. "Pelatihan Laboratorium Virtual Go-Lab Dalam Mendukung Merdeka Belajar." *Bubungan Tinggi: Jurnal Pengabdian Masyarakat* 4 (4): 1523. <https://doi.org/10.20527/btjpm.v4i4.6643>.
- Syafa Wani, Anis, Feby Annisa Yasmin, Septiana Rizky, & Deasy Yunita Siregar. 2024. "Penggunaan Teknik Observasi Fisik Dan Observasi Intelektual Untuk Memahami Karakteristik Siswa Di Sekolah Menengah Pertama." *Universitas Islam Negeri Sumatera Utara* 8 (1): 2614–6754.
- Taib, R. H., Yusuf, F. M., Solang, M., Ibrahim, M., & Nusantari, E. 2025. Validitas modul ajar pada materi sistem gerak menggunakan model pembelajaran Problem-Based Learning (PBL) berbasis kesadaran kognitif di SMA Negeri 2 Gorontalo. *Jurnal Review Pendidikan dan Pengajaran*, 8(2), 4233–4240. <https://journal.universitaspahlawan.ac.id/index.php/jpp/article/download/44518/27973/149817>
- Umi Nur Azizah, endang Sri Maruti, & Fachri Zahro. 2024. "Penerapan Media Diosilir (Diorama Siklus Air) Sebagai Upaya Peningkatan Hasil Belajar Siswa Kelas IV Sekolah Dasar." *Khazanah Pendidikan- Jurnal Ilmiah Kependidikan (JIK)* 18 (2): 340–348. <https://doi.org/10.30595/jkp.v18i2.22566>.
- Wahid, Farhan Saefudin, Didik Tri Setiyoko, Slamet Bambang Riono, & Agung Aji Saputra. 2020. "Pengaruh Lingkungan Keluarga Dan Lingkungan Sekolah Terhadap Prestasi Belajar Siswa." *Syntax Literate ; Jurnal Ilmiah Indonesia* 5 (8): 555. <https://doi.org/10.36418/syntax-literate.v5i8.1526>.
- Windy, Erlina, Ayu Safitri, Ulhaq Zuhdi, Ana Sofiya, Pgsd Fkip, Universitas Negeri Surabaya, Sdn Manukan, & Kulon Surabaya. 2024. "Peningkatan Pemahaman Siswa Kelas IV Tentang Siklus Air Melalui Penggunaan Media Diorama Dengan Pendekatan Problem Based Learning." *Pendas : Jurnal Ilmiah Pendidikan Dasar* 9 (4): 2548–6950.
- Wulandari, Silfi, & Lianda Dewi Sartika. 2024. "Pemanfaatan Media Diorama Untuk Meningkatkan Berpikir Kritis Siswa Dalam Pembelajaran Sejarah Di SMA Negeri 11 Medan." *Education & Learning* 4 (1): 1–6. <https://doi.org/10.57251/el.v4i1.1241>.
- Yam, Jim Hoy, & Ruhiyat Taufik. 2021. "Hipotesis Penelitian Kuantitatif." *Perpekstif: Jurnal Ilmu Administrasi* 3 (2): 96–102. <https://doi.org/10.33592/perspektif.v3i2.1540>
- Yandi, Andri, Anya Nathania, Kani Putri, & Yumna Syaza. 2023. "Faktor-Faktor Yang Mempengaruhi Hasil Belajar Peserta Didik (Literature Review)." *Jurnal Pendidikan Siber Nusantara (JPSN)* 1 (1): 13–24. <https://doi.org/10.38035/jpsn.v1i1>.
- Yanto, Riki, Tito Sugiharto, & Rio Priantama. 2024. "Implementasi Augmented Reality Untuk Pembelajaran Siklus Air Menggunakan Metode Kirsch." *Jurnal Buffer Informatika* 10 (1). <https://journal.fkom.uniku.ac.id/buffer>.
- Yuli, Endah, & Widi Astuti. 2018. "Pengaruh Media Pembelajaran Corong Hitung Terhadap Hasil Belajar Siswa Dalam Materi Perkalian." *Jurnal Penelitian Pendidikan* 21(1):76–84. <https://doi.org/10.20961/paedagogia.v21i1.9008>.
- Yuniarti, Anisyah, Amalia Putri Shalihah, & Dea Amanda, Ineke Laili Ramadhini, Virga Virnanda, Fakultas Keguruan. 2023. "Memahami Media Untuk Efektivitas Pembelajaran." *Jurnal Education and Technology* 4 (2): 2722–9297