STRENGTHENING ENVIRONMENTAL EDU-LITERACY THROUGH THE IMPLEMENTATION OF THE ADIWIYATA PROGRAM

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ABSTRACT
Low participation of school members in waste management and the limited integration of environmental education into the school curriculum are key challenges in implementing the Environmental Care and Culture Movement in Schools (PBLHS) at SMP Al-Fattah Tambakrejo, Semarang City. This research employed a community-based participatory action design involving teachers, students, and Adiwiyata cadres as active partners. The program was implemented over an eight-month period through four main stages: (1) needs assessment and initial coordination, (2) capacity building via training and workshops on environmental literacy, leadership, and waste management, (3) provision of eco-friendly facilities including reusable eating–drinking utensils and a maggot cultivation unit for organic waste processing, and (4) mentoring and evaluation of behavioral change. Data were collected through pre-test and post-test questionnaires, observation of waste generation, and documentation of lesson plan (RPP) integration. The findings show an increase in the number of teachers incorporating environmental topics into RPPs, a 50% rise in student participation in waste reduction activities, and a measurable decrease in single-use plastic and food waste generation. The study demonstrates that combining curriculum integration, student leadership empowerment, and simple waste processing technology can significantly strengthen environmental edu-literacy and foster a sustainable school culture.

Keywords: Adiwiyata School, Environmental Literacy, Participatory Action Research, Waste Management, Circular Economy

INTRODUCTION

Semarang City, Central Java, Indonesia has committed to becoming a sustainable city since 2022 (Mahendra & Dwijendra, 2022; Prihanto et al., 2020). However, the reality reveals persistent environmental challenges. The city generates approximately 1,300 tons of waste each day, with household waste as the largest contributor, of which only 72.10% is managed (Yolanda Pramesti et al., 2023). In 2023, community participation in environmental management was recorded at just 50%, and household waste reduction reached only 27%. Low environmental awareness and limited action from residents remain significant barriers to achieving effective waste reduction.

Tambakrejo Subdistrict, a densely populated coastal area with 9,178 inhabitants per square kilometer, reflects these challenges acutely. The area suffers from tidal flooding due to land subsidence, seasonal river flooding, and unmanaged solid waste (Martuti, 2022; Sidiq et al., 2024; Syafei et al., 2017), compounded by slum settlements and a lack of green open space (Herawati & Banowati, 2019; Praditya & Hidayat-Sardini, 2022). The environmental condition of Tambakrejo Subdistrict can be observed in Figure 1.

Figure 1. Environmental Conditions of Tambakrejo Subdistrict

These conditions also affect the education sector, where schools play a vital role in shaping environmental behavior. SMP Al-Fattah, an Adiwiyata pilot school since 2023, faces a dual challenge: substantial daily waste generation—including an estimated 181.2 kg of food waste from the national Free Nutritious Meal (MBG) program— (Hasyim, 2025) and low student engagement in sustainable practices such as using reusable drink bottles or proper waste disposal.

Although the Adiwiyata program has been recognized for fostering environmental awareness in schools, existing applications, particularly in coastal urban contexts, have largely focused on awareness campaigns (Naryatmojo et al., 2024; Probosari et al., 2021) or infrastructure provision (Halimah et al., 2022; Listina Rahmawati & Arifin, 2021; Rahmawati et al., 2025) in isolation. Few initiatives have adopted a comprehensive approach that combines curriculum integration, leadership development, and practical waste reduction technologies. This gap is particularly critical for schools like SMP Al-Fattah, which operate in high-density, disaster-prone environments where waste issues intersect with climate and social vulnerabilities.

To address these challenges, this study implements an integrated, community-based participatory action model to strengthen environmental edu-literacy in SMP Al-Fattah. The approach combines curriculum integration of locally relevant environmental themes, capacity building for teachers and Adiwiyata student cadres, provision of sustainable infrastructure such as reusable utensils and maggot-based organic waste processing, and ongoing mentoring to ensure long-term behavioral change. This multi-pronged intervention not only responds to the school's immediate waste management needs but also embeds sustainable practices into its institutional culture, offering a replicable model for similar urban coastal schools facing complex environmental challenges.

EDU (Education, Development, and Unification) Literacy represents a strategic framework for equipping teachers to foster human literacy in learners, driving sustainable educational progress and lifelong learning culture in Indonesia (Rusydiyah, 2021). It aligns with the vision of developing competent, innovative, and human literate individuals prepared for current and future challenges. Edu-literacy, as a pedagogical concept, refers to the integration of cognitive, affective, and behavioral domains of learning to produce individuals who are not only knowledgeable but also capable and willing to apply their understanding in real-world contexts. Originating from the broader field of educational literacy studies, the concept moves beyond the traditional definition of literacy as basic reading and writing skills. Instead, it encompasses the ability to access, comprehend, critically evaluate, and effectively use information to make informed decisions and take purposeful actions. In environmental education, edu-literacy serves as a framework for cultivating environmentally responsible citizens by ensuring that learning leads to sustained behavioral change.

In the context of environmental learning, edu-literacy aligns closely with UNESCO's Education for Sustainable Development (ESD) framework, which emphasizes the interconnection between knowledge acquisition, attitudinal formation, and skill development for sustainability (Avelar et al., 2025). Environmental education significantly improves children's and adolescents' environmental knowledge, attitudes, intentions, and self-reported behaviors across diverse settings and activities, though the largest effects are seen in knowledge gains (van de Wetering et al., 2022). Within Indonesian policy, the Gerakan Peduli dan Berbudaya Lingkungan Hidup di Sekolah (PBLHS) and the Adiwiyata program operationalize these principles by embedding environmental themes into school curricula, promoting participatory environmental management, and creating platforms for student leadership. However, as studies by (Desfandi, 2015) and (Setiawan & Jatmikowati, 2022) indicate, many schools still struggle to move from theoretical environmental awareness to concrete, sustained behavioral change. This gap highlights the need for edu-literacy approaches that not only convey environmental knowledge but also create authentic learning experiences and opportunities for students to practice environmentally responsible behaviors in their daily lives.

By applying edu-literacy theory to environmental education in SMP Al-Fattah Tambakrejo, this study situates its intervention within a holistic learning model. The program's design—integrating environmental themes into lesson plans (knowledge), fostering student-led environmental campaigns (disposition), and providing infrastructure for sustainable waste management (action competence)—reflects the essential triad of edu-literacy. In doing so, it responds to the call for environmental education programs that bridge the gap between awareness and action, particularly in urban coastal schools facing complex environmental pressures.

METHOD

This study employed a community-based Participatory Action Research (PAR) design (Keahey, 2021) to strengthen environmental edu-literacy in SMP Al-Fattah, Tambakrejo, Semarang City. The participatory approach was chosen to ensure active engagement of teachers, students, Adiwiyata cadres, and other school stakeholders in both the design and implementation of interventions.

Participants and Setting

The study was conducted at SMP Al-Fattah, an Adiwiyata pilot school located in the coastal area of Kelurahan Tambakrejo, which faces recurrent flooding, high population density, and unmanaged waste problems. Participants consisted of 14 teachers, 3 administrative staff, 204 students, and 20 Adiwiyata student cadres. School management, canteen operators, and representatives from the Semarang City Environmental Office were also involved as key stakeholders.

Intervention Design and Stages

The program was implemented over an eight-month period and consisted of the following stages: 1) Initial Coordination and Needs Assessment. A preliminary meeting with the school management and stakeholders was conducted to identify specific environmental challenges, agree on intervention priorities, and finalize the activity schedule. Baseline data were collected through waste audits, direct observation, and pre-test questionnaires measuring environmental knowledge and attitudes. 2) Capacity Building and Training. The capacity-building program included teacher workshops on integrating locally relevant environmental themes into lesson plans, leadership training for Adiwiyata student cadres to strengthen campaign and conservation skills, and practical waste management sessions on segregation, food waste reduction, and maggot (Black Soldier Fly) cultivation for organic waste processing. Together, these activities fostered curriculum integration, student leadership, and sustainable waste practices within SMP

Al-Fattah. 3) Provision of Infrastructure and Learning Media. Distribution of 240 reusable eating–drinking utensil sets (plates, glasses, tumblers) to reduce single-use plastics, installation of four refillable water stations, and construction of a maggot cultivation facility (3×2×3 m) equipped with six-tier racks for organic waste processing. 4) Implementation and Mentoring. Interventions were applied in daily school activities, with ongoing mentoring provided by the research team and local environmental experts to reinforce behavioral change, monitor waste reduction practices, and troubleshoot challenges. 5) Evaluation and Reflection. Program effectiveness was measured through post-test questionnaires, follow-up waste audits, lesson plan reviews, and documentation of cadre-led environmental campaigns. Quantitative indicators included the number of teachers integrating environmental content into lesson plans, the percentage of students adopting waste reduction behaviors, and the volume reduction of single-use plastic and food waste. Qualitative feedback from participants was also collected to assess perceptions and sustainability potential.

Data Analysis

Pre- and post-test scores were analyzed using descriptive statistics to measure changes in environmental knowledge and attitudes. Waste audit data were compared before and after the intervention to determine reductions in waste generation. Qualitative data from interviews and observations were coded thematically to capture participant experiences and perceived impacts.

RESULTS AND DISCUSSION

Stage 1: Needs Assessment and Initial Coordination

The needs assessment confirmed critical gaps in environmental education and waste management at SMP Al-Fattah. Baseline waste audits showed daily production of 35.9 kg of inorganic waste, 12.2 kg of organic waste, and a potential 181.2 kg/day of food waste from the Free Nutritious Meal (MBG) program. Observations revealed minimal integration of environmental topics in lesson plans, low student engagement in waste reduction behaviors, and the absence of structured waste management procedures. Coordination meetings with school leadership, teachers, and student representatives established consensus on program priorities, target outcomes, and implementation timelines.

Table 1. Baseline Conditions of SMP Al-Fattah (Pre-Intervention)

Parameter	Value	Notes
Inorganic waste/day	35.9 kg	Mixed plastics, paper, packaging
Organic waste/day	12.2 kg	Food scraps, garden waste
Potential food waste/day	181.2 kg	Estimated from MBG program
Teachers integrating RPPs	0	No environmental content pre-program
Student participation rate	<25%	Based on observed behavior

Source: primary data (2025)

The baseline conditions at SMP Al-Fattah prior to the intervention reveal significant challenges and opportunities for improving environmental practices within the school community. The daily generation of 35.9 kg of inorganic waste, composed primarily of mixed plastics, paper, and packaging, alongside 12.2 kg of organic waste, such as food scraps and garden debris, highlights a considerable volume of refuse that requires effective management. Of particular concern is the estimated 181.2 kg of potential food waste daily, as identified through the MBG program, which underscores inefficiencies in food consumption and waste reduction that the school could target for sustainability improvements.

Furthermore, the complete lack of environmental content integration in teachers' lesson plans prior to the program indicates a critical gap in environmental education and awareness-building efforts among students and staff. This gap likely contributes to the observed low student participation rate in

environmental activities (<25%), reflecting limited engagement and perhaps awareness or motivation among students to participate in sustainable waste management and environmental stewardship initiatives. Together, these baseline indicators provide a clear rationale and urgent need for the planned intervention (Kelly & Reid, 2021; Rutka et al., 2024), in this context, it is not only enhancing waste reduction and recycling efforts but also systematically incorporating environmental education into the curriculum to foster a culture of sustainability and active student participation at SMP Al-Fattah.

Stage 2: Capacity Building

Three interconnected training streams were implemented. Teacher workshops focused on embedding locally relevant environmental topics into lesson plans, resulting in all 14 teachers producing at least one environment-themed lesson plan by the end of the program. Leadership training for 20 Adiwiyata student cadres strengthened their ability to lead campaigns, organize events, and act as peer role models. Waste management training provided hands-on practice in organic/inorganic segregation, food waste reduction, and maggot (Black Soldier Fly) cultivation for organic waste processing.

Figure 2. Leadership Training

Figure 3. Workshop for BSF Larvae Cultivation

Teacher workshops that integrated locally relevant environmental topics into lesson plans, aligns closely with Reddy's (2021) argument for situating environmental education (EE) within authentic, context-based learning experiences. Reddy emphasizes that meaningful environmental learning arises when educators move beyond transmissive, content-heavy approaches to adopt active and transformative pedagogies engaging teachers and students with real-world environmental issues. Specifically, (Reddy, 2021) highlights the importance of local context knowledge and active learning approaches in teacher education, suggesting that the practicum setting offers unique opportunities for co-constructing knowledge between teachers, students, and communities. By embedding environmental topics in the lesson plans, environmental education can meaningfully enter mainstream teacher preparation.

The leadership training for 20 Adiwiyata student cadres strengthened their ability to lead campaigns, organize events, and act as peer role models, aligning with the principles of Environmental Leadership Education (ELE) as outlined in the broader framework of Education for Sustainable Development (ESD). ELE emphasizes the development of knowledge, skills, values, and attitudes required to foster sustainable practices and environmental stewardship across diverse contexts. Drawing on theoretical perspectives such as transformative learning, lifelong learning, and experiential learning, ELE promotes both technical and adaptive competencies necessary for addressing environmental challenges effectively. As noted in the literature, professional development initiatives focusing on environmental leadership cultivate the capacity of learners to become proactive change agents, capable of organizing and inspiring collective environmental action(Miao & Nduneseokwu, 2025).

The waste management training that provided hands-on practice in organic/inorganic segregation, food waste reduction, and maggot (Black Soldier Fly) cultivation for organic waste processing reflects similar outcomes reported by Meindrawan et al. (2024). Their community-based program in Baros Village showed that structured training and mentoring enabled participants to differentiate organic and inorganic waste, implement household-level sorting systems, and cultivate Black Soldier Fly larvae as a sustainable solution for organic waste reduction and alternative animal feed production. Participants gained practical skills—

from initial socialization to technology application and evaluation—leading to improved environmental awareness and adoption of waste-to-resource technologies in local communities (Meindrawan et al., 2024).

Stage 3: Provision of Eco-Friendly Facilities

The provision of infrastructure was a key factor in supporting behavior change, consistent with evidence showing that enabling facilities significantly influence environmental practices. For instance, research on waste management interventions demonstrates that when communities receive adequate infrastructure—such as segregated waste bins, composting units, or recycling stations—they are more likely to adopt sustainable behaviors because structural barriers to action are reduced (Rajapaksa et al., 2018). The study highlights that infrastructure not only facilitates practical engagement but also reinforces habit formation and long-term commitment to environmentally responsible practices, especially when combined with education and awareness programs (Rajapaksa et al., 2018). The program distributed 240 sets of reusable plates, glasses, and tumblers to students, teachers, and canteen staff; installed four refillable water stations; and constructed a maggot cultivation unit (3×2×3 m) with six-tier racks for processing organic waste. These facilities reduced single-use plastic consumption and provided practical learning opportunities in sustainable waste management.

Table 2. Infrastructure Provided to SMP Al-Fattah

Facility/Equipment	Quantity	Purpose
Reusable utensil sets	240 sets	Reduce single-use plastic from canteen
Tumblers	240 sets	Reduce single-use plastic bottle
Water refill stations	4 units	Support reusable bottle use
Maggot BSF cultivation unit	1 unit	Process organic waste, circular economy model

Source: primary data (2025)

Stage 4: Implementation and Mentoring

Based on the study findings, mentoring proved to be a key factor in enhancing the effectiveness of the Green School program, enabling teachers and students to consistently apply environmentally responsible practices and strengthening the development of environmentally caring character across the school community (Paryati, 2024).The interventions embedded into the daily routines of SMP Al-Fattah will ensure that environmental practices became a sustained part of school life rather than isolated activities. Actions included the regular use of reusable eating–drinking utensils, active waste segregation in classrooms and the canteen, and the operation of the maggot cultivation unit for processing food waste. The research team, alongside local environmental experts from the Semarang City Environmental Office and NGOs such as Bina Karta Lestari and Yayasan Akar Banir Indonesia, provided continuous mentoring throughout the eight-month program. This mentoring supported teachers in implementing environment-themed RPPs, guided student Adiwiyata cadres in leading campaigns, and helped troubleshoot issues related to waste processing, infrastructure use, and student participation. The process also ensured that the newly established SOPs for organic and inorganic waste management were applied consistently, with regular monitoring to track progress and maintain motivation among school stakeholders.

Stage 5: Evaluation and Reflection

Ongoing mentoring reinforced training outcomes and ensured the consistent application of new practices. Post-intervention waste audits revealed a reduction in single-use plastic waste and a measurable decrease in unmanaged food waste. Student participation in waste reduction increased by 50%, driven by cadre-led campaigns and visible role modeling. Teacher lesson plans integration exceeded targets, with 14 environment-themed lesson plans developed across various subjects. The maggot cultivation unit processed a portion of the school's organic waste and became a focal point for environmental education activities.

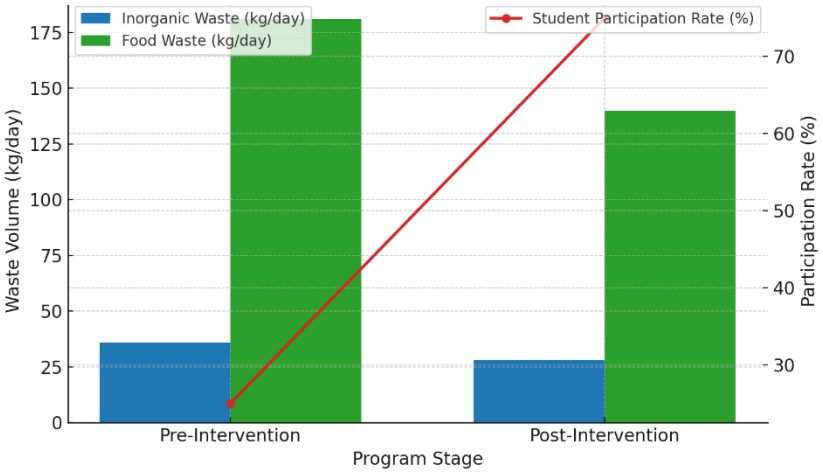

Figure 4. Changes in Student Participation and Waste Generation

The graph shows a clear improvement in student engagement and a measurable reduction in waste generation after the eight-month intervention. Inorganic waste, which was initially around 35.9 kg per day, decreased to approximately 28.0 kg per day, representing a reduction of about 21.9 percent. This decline coincides with the introduction of reusable eating–drinking utensils and greater student involvement in waste segregation, suggesting that the combination of infrastructure provision and reinforced behavioral change was effective in reducing non-biodegradable waste.

Food waste also experienced a notable reduction. Before the intervention, the school produced an estimated 181.2 kg of food waste per day, much of it originating from the Free Nutritious Meal (MBG) program. By the end of the program, this figure had dropped to around 140.0 kg per day, a decrease of approximately 22.7 percent. The maggot cultivation unit played an important role in this achievement, allowing a significant portion of organic waste to be processed into larval biomass, thereby reducing the amount of waste requiring disposal.

Student participation in waste reduction activities increased dramatically over the course of the program. Initially, only about 25 percent of students actively engaged in behaviors such as using reusable bottles or correctly segregating waste. By the conclusion of the intervention, this figure had risen to roughly 75 percent, representing a gain of 50 percentage points. This substantial improvement can be attributed to leadership training for Adiwiyata cadres, the continuous execution of environmental campaigns, and the visible presence of new waste management facilities, which together fostered a shift in the school's environmental culture.

CONCLUSION

The findings underscore the importance of a holistic approach that combines educational content, leadership development, and enabling infrastructure to address environmental challenges in schools, particularly in high-density, flood-prone urban coastal areas. By fostering active participation and building a shared sense of responsibility among students, teachers, and community stakeholders, such programs can create lasting cultural shifts toward sustainability and serve as replicable models for other schools facing similar conditions. However, this study is not without limitations. The intervention was limited to a single school, which may restrict the generalizability of results to different socio-economic or geographic contexts. The monitoring period, while adequate for capturing immediate behavioral changes, was relatively short for assessing long-term sustainability of the interventions. In addition, external factors such as seasonal flooding or changes in government school meal programs could influence waste generation patterns and were not controlled for in the study design. Future research should expand the scope to include multiple

schools across diverse settings to validate the model's adaptability and scalability. Longitudinal studies are recommended to assess the persistence of behavioral changes and the long-term environmental impact of such programs. Further investigation into integrating digital tools for environmental monitoring, peer-to-peer environmental education models, and community-wide waste management linkages could enhance the effectiveness and sustainability of future interventions.

REFERENCES

Avelar, A. B. A., Mitchell, S. F., & Sandes-Guimarães, L. V. (2025). Integrating sustainable development goals in management education: Impact on student knowledge, attitudes, and behaviors. *The International Journal of Management Education*, *23*(2), 101116.

Desfandi, M. (2015). MEWUJUDKAN MASYARAKAT BERKARAKTER PEDULI LINGKUNGAN MELALUI PROGRAM ADIWIYATA. *SOSIO DIDAKTIKA: Social Science Education Journal*, *2*(1). https://doi.org/10.15408/sd.v2i1.1661

Halimah, H., Suriansyah, A., & Syaifuddin, A. (2022). Adiwiyata-Program-Based School Management. *International Journal of Social Science And Human Research. Https://Doi. Org/10.47191/Ijsshr/v5-I12-06*.

Hasyim, I. (2025). Potensi Sampah Makanan Program Makan Bergizi Gratis 624 Ribu Ton Per Tahun. In *Tempo.co* (p. 1).

Herawati, F., & Banowati, E. (2019). Pengaruh Perilaku Masyarakat dalam Menjaga Kebersihan Sungai Tenggang Terhadap Kebersihan Lingkungan di Kelurahan Tambakrejo Kecamatan Gayamsari Kota Semarang. *Edu Geography*, *7*(1), 57–64.

Keahey, J. (2021). Sustainable development and participatory action research: a systematic review. *Systemic Practice and Action Research*, *34*(3), 291–306.

Kelly, L. M., & Reid, C. (2021). Baselines and monitoring: More than a means to measure the end. *Evaluation Journal of Australasia*, *21*(1), 40–53.

Listina Rahmawati, D., & Arifin, Z. (2021). The Facilities and Infrastructure Management of Adiwiyata School at MTs Negeri Sleman. *Proceedings of the 5th International Conference on Learning Innovation and Quality Education*, 1–4.

Mahendra, I. G. I., & Dwijendra, N. K. A. (2022). Evaluasi Penerapan Green City Pada Taman Kota (Studi Kasus: Taman Kota Lumintang Denpasar). *RUAS*, *20*(1), 74–86.

Martuti, N. K. T. (2022). The Environment, socio-economic, and stakeholder partnership analysis as integrated coastal management in Semarang City. *Journal of Integrated Coastal Zone Management*, *22*(1), 11–25.

Meindrawan, B., Nafisah, A., Syaifudin, R., Aini, F. S., & Romadoni, F. B. (2024). Training on Domestic Waste Management and Use of Maggots (Black Soldier Fly (BSF) Larvae) for Alternative Animal Feeding for Farmer Groups. *MOVE: Journal of Community Service and Engagement*, *4*(2), 75–82. https://doi.org/10.54408/move.v4i2.402

Miao, Q., & Nduneseokwu, C. (2025). Advancing environmental leadership: education, development, and training. *Environmental Leadership in a VUCA Era: An Interdisciplinary Handbook*, 467–538.

Naryatmojo, D. L., Kusumantoro, K., Sholeh, M., & Simbolon, A. S. (2024). The Actualization of Adiwiyata School Values Through the Environmental Campaign of Al-Fattah Islamic Junior High School, Semarang. *Jurnal Abdimas*, *28*(2), 279–284.

Paryati, P. (2024). Increasing the Effectiveness of the Implementation of the Green School Program in the Context of Instilling Environmentally Caring Character Values for Teachers at SD Negeri Candirejo Through the Mentoring Program for the 2022/2023 Academic Year. *IJCER (International Journal of Chemistry Education Research)*, 57–63. https://doi.org/10.20885/ijcer.vol8.iss1.art9

Praditya, A. A., & Hidayat-Sardini, N. (2022). PERAN SERTA MASYARAKAT DALAM UPAYA PENANGGULANGAN BANJIR DI DAERAH ALIRAN SUNGAI (DAS) TENGGANG, KECAMATAN GAYAMSARI, KOTA SEMARANG TAHUN 2020. *Journal of Politic and Government Studies*, *12*(1), 383–391.

Prihanto, T., Wilonoyudho, S., & Akhsin Budi Nur Sidiq, W. (2020). Study on implementation of green city concept in the suburbs of semarang city based on landuse. *The 7th Engineering International Conference (EIC), Engineering International Conference on Education, Concept And*.

Probosari, R. M., Nugraheni, F. S. A., & Widyastuti, F. (2021). Raising environmental awareness in school: A case study of environmental education through implementation adiwiyata-based curriculum. *Proceeding Biology Education Conference: Biology, Science, Enviromental, and Learning*, *17*(1), 181–190.

Rahmawati, S., Munthe, C. C., Sinaga, C. E., Manurung, B. A., Rosdianti, F., & Ikhlas, M. (2025). Evaluasi Kesiapan Infrastruktur Dasar Sekolah untuk Mendukung Program Lingkungan Hidup Berbasis Adiwiyata. *Harmoni Pendidikan: Jurnal Ilmu Pendidikan*, *2*(3), 233–247.

Rajapaksa, D., Islam, M., & Managi, S. (2018). Pro-environmental behavior: The role of public perception in infrastructure and the social factors for sustainable development. *Sustainability (Switzerland)*, *10*(4). https://doi.org/10.3390/su10040937

Reddy, C. (2021). Environmental education, social justice and teacher education: Enabling meaningful environmental learning in local contexts. *South African Journal of Higher Education*. https://doi.org/10.20853/35-1-4427

Rusydiyah, E. F. (2021). *Evi Fatimatur Rusydiyah_EDU Literasi Membangun Komunitas Belajar bagi Guru Penggerak Human Literacy Indonesia*.

Rutka, A., Michnej, M., Zwoliński, T., & Gabory, M. (2024). Core indicators for monitoring the sustainable urban mobility plan: a case study. *Sustainability*, *16*(13), 5632.

Setiawan, B. A., & Jatmikowati, T. E. (2022). Mensinergikan Pengembangan Green House sebagai Media Pembelajaran dan Program Adiwiyata di MIN 2 Jember. *Mujtama Jurnal Pengabdian Masyarakat*, *2*(2), 9–16. https://doi.org/10.32528/mujtama.v2i2.7586

Sidiq, W. A. B. N., Martuti, N. K. T., & Nugraha, S. B. (2024). Rintisan Kelurahan Tambakrejo Tanggguh Bencana Sebagai Upaya Mitigasi Bencana Kota Semarang. *BERNAS: Jurnal Pengabdian Kepada Masyarakat*, *5*(1), 832–841.

Syafei, N. I., Muryani, C., & Rintayati, P. (2017). Analisis sebaran, dampak dan adaptasi masyarakat terhadap banjir rob di Kecamatan Semarang Timur dan Kecamatan Gayamsari Kota Semarang. *GeoEco*, *3*(2).

van de Wetering, J., Leijten, P., Spitzer, J., & Thomaes, S. (2022). Does environmental education benefit environmental outcomes in children and adolescents? A meta-analysis. In *Journal of Environmental Psychology* (Vol. 81). Academic Press. https://doi.org/10.1016/j.jenvp.2022.101782

Yolanda Pramesti, P., Larasati, E., & Yuniningsih, T. (2023). Perencanaan Pengelolaan Sampah Oleh Dinas Lingkungan Hidup Kota Semarang pada TPA Jatibarang. *Journal of Public Policy and Management Review*, *12*, 232–250. https://doi.org/https://doi.org/10.14710/jppmr.v12i2.38393