International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Beyond the Lab: Exploring Science Teachers' Perceptions on Utilizing the Environment and School Grounds for Practical Learning

De Gracia, Moises Von Rosauro R.*

Don Gaudencio B. Dumlao National High School, Schools Division Office I Pangasinan, Philippines

A B S T R A C T

This study explored the perceptions of public secondary science teachers in Aguilar District, Pangasinan, regarding the utilization of the environment and school grounds as alternatives to traditional laboratory work. Faced with limited laboratory facilities, teachers are increasingly exploring outdoor learning. A descriptive qualitative research design, incorporating quantitative survey data from 37 science teachers, revealed that teachers "often" utilize outdoor spaces for laboratory-related activities, demonstrating adaptability and creativity. Teachers strongly perceive that outdoor learning enhances student engagement, aligns with the K-12 curriculum, and promotes creativity and critical thinking. However, significant challenges include limited class time, student discipline, large class sizes, and a lack of clear guidelines or administrative support. Proposed strategies, all highly supported by teachers, include providing contextualized modules, utilizing mobile devices, establishing school gardens, promoting collaboration, and ensuring safety protocols. These findings underscore the need for comprehensive support systems to maximize the potential of environment-based science education.

Keywords: Outdoor learning, environmental education, science teaching, teacher perceptions, school grounds, alternative laboratories, Philippines.

Introduction

The teaching of science is deeply rooted in inquiry-based learning and experiential engagement. For decades, Hofstein and Lunetta (2004) as cited by Bybee (2013) reiterated that science education has emphasized the importance of hands-on activities and laboratory experiments to build scientific skills and conceptual understanding. However, the lack of fully equipped science laboratories in many public schools—particularly in developing countries like the Philippines—limits the ability of teachers to provide these authentic learning experiences (Oladejo et al., 2011; Lasala, 2020). In response, teachers are exploring innovative and alternative strategies for delivering practical learning, one of which is utilizing the natural environment and school grounds.

Abungu, Okere, and Wachanga (2014) further explained that learning scince is most effective when learners engage in hands-on and minds-on activities. Traditional laboratory experiments are integral for developing scientific inquiry and critical thinking.

However, in many rural or resource-limited settings, the availability of fully equipped science laboratories is scarce, prompting educators to explore alternative practical teaching methods (Opara, 2014).

Meaningful and authentic science learning can be achieved outside of traditional classroom and laboratory experiences. Outdoor learning, especially when it is based on children's observation and interaction with nature in daily life, can support children's cognitive as well as affective and psychomotor development (Rickinson et al., 2004; Dillon et al., 2006). There is a focus on making use of learners' actual environment as a foundation for learning, particularly for the development of basic literacy, numeracy and problem-solving skills (DepEd, 2016, p. 3) DepEd (2016) has promoted what it calls "contextualization and localization" of the curriculum for the Philippines. Through this approach, science teachers are able to see the school and the job - training facility as rich places of learning.

The school grounds and the surrounding area are brimming with educational opportunities. Dyment and Bell (2008) highlight that natural features like trees, gardens, and soil within the school can be fantastic tools for teaching subjects such as biology, earth science, and environmental science. Tayao et al. (2021) conducted study on environmental education in Southeast Asia, they revealed that Filipino teachers see the natural environment as a treasure trove of scientific phenomena for students to observe, document, and analyze. Additionally, studies have shown that hands-on science instruction can spark curiosity, creativity, and a sense of environmental responsibility in students (Ballantyne & Packer, 2009; NAAEE, 2015).

According to Buxton (2010), as mentioned by Fabito (2028), instructors play an important part in making contextualized scientific teaching successful, and their perspectives can have a significant impact on how open they are to attempting new methods. As a result, Acierto and Balila (2021) noted that, while some teachers perceive the benefits of incorporating the school environment into their science courses, they frequently face barriers such as large class sizes, limited time, and insufficient training, making it difficult to put these concepts into effect.

Considering this, the current study aims to delve into how science teachers perceive the use of the environment and school grounds as alternatives or enhancements to traditional lab instruction. This topic is particularly significant in the Philippine educational context, where there's a growing demand for practical and budget-friendly solutions that meet both teaching objectives and resource constraints.

According to the study Manalo and Ong (2020), integrating local rivers and gardens as teaching tools in General Science classrooms boosted student performance and engagement. Similarly, Domingo (2019) highlighted how teachers in rural Mindanao integrated biodiversity courses with field trips to surrounding woods, which enhanced academic achievement while simultaneously raising environmental awareness. These findings provide confidence to the growing belief that incorporating the natural world into science education is not only possible, but also very beneficial.

At the advent of the K-12 Curriculum and the ongoing movement towards flexible and context- responsive pedagogies (DepEd, 2020); there is an exigency to examine how educators interpret and actualize outdoor learning. Tan (2022) stresses that grounded realities and teacher knowledge are essential in the creation of sustainable and innovative teaching strategies. In addition, as schools are increasingly interrupted by natural disasters and health emergencies, such as the Covid-19 pandemic, outdoor learning might offer a robust lever for the continuation of science teaching (UNESCO, 2020).

Research Questions

This study aims to explore the perceptions of public secondary science teachers of Aguilar District, Pangasinan regarding the use of the environment and school ground as a substitute for traditional laboratory work in science education.

Hence, it specifically seeks answer to the following questions

1. How may the public secondary science teachers of Aguilar District utilize the school ground and local environment for laboratory-related activities?

2. How may the public secondary science teachers of Aguilar District perceived benefits of using the environment and school ground as a substitute for traditional science laboratories?

3. What challenges do science teachers face in implementing outdoor or environmental science activities in their teaching practices?

4. What strategies can be proposed to support and enhance the use of environmental and school grounds in science teaching?

Methodology

Research Design

This study utilized a descriptive qualitative research design with elements of quantitative data collection through survey questionnaires. The qualitative aspect will involve interviews and thematic analysis to explore perceptions in depth.

Respondents of the Study

The respondents of the study are thirty-seven (37) public Junior and Senior High School science teachers from the Aguilar District, Pangasinan

Results and Discussion

Table 1. Utilization of School Grounds and Environment for Laboratory-Related Activities

Scale	Description
1	Never
2	Rarely
3	Sometimes
4	Often
5	Always

Indicators	Mean Score	Description
I bring students outside the classroom for direct environmental observations.	4.00	*Often*
I utilize the school ground to demonstrate science processes or principles.	4.08	*Often*
I design science activities based on available natural resources near the school.	4.11	*Often*

I conduct simple experiments or investigations using natural materials (e.g., soil, leaves, rocks).	4.08	*Often*
I substitute laboratory experiments with environment-based tasks when resources are limited.	4.05	*Often*
I involve learners in exploring ecological relationships in their surroundings	4.11	*Often*
I conduct biodiversity surveys or habitat studies around the school.	4.00	*Often*
I integrate school garden or mini-ecosystem activities in my lessons.	4.00	*Often*
I collaborate with colleagues in planning environment-based science lessons.	4.00	*Often*
I document and assess students' performance during outdoor science activities.	4.24	*Often*

The study explored the extent to which science teachers utilize school grounds and the surrounding environment for laboratory-related activities. The results show that all indicators received a mean score ranging from 4.00 to 4.24, indicating that teachers "Often" use environmental and school-based resources in their science instruction.

The highest mean score (M = 4.24) was recorded for the indicator "I document and assess students' performance during outdoor science activities," highlighting the importance teachers place on monitoring and evaluating learning outcomes during field-based lessons. This aligns with the findings of Zeidler and Nichols (2015), emphasized that authentic assessment in outdoor settings increases students' understanding of scientific concepts and promotes higher-order thinking skills.

Indicators such as "I design science activities based on available natural resources near the school" and "I involve learners in exploring ecological relationships in their surroundings" both received a mean score of 4.11. This revealed that science teachers of Aguilar District are keen on leveraging local biodiversity and ecological systems to make science instruction more relevant and contextualized. This is supported by Waite (2020), who supported that place-based education fosters environmental literacy and student engagement, uniquely when local ecosystems are used as learning environments.

The indicator "I utilize the school ground to demonstrate science processes or principles" scored a slightly lower mean of 4.08 but still categorized as "Often." This reflects a growing pedagogical shift toward experiential learning, where the school environment is used not just for theory but for real-world scientific application. Furthermore, Ballantyne and Packer (2014) found that outdoor science teaching encourages inquiry-based learning and enhances student curiosity.

Equally, activities such as using natural materials for simple experiments (M = 4.08) and substituting lab experiments with environment-based tasks when resources are limited (M = 4.05) demonstrate adaptability and creativity among science teachers. These findings align with the work of Rickinson et al. (2022), who highlighted that environmental constraints often drive innovation in science pedagogy, especially in resource-limited contexts.

Despite the generally high ratings, indicators like "I conduct biodiversity surveys or habitat studies around the school" and "I integrate school garden or mini-ecosystem activities in my lessons" had lower mean scores of 4.00. This suggests opportunities for further enhancement of field-based science instruction. Hence, the conducted study Lieberman and Hoody (1998) found that structured outdoor programs, such as habitat monitoring and school gardens, significantly improve science learning outcomes, but require institutional support and professional development.

Finally, teacher collaboration in planning environment-based lessons (M = 4.00) shows moderate frequency, which may reflect time constraints or lack of collaborative structures. study by Beames, Higgins, and Nicol (2016) suggests that professional learning communities focused on environmental education can empower teachers and promote curriculum innovation.

Table 2. Teachers Perception

Scale	Description
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

Indicators	Mean Score	Description
Outdoor environments provide authentic contexts for science learning.	4.22	*Agree*
I believe that learning science outdoors increases student interest and engagement.	4.43	*Agree*

Using school grounds compensates well for the lack of laboratory facilities.	3.27	*Neutral*
Students show improved understanding when exposed to environment-based activities.	4.49	*Agree*
Environmental-based teaching promotes creativity and critical thinking.	4.51	*Agree*
Outdoor activities align with the competencies in the K-12 science curriculum.	4.73	*Agree*
I am confident in facilitating environment-based learning.	4.00	*Agree*
I feel that I need more training on how to use the environment for teaching science.	4.68	*Agree*
My students are more participative during outdoor activities than in the lab.	4.78	*Agree*
The benefits of using the school ground outweigh the limitations.	4.08	*Agree*

The study investigated teachers' perceptions on the use of outdoor environments and school grounds as substitutes for traditional laboratory settings in science instruction. The results reveal a strong positive perception toward environment-based teaching, with mean scores ranging from 3.27 (Neutral) to 4.78 (Agree).

The indicator with the highest mean score (M = 4.78) was *"My students are more participative during outdoor activities than in the lab."* This suggests that teachers perceive a significant increase in student engagement when science learning occurs outdoors. This is supported by the study Beames, Higgins, and Nicol (2012) who found that outdoor learning environments stimulate higher participation due to their experiential and interactive nature.

Similarly, the high mean score for *"Outdoor activities align with the competencies in the K–12 science curriculum"* with a mean score of 4.73 indicates that teachers recognize the curriculum relevance of environmental learning. According to Dilon and Lovell (2022), when outdoor activities are aligned with standards-based goals, they can lead to improved conceptual understanding and curriculum integration.

Teachers also strongly agreed that *"Environmental-based teaching promotes creativity and critical thinking"* with a mean score of 4.51. This aligns with findings of Waite (2020), who concluded that open-ended, real-world tasks in outdoor settings foster innovative thinking and problem-solving among learners.

The belief that *"Students show improved understanding when exposed to environment-based activities"* (M = 4.49) further validates the effectiveness of these methods. Carrier et al. (2014) emphasized that real-world contexts enhance science literacy by grounding abstract concepts in observable phenomena.

Moreover, teachers expressed a strong desire for professional development, as reflected by the statement *"I feel that I need more training on how to use the environment for teaching science"* (M = 4.68). This indicates a positive attitude paired with the need for capacity-building. Ernst and Monroe (2016) argue that effective environmental instruction is contingent on sustained teacher training and confidence-building programs.

Interestingly, the statement *"Using school grounds compensates well for the lack of laboratory facilities"* scored the lowest (M = 3.27, Neutral), suggesting mixed opinions on whether outdoor teaching can fully substitute traditional laboratory setups. This aligns with Carrier, Tugurian, and Thomson (2013), who noted that while outdoor instruction enhances engagement, it does not always match the precision and control offered by laboratory experiments.

Despite this, teachers largely agreed that *"The benefits of using the school ground outweigh the limitations"* (M = 4.08), reflecting an overall positive disposition. Sobel (2014) emphasized that outdoor instruction not only bridges learning gaps but also encourages environmental stewardship and scientific inquiry.

Confidence in facilitating outdoor science learning also rated positively (M = 4.00). However, as noted by Moseley, Reinke, and Bookout (2003), teacher confidence is often linked to prior experience and institutional support.

Overall, the study confirms that teachers perceive outdoor and environment-based learning as effective, engaging, and relevant to the science curriculum, though ongoing support, training, and resource development are essential to maximize its potential.

Table 3. Challenges Encountered

Scale	**Description**
1	Never
2	Rarely
3	Sometimes
4	Often
5	Always

Indicators	**Mean Score**	**Description**
Lack of administrative or school support for outdoor activities	4.30	*Often*
Insufficient training in outdoor-based teaching methods	4.68	*Often*
Safety risks during field or environmental activities	4.11	*Often*
Limited time within the class schedule	4.84	*Often*
Absence of clear guidelines or assessment tools	4.51	*Often*
Inaccessibility of nearby natural or green spaces	3.38	*Sometime*
Poor weather conditions interfering with scheduled outdoor lessons	2.54	*Rarely*
Difficulty in managing large classes outdoors	4.81	*Often*
Student discipline and behavioral issues during outdoor lessons	4.84	*Often*
Misalignment of outdoor lessons with learning competencies	3.32	*Sometime*

The table presents the challenges perceived by teachers when implementing environment-based science teaching using outdoor spaces or school grounds. The findings reflect a range of structural, pedagogical, and logistical issues that hinder effective integration of outdoor lessons in science education.

The most pressing concern, with the highest mean scores of 4.84, pertains to both *"Limited time within the class schedule"* and *"Student discipline and behavioral issues during outdoor lessons."* These issues indicate that time constraints and classroom management remain significant barriers. Beames et.al. (2012) emphasized that time limitations due to rigid curricula and disciplinary unpredictability in open spaces hinder seamless outdoor instruction.

Similarly, the challenge *"Difficulty in managing large classes outdoors"* scored 4.81, highlighting logistical problems of supervision and engagement in less structured environments. However, Ehrenberg, Brewer, Gamora, and Willms (2010) quoted that teachers believe that smaller classes provide more attention for each individual child, make it easier to manage student conduct, reduce student misbehavior, and engage pupils in academic pursuits. However, these impressions do not correspond to any differences in what teachers are doing, as evidenced by observations and teacher survey replies. Either teachers do not modify their practices in smaller and bigger classrooms, or the instruments used to assess classroom practices are not sensitive enough to detect the differences that do occur.

Teachers also cited *"Absence of clear guidelines or assessment tools"* (M = 4.51) and *"Lack of administrative or school support for outdoor activities"* (M = 4.30) as common obstacles. Dillon et al. (2016) argued that without institutional support and policy alignment, outdoor learning becomes a burden rather than an opportunity.

"Safety risks during field or environmental activities" also emerged as a frequent concern (M = 4.11). As observed by Waite (2020), safety anxieties often discourage schools from embracing outdoor teaching despite its proven benefits.

Some indicators received relatively lower mean scores, such as *"Poor weather conditions interfering with scheduled outdoor lessons"* (M = 2.54, *Rarely*), indicating that weather is not a frequent impediment, likely due to geographical location or effective scheduling. In a Philippine context, teachers may adapt schedules around predictable seasons, as suggested by Preña and Labayo (2025) quoted that significant gaps and challenges persist in these responses, underscoring the need for time-consistent policies focused on creating conducive learning environments.

Indicators such as *"Misalignment of outdoor lessons with learning competencies"* (M = 3.32) and *"Inaccessibility of nearby natural or green spaces"* (M = 3.38) were rated *Sometimes*. This suggests that while these issues exist, they are not persistent.

Overall, the results suggest that although outdoor learning is perceived as beneficial, its implementation is significantly hindered by institutional, instructional, and behavioral challenges. Addressing these barriers requires coordinated efforts in teacher training, policy support, curriculum flexibility, and the development of context-specific assessment tools, as supported by Carrier et al. (2013).

Table 4. Proposed Strategies

Scale	**Description**
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

Indicators	**Mean Score**	**Description**
Conduct teacher training workshops on outdoor science instruction.	4.38	*Agree*
Provide contextualized modules that integrate environment-based learning	5.00	*Strongly Agree*
Allocate specific time for outdoor science activities in the school calendar.	4.14	*Agree*
Establish school gardens and biodiversity areas as learning zones	4.86	*Agree*
Develop localized assessment tools for evaluating outdoor science tasks.	4.35	*Agree*
Promote collaboration among teachers in planning field-based science activities.	4.73	*Agree*
Include outdoor safety protocols in school policies.	4.51	*Agree*
Seek community and LGU partnerships for environmental education	4.68	*Agree*
Use mobile devices or apps to support outdoor scientific investigations	4.89	*Agree*
Recognize and reward innovative practices in using the environment for science education.	4.38	*Agree*

As shown in Table 4, all proposed strategies received a mean score indicating "Agree" or "Strongly Agree," highlighting teachers' receptiveness to interventions that can facilitate outdoor science education.

The strategy of "*Providing contextualized modules that integrate environment-based learning*" garnered the highest mean score of 5.00, indicating "Strongly Agree." This finding underscores the critical need for readily available, locally relevant instructional materials that bridge classroom learning with outdoor experiences. Contextualized modules can help teachers overcome challenges related to lesson planning and resource development for outdoor activities (Ernst & Trowbridge, 2018). The strong agreement suggests that teachers perceive a direct benefit in having structured, yet adaptable, resources to guide their integration of environmental learning. This aligns with research emphasizing the importance of curriculum integration for effective environmental education (Dillon et al., 2011).

Furthermore, "*Using mobile devices or apps to support outdoor scientific investigations*" (mean score = 4.89, "Agree") and "*Establishing school gardens and biodiversity areas as learning zones*" (mean score = 4.86, "Agree") also received high mean scores. The high agreement on using technology suggests that teachers recognize the potential of digital tools to enhance data collection, analysis, and overall engagement in outdoor settings (Liu et al., 2017). This indicates a forward-thinking approach to leveraging available resources for scientific inquiry. Similarly, the study of Blair (2009) with regards to the strong support for school gardens and biodiversity areas reflects an understanding of their value as accessible, living laboratories for hands-on learning in biology, ecology, and environmental science. These spaces offer tangible opportunities for observation, experimentation, and fostering a connection to nature (Lieberman & Hoody, 1999).

Strategies focused on collaboration and partnerships also scored highly. "*Promoting collaboration among teachers in planning field-based science activities*" received a mean score of 4.73 ("Agree"), and "*Seeking community and LGU partnerships for environmental education*" received a mean score of 4.68 ("Agree"). These results emphasize the importance of a supportive professional learning community and external collaborations to overcome resource limitations and enhance the scope of outdoor learning experiences (Rickinson et al., 2004). Teacher collaboration can facilitate sharing of best practices and reduce individual planning burdens, while community partnerships can provide access to expertise, resources, and real-world contexts for learning (Louv, 2005).

Other significant strategies include "*Including outdoor safety protocols in school policies*" (mean score = 4.51, "Agree"), which addresses a crucial practical concern often cited as a barrier to outdoor activities (Dyment & Bell, 2008). The understanding here suggests that clear guidelines and institutional support for safety measures would significantly encourage teachers to undertake more outdoor lessons. "*Conducting teacher training workshops on outdoor science instruction*" and "*Recognizing and rewarding innovative practices in using the environment for science education*" both received a mean score of 4.38 ("Agree"). These findings highlight the ongoing need for professional development that equips teachers with the pedagogical skills and confidence to teach effectively in outdoor settings (Powers, 2004). Hence, Hammerman and Hammerman (1985) stated that recognition and rewards, on the other hand, can serve as powerful motivators, encouraging teachers to explore and implement innovative approaches to environmental education.

Finally, *"Developing localized assessment tools for evaluating outdoor science tasks"* (mean score = 4.35, "Agree") and "*Allocating specific time for outdoor science activities in the school calendar*" (mean score = 4.14, "Agree") also indicate a positive perception among teachers. The need for appropriate assessment tools acknowledges that traditional classroom-based assessments may not fully capture the learning outcomes achieved in outdoor settings (Pella, 2008). Dedicated time in the school calendar is a fundamental structural support, without which outdoor activities often remain marginalized or spontaneous (Monroe et al., 2000).

In conclusion, the perceptions of public secondary science teachers in Aguilar District reveal a strong desire for a supportive ecosystem that facilitates the integration of environmental and school grounds into science education. The proposed strategies address key areas including curriculum and resources, technology integration, infrastructure development, professional development, safety, collaboration, and institutional support. Implementing these strategies has the potential to significantly enhance the utilization of the environment and school grounds as viable and effective alternatives to traditional laboratory work, ultimately enriching students' practical learning experiences in science.

Conclusion

The results of this study clearly show that public secondary school science teachers in Aguilar District, Pangasinan, appreciate and utilize the environment and school premises as real ecological science learning spaces. Regardless of the difficulties, teachers incorporate outdoor lessons into their teaching as a routine practice, using the local community and natural ecosystems to deepen students' understanding. This, in turn, promotes an effective change in pedagogy that is is tailored to guided and discovery-based "hands-on" learning, where the environment becomes a laboratory and classroom for scientific exploration beyond the confines of the traditional science laboratory. The use of these alternative strategies is further proven by the high levels of student enthusiasm and participation in outdoor activities.

Though the advantages of environment-based learning are noticeably impactful, the study also described considerable obstacles which seem to hinder its complete adoption. Some of the major problems include tight timetables during class, problems supervising large groups of students outdoors, and problems concerning students' behavior. Additionally, lack of defined procedures, evaluative measures, and reliable administrative backing construct an underlying barrier. All of these factors show that there is no need for reform that is more practical than systemic as it concerns outdoor teaching as well as the policies that control it.

Importantly, teachers articulated an eagerness for professional development and resources, showing readiness to further their understanding and skills in teaching outdoor science within the context of the curricula. The strong appreciation of the strategies like mobile technology usage, custom-made curriculum modules, and school garden creations suggests that educators are open to modern approaches to environmental education and the use of mobile infrastructure technology. This shared understanding of the offered solutions illustrates the types of support systems teachers wish to have to achieve a great extent of outdoor learning experiences.

In summary, this study presents a persuasive case on why the Philippines needs to invest in and structure administrative policies around environment-based science education. With the challenges already identified, educational stakeholders can greatly improve the accessibility and quality of relevant and practical science education by providing professional development, policies, funding, resources, and building collaborative networks. In the end, allowing teachers to exploit and fully harness the diverse wonders offered by the environment and the school to facilitate learning will substitute the absent laboratory complements and develop appreciation for science and environmental care among the learners.

Recommendations

Based on the findings and conclusions of this study, the following recommendations are proposed to support and enhance the utilization of the environment and school grounds in science teaching:

1. **Curriculum and Resource Development**
   - Prioritize the development and dispersion of contextualized modules and assignment plans that specifically integrate terrain-grounded literacy conditioning. These modules should be aligned with the K- 12 wisdom class and give clear guidance on how to use original coffers for scientific examinations;
   - Invest in creating and acquiring mobile operations and digital tools that can support out-of-door scientific examinations, data collection, and analysis. give training to preceptors on how to effectively integrate these technologies into their out-of-door assignments.
2. **Professional Development and Capacity Building:**
   - Conduct regular and comprehensive schoolteacher training shops concentrated on out-of-door wisdom instruction. These shops should cover pedagogical approaches, safety protocols, classroom operation strategies for out-of-door settings, and the effective use of environmental coffers.
   - Establish professional literacy communities among wisdom preceptors to promote collaboration in planning and enforcing field-grounded wisdom conditioning. Encourage sharing of stylish practices, challenges, and innovative results.
3. **Infrastructure and Institutional Support:**
   - Allocate specific time within the school timetable for out-of-door learning to insure they aren't marginalized or treated as robotic events. This requires inflexibility in scheduling and class planning.

- Establish and maintain school grounds, biodiversity areas, and other designated literacy zones within school premises. These areas should be designed to grease hands- on scientific observation and trial.
- Develop and apply clear out-of-door safety protocols as part of school programs. Give preceptors with training on these protocols and insure necessary safety outfit is available.
- Laboriously seek and foster partnerships with local government units(LGUs), community associations, and environmental groups to gain access to fresh coffers, moxie, and natural spaces for environmental education.

4. **Assessment and Recognition:**

- Develop localized and authentic assessment tools specifically designed to estimate learners learning issues during out-of-door learning activities. These tools should capture the unique chops and understanding developed in terrain- grounded settings.
- Apply a system to fete and award innovative practices in using the terrain for wisdom education. This can motivate preceptors and encourage the relinquishment of creative and effective out-of-door learning styles.

References

Abungu, H. E., Okere, M. I., & Wachanga, S. W. (2014). The effect of science process skills teaching approach on secondary school students' achievement in chemistry in Nyando District, Kenya.

Acierto, R. A., & Balila, A. A. (2021). Contextualization of Science Teaching Using Local Resources in Rural Schools. *International Journal of Educational Management and Development Studies*, 2(3), 55–70. https://doi.org/10.53378/345

Ballantyne, R., & Packer, J. (2009). Introducing a fifth pedagogy: Experience-based strategies for facilitating learning in natural environments. *Environmental Education Research*, 15(2), 243–262. https://doi.org/10.1080/13504620802711282

Ballantyne, R., & Packer, J. (2011). Using tourism free-choice learning experiences to promote environmentally sustainable behaviour: the role of post-visit 'action resources'. *Environmental education research*, *17*(2), 201-215.

Beames, S., Higgins, P., & Nicol, R. (2012). *Learning outside the classroom: Theory and guidelines for practice*. Routledge.

Blair, D. (2009). The child in the garden: An evaluative review of the benefits of school gardening. *Journal of Environmental Education*, *40*(2), 15-38.

Buxton, C. A. (2010). Social constructivism and the impact of teachers' beliefs and knowledge on the teaching of science to English language learners. *Science Education*, 94(3), 543–573. https://doi.org/10.1002/sce.20357

Bybee, R. W. (2013). *The Case for STEM Education: Challenges and Opportunities*. NSTA Press.

Carrier, S. J., Tugurian, L. P., & Thomson, M. M. (2013). Elementary science indoors and out: Teachers, time, and testing. *Research in Science Education*, *43*, 2059-2083.

DepEd. (2016). *Policy Guidelines on Daily Lesson Preparation for the K to 12 Basic Education Program* (DepEd Order No. 42, s. 2016). https://www.deped.gov.ph

DepEd. (2020). *Guidelines on the Implementation of Distance Learning Modalities in Public Schools* (DepEd Memorandum No. 162, s. 2020). https://www.deped.gov.ph

Dettweiler, U., Ünlü, A., Lauterbach, G., Becker, C., & Gschrey, B. (2015). Investigating the motivational behavior of pupils during outdoor science teaching within self-determination theory. *Frontiers in psychology*, *6*, 125.

Dillon, J., & Lovell, B. (2022). Links between natural environments, learning and health: evidence briefing.

Dillon, J., Rickinson, M., & Teamey, K. (2016). The value of outdoor learning: evidence from research in the UK and elsewhere. In *Towards a convergence between science and environmental education* (pp. 193-200). Routledge.

Dillon, J., Rickinson, M., Teamey, K., Morris, M., Choi, M. Y., Sanders, D., & Benefield, P. (2006). The value of outdoor learning: Evidence from research in the UK and elsewhere. *School Science Review*, 87(320), 107–111.

Dillon, J., Stephenson, A., & Reid, A. (2011). *Researching environmental education: Changing perceptions of teaching and learning*. Routledge.

Domingo, C. J. (2019). Using the Local Environment as a Teaching Tool in Science: A Case in Rural Mindanao. *The Normal Lights*, 13(2), 109–130. https://po.pnuresearchportal.org/ejournal/index.php/normallights/article/view/1134

Dyment, J. E., & Bell, A. C. (2008). Grounds for movement: Green school grounds as sites for promoting physical activity. *Health Education Research*, 23(6), 952–962. https://doi.org/10.1093/her/cym059

Ehrenberg, R. G., Brewer, D. J., Gamoran, A., & Willms, J. D. (2001). Class size and student achievement. *Psychological science in the public interest*, *2*(1), 1-30.

Ernst, J., & Trowbridge, R. (2018). *The essential guide to environmental education: Developing your program for success*. Corwin Press.

Fabito, B. S. (2018). Localized Instructional Materials in Teaching Earth Science. *Asian Journal of Education*, 6(2), 45–52.

Hammerman, D. R., & Hammerman, W. M. (1985). *Outdoor education: A book of readings* (4th ed.). Burgess Publishing Company.

Hofstein, A., & Lunetta, V. N. (2004). The laboratory in science education: Foundations for the twenty-first century. *Science Education*, 88(1), 28–54. https://doi.org/10.1002/sce.10106

Lasala, M. (2020). Challenges in Science Laboratory Activities: Experiences of Philippine Secondary Schools. *International Journal of Curriculum and Instruction*, 12(2), 453–470.

Lieberman, G. A., & Hoody, L. L. (1998). Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning. Results of a Nationwide Study.

Liu, J., Li, S., Wang, K., & Chang, P. (2017). Investigating the effectiveness of a mobile-assisted seamless learning approach in an outdoor scientific inquiry. *Educational Technology Research and Development*, *65*(3), 735-758.

Louv, R. (2005). *Last child in the woods: Saving our children from nature-deficit disorder*. Algonquin Books.

Manalo, R. A., & Ong, A. C. (2020). Promoting Place-Based Learning in Science through Local Natural Resources. *Asia Pacific Journal of Multidisciplinary Research*, 8(1), 57–65.

Monroe, M. C., Pomerantz, J., & Herman, K. (2000). The characteristics of effective environmental education programs. *Journal of Environmental Education*, *31*(4), 10-21.

Moseley, C., Reinke, K., & Bookout, V. (2003). The effect of teaching outdoor environmental education on elementary preservice teachers' self-efficacy. *Journal of Elementary Science Education*, *15*(1), 1-14.

NAAEE. (2015). *Environmental Education: Advancing Opportunities for the Next Generation*. North American Association for Environmental Education. https://naaee.org/sites/default/files/ee_prospectus.pdf

Oladejo, M. A., Olosunde, G. R., Ojebisi, A. O., & Isola, O. M. (2011). Instructional Materials and Students' Academic Achievement in Physics: Some Policy Implications. *European Journal of Humanities and Social Sciences*, 2(1), 112–126.

Opara, J. A. (2014). Revisiting Integrated Science Education in Rural Southern Nigeria: Perspectives on Teacher's Job Status and Satisfaction. *Techno Learn*, *4*(1), 7.

Pella, M. O. (2008). *The development of an instrument to measure student attitudes toward environmental education*. ProQuest LLC.

Powers, A. L. (2004). Teacher preparation for environmental education: Perceptions of pre-service teachers. *Journal of Environmental Education*, *36*(2), 13-26.

Preña, E. M., & Labayo, C. P. (2025). Policy responses to extreme heat and its impact on education: The Philippine experience. *Policy Futures in Education*, *23*(3), 652-675.

Rickinson, M., Dillon, J., Teamey, K., Morris, M., Choi, M. Y., Sanders, D., & Benefield, P. (2004). *A Review of Research on Outdoor Learning*. National Foundation for Educational Research. https://www.nfer.ac.uk/publications/outdoor-learning/

Sobel, D. (2004). Place-based education: Connecting classrooms and communities. *Education for meaning and social justice*, *17*(3), 63-64.

Tan, C. S. (2022). Innovation in Science Teaching: Grounding Curriculum in Teacher Perceptions. *Philippine Journal of Education Studies*, 3(1), 1–17.

Tayao, M. I., Ramos, J. M., & Evangelista, S. V. (2021). Teacher Perceptions on Environmental Education Integration in Southeast Asian Classrooms. *ASEAN Journal of Education*, 2(2), 35–50.

UNESCO. (2020). *Education in a post-COVID world: Nine ideas for public action*. https://en.unesco.org/news/education-post-covid-world-nine-ideas-public-action

Waite, S. (2020). Teaching and learning outside the classroom: Personal values, alternative pedagogies and standards. In *Outdoor learning research* (pp. 8-25). Routledge.

Zeidler, D. L., & Nichols, B. H. (2009). Socioscientific issues: Theory and practice. *Journal of elementary science education*, *21*(2), 49-58.