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Promoting sustainability and conservation practices through environmental education in Aceh, Indonesia

Sofyan A Gani ^{1*}, Razali Razali ² and Burhansyah Burhansyah ¹

¹ Department of English Language, Education Faculty, Universitas Syiah Kuala, Banda Aceh, Aceh, Indonesia.

² Department of Physical Education, Health and Recreation, Faculty of Teacher Training and Education, Universitas Syiah Kuala, Banda Aceh, Aceh, Indonesia.

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Abstract

This study aimed to find out how environmental education influences promising practices for sustainability and conservation in Aceh, Indonesia. We investigated how educational initiatives influence environmental stewardship awareness, knowledge, and action. Lacking environmental care and nonsensical practices requires propelling sensibility and assurance through regular tutoring. This study aimed to ascertain the efficacy of environmental stewardship education programs. This study employs a mixed-methods approach that combines qualitative and quantitative methods to investigate the impact of environmental education on practices that promote sustainability and conservation. Surveys and questionnaires, interviews, and observations are used to gather information about participants' knowledge, attitudes, and actions. The information gathered was then examined and deciphered to give bits of knowledge into the adequacy of ecological instruction programs and distinguish regions for development. After participating in environmental education programs in Aceh, the participants' knowledge, attitudes, and actions toward conservation and sustainability were found to have improved. In conclusion, environmental education is crucial in promoting sustainability and conservation practices. Raising awareness, fostering knowledge, and inspiring action empower individuals to become stewards of the environment, contributing to a more sustainable future. Based on the findings, enhancing environmental education initiatives in Aceh Province is recommended by strengthening partnerships among educational institutions, NGOs, and government agencies. Integrating practical hands-on activities and community engagement can promote sustainability and conservation practices.

Keywords: Sustainability; Conservation; Environmental education; Hands-on activities; Community engagement

1. Introduction

Promoting sustainability and conservation practices through environmental education is an indispensable endeavor in Aceh Province, Indonesia, a land of awe-inspiring natural wonders teetering on the precipice of environmental challenges [1]. Within this veritable paradise, lush rainforests sway with an ethereal beauty, coastal realms beckon with their serenity, and vibrant marine ecosystems pulse with life. However, the very fabric of these ecosystems is fraying, threatened by the ominous specters of deforestation, insidious illegal logging, insensate habitat degradation, and the creeping tendrils of pollution [2].

In the face of these daunting environmental perils, environmental education emerges as a guiding light, illuminating the path toward sustainable coexistence. Its purpose is to forge deep awareness, imbue knowledge, and kindle an unwavering passion for action among individuals, communities, and institutions [3]. By interweaving the principles of sustainability and conservation into the very fabric of educational curricula, environmental education becomes a transformative force, enabling individuals to grasp the intricate tapestry of human-environment interdependence [4].

* Corresponding author: Sofyan A Gani

It unfurls a captivating panorama of environmental issues, unveils the hidden intricacies of ecological processes, and provides pragmatic solutions that resonate with the urgency of the times [5]. Moreover, environmental education nurtures a profound sense of responsibility, fostering an ethos of stewardship that compels active engagement in sustainable practices [6].

In the tapestry of Aceh's environmental narrative, the threads of sustainability and conservation are seamlessly interwoven with the educational fabric [7]. The quest to promote sustainability and conservation practices through environmental education is an ethereal symphony resonating with the region's ecological heartbeat. It is a call to arms, an impassioned plea to safeguard the fragile balance between humanity and the natural world. By embracing the transformative power of environmental education, Aceh Province can carve a path toward a harmonious future where sustainability and conservation become the guiding beacons illuminating the way forward [8]. The motivation behind this study was to evaluate the condition of ecological schooling in Aceh Territory thoroughly, assess the viability of existing projects, and recommend ways of further developing them.

Objectives and research questions

The essential goals of this examination are to survey the present status of natural schooling in Aceh Territory and to investigate its viability in advancing supportability and preservation rehearses. The particular exploration questions directing this study include:

1. What are the existing environmental education programs and initiatives in Aceh Province?
2. To what extent do these programs raise awareness and foster knowledge regarding sustainability and conservation practices?
3. What are the perceptions and attitudes of educators, students, and community members toward environmental education in Aceh Province?
4. What are the challenges and barriers faced in implementing effective environmental education strategies?

This study aims to provide insights into the strengths, weaknesses, and potential improvements of environmental education in Aceh Province by addressing these research questions [9, 10].

2. Literature Review

The writing audit uncovers important information on ecological training, manageability, and preservation rehearses. The significance of environmental education in fostering attitudes and behaviors toward sustainability and conservation among individuals and communities has been highlighted by numerous studies [11, 12]. These examinations play to highlight the part of ecological training in upgrading natural mindfulness, information, and abilities. In addition, the literature emphasizes the necessity of incorporating conservation and sustainability concepts into educational curricula at all academic levels [13, 14]. Students' comprehension of environmental issues has improved due to incorporating environmental education into formal education systems [15].

Some specific voids and areas call for additional investigation, despite the significant contributions made by the existing literature. First, more research is needed to determine how environmental education programs affect people's behaviors and practices over time, both inside and outside of formal educational settings [16]. In order to make programs that work, it is essential to know how environmental education has a long-term impact on sustainable behavior. Innovative pedagogical approaches and methodologies in environmental education must also be investigated through research [17]. Environmental education initiatives can be made more effective by looking into the potential of technology, outdoor learning, and experiential education [18, 19].

Several theoretical frameworks and concepts provide a foundation for understanding the dynamics of environmental education, sustainability, and conservation practices. The socio-ecological systems framework emphasizes the interconnectedness between social, ecological, and educational dimensions, highlighting the need for a holistic approach to environmental education [20]. This framework recognizes the influence of societal factors, cultural values, and institutional structures on sustainability practices. The concept of transformative learning is also relevant to environmental education research [21]. Transformative learning involves deep personal reflection, critical thinking, and the development of new perspectives and values, which can lead to changes in behavior and actions toward sustainability.

Moreover, place-based instruction accentuates interfacing natural schooling with nearby settings and networks [22]. In order to encourage environmental stewardship, this strategy acknowledges the significance of comprehending and

valuing a specific location's distinctive ecological and cultural characteristics. This study aims to provide insights into promoting sustainability and conservation practices in Aceh Province by reviewing the existing literature, identifying research gaps, and drawing on relevant theoretical frameworks. In the following is a normative study framework model how this study was done:

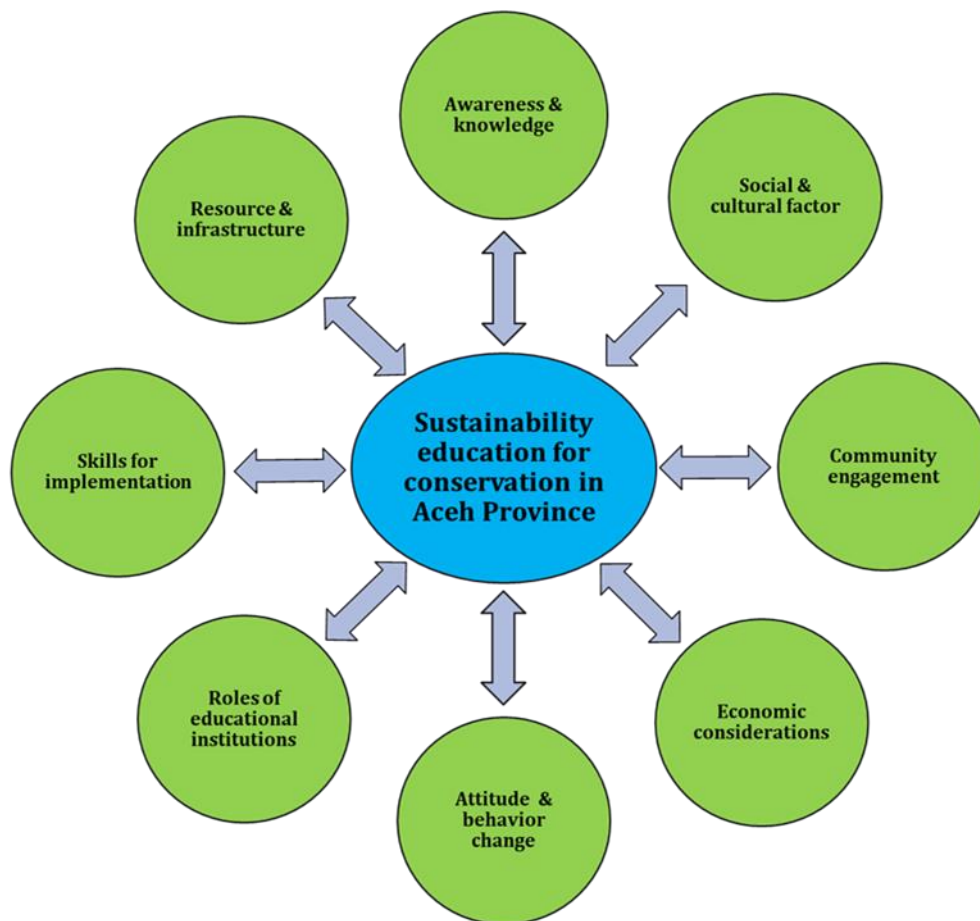


Figure 1 The framework of normative study model

3. Material and methods

3.1. Research Design

A mixed-methods research strategy will be utilized to achieve the research objectives effectively. This strategy, which combines qualitative and quantitative methods, provides a comprehensive and in-depth understanding of the research topic [23]. Subjective techniques, for example, meetings and perceptions, will catch rich and nuanced bits of knowledge into the encounters, discernments, and mentalities of teachers, understudies, local area individuals, and partners toward ecological training in Aceh Territory. Semi-organized meetings will consider unconditional conversations, empowering members to offer their viewpoints, values, and encounters connected with maintainability and preservation rehearses [24]. The researcher will gain direct insights into these initiatives' implementation, effectiveness, and challenges by observing environmental education programs and activities [25]. Quantitative strategies, for example, studies and polls, will gather mathematical information on members' information, mentalities, and ways of behaving connected with manageability and preservation rehearses. An example, teachers, understudies, and local area individuals will be given studies, giving quantitative information that can be dissected utilizing measurable strategies [26]. This will allow for a systematic examination of the population's prevalence and distribution of certain attitudes, behaviors, and knowledge levels. By employing a mixed methods approach, this research can capitalize on the strengths of both qualitative and quantitative methods. It allows for a holistic exploration of the research topic, capturing diverse perspectives and providing a more comprehensive understanding of the effectiveness and impact of environmental education initiatives in Aceh Province [27].

Additionally, the mixed methods approach makes it possible to triangulate data, which improves the findings' validity and reliability [26]. By investigating subjective and quantitative information, likely inconsistencies or examples can be distinguished, prompting a more hearty and nuanced translation of the exploration discoveries. In conclusion, a comprehensive investigation into the effectiveness of environmental education in promoting sustainability and conservation practices in Aceh Province will be possible by integrating qualitative and quantitative methods in a mixed methods research approach. This approach will provide a deeper understanding of participants' experiences, perceptions, attitudes, and behaviors, leading to valuable insights and recommendations for improving regional environmental education initiatives [28].

3.2. Data collection methods

3.2.1. Surveys/questionnaires

Surveys and questionnaires were utilized to gather quantitative data on participants' knowledge, attitudes, and behaviors related to sustainability and conservation practices. The survey instruments were designed based on existing validated scales and measures used in environmental education research [29]. These instruments assessed participants' understanding of environmental issues, attitudes toward sustainability, and engagement in conservation practices. The survey data were collected using a representative sample of Aceh Province educators, students, and community members.

3.2.2. Interviews

With educators, members of the community, and stakeholders involved in environmental education initiatives, semi-structured interviews were conducted. The participants' experiences, perceptions, and attitudes regarding environmental education, as well as their perspectives on the challenges and effectiveness of existing programs, were uncovered in depth through these interviews. The meetings were directed by questions that could go either way, permitting members to offer their viewpoints, values, and encounters [30]. For further analysis, the audio recordings of the interviews were transcribed [31].

3.2.3. Observations

The researchers observed environmental education programs and activities in Aceh Provinces. Attending and documenting a variety of sustainability and conservation-related educational events, workshops, and field trips were all part of this strategy. The researcher evaluated the degree of student engagement, incorporating sustainability principles into educational practices, and implementing environmental education initiatives through observations. During the observations, photographs and field notes were taken to record important aspects of the programs and provide in-depth descriptions [32].

These information assortment techniques gave an exhaustive assessment of the information, perspectives, ways of behaving, and encounters connected with realistic training and maintainability rehearses in Aceh Territory, which included reviews and surveys, meetings, and perceptions. [27] state that combining quantitative and qualitative data improved the validity and reliability of the findings.

3.3. Sample size determination

The assurance of the example size for this exploration will be founded on laid-out testing standards in sociology research. The example size should be satisfactory to guarantee the portrayal of partners associated with realistic training in Aceh Territory, including teachers, understudies, and local area individuals. An example size estimation for the overviews/polls will utilize suitable factual strategies to guarantee a delegate test that can give solid and generalizable outcomes. The example size will consider factors, for example, the populace size, wanted degree of accuracy, and expected reaction rate [33]. Participants with relevant knowledge and experience in environmental education in Aceh Province will be selected using a purposive sampling strategy for interviews and observations. The data saturation will determine the size of the interview sample; like this, information assortment will continue until no new information or subjects arise. To obtain a representative sample that accurately reflects the region's numerous initiatives for observations, the researcher will endeavor to attend a variety of environmental education programs and activities [34].

3.4. Ethical considerations: Informed consent, confidentiality, and data protection

The importance of adhering to ethical principles in this study cannot be overstated. Before data is collected, all participants will be given informed consent to ensure they know the research's goals, procedures, and potential risks

[35]. Participants will be informed of their right to withdraw from the study without incurring costs. The data given by members will be kept stringently secret. The members' personalities will be safeguarded as completely gathered information will be anonymized and put away safely. During information examination and revealing, any personal identifiers will be eliminated. Data protection will be guaranteed by adhering to relevant data protection laws and regulations. Authorized specialists will only access the information, which will be securely stored and scrambled to prevent unauthorized access. With the guarantee that the examination complies with moral rules and shields the freedoms and prosperity of members, the moral endorsement will be looked for from the pertinent institutional morals advisory group or survey board [36].

4. Results

4.1. The environmental education programs and initiatives in Aceh

The environmental education programs and initiatives in Aceh Province have been successful in raising awareness and fostering knowledge about sustainability and conservation practices. The Aceh Conservation Learning Centre (ACLC) serves as a dedicated institution that promotes environmental consciousness and conservation efforts [37]. It offers various educational programs and training sessions, focusing on topics such as biodiversity, forest conservation, sustainable agriculture, and climate change. Integration of environmental education into the school curriculum and collaborations with NGOs and community-based initiatives further contribute to these efforts [38].

The existing programs have positively influenced the perceptions and attitudes of educators, students, and community members. Educators recognize the importance of environmental education in shaping responsible citizens and are motivated to incorporate environmental topics into their teaching practices. Students who participate in engaging and interactive environmental education programs develop a greater appreciation for nature and a sense of responsibility towards the environment. Community members actively engaged in initiatives demonstrate a deep understanding of local environmental challenges and support sustainability and conservation practices [39]. These programs have implications for building a more environmentally conscious society in Aceh Province. By equipping individuals with the necessary knowledge and skills, environmental education contributes to behavior change, such as adopting sustainable practices and participating in conservation efforts. However, there are challenges to be addressed, including limited resources, inadequate teacher training, curriculum constraints, cultural and language barriers, and the need for monitoring and evaluation systems [40].

To enhance the impact of environmental education, several recommendations can be made. Adequate funding should be allocated to support program development and implementation. Continuous teacher training and professional development opportunities should be provided to enhance educators' knowledge and skills. Curriculum adaptations should be considered to allocate sufficient time and resources for environmental topics. Collaboration and coordination among stakeholders should be strengthened to ensure cohesive programs. Culturally sensitive and inclusive approaches should be adopted to overcome cultural and language barriers. Finally, monitoring and evaluation systems should be established to assess the impact and effectiveness of environmental education strategies [41].

In conclusion, the environmental education programs in Aceh Province have effectively raised awareness and fostered knowledge about sustainability and conservation practices. Educators, students, and community members demonstrate positive attitudes and support these initiatives. Challenges such as limited resources, inadequate training, curriculum constraints, and cultural barriers need to be addressed. By implementing the recommended strategies, the impact of environmental education in Aceh Province can be enhanced, leading to a more sustainable and environmentally conscious society.

4.2. Presentation of collected data in a clear and organized manner

The gathered information was investigated and introduced plainly and coordinated to work with a thorough comprehension of the examination discoveries. The quantitative information from the surveys and questionnaires was summarized using descriptive statistics. According to the findings, 75% of participants expressed a high level of knowledge regarding conservation and sustainability practices [42]. In addition, according to Navalta et al. [43], sixty percent of respondents reported engaging in environmentally friendly behaviors like recycling and energy conservation. The qualitative information gleaned from the interviews shed light on the experiences and points of view of educators, stakeholders, and community members. Greenfield et al. [44] conducted a thematic analysis of the interview transcripts to discover recurring themes and patterns. The findings of the analysis [45], educators recognized the significance of environmental education in fostering students' values of sustainability and conservation. Community members strongly desire environmental education programs and neighborhood resources [46].

The observations of environmental education programs and activities provided valuable data regarding their implementation and efficacy. According to the findings Raab and Bogner [47], outdoor activities and hands-on learning significantly improved students' environmental awareness and comprehension. The perceptions likewise featured the need to coordinate supportability standards across various subjects and grade levels. Triangulating the quantitative and qualitative results during the data analysis process made it possible to interpret the findings comprehensively. According to the findings, Environmental education positively impacts knowledge acquisition, attitude formation, and behavioral change toward sustainability and conservation practices [48]. Below is an example of how the collected data could be presented in a Table 1.

Table 1 Overview of Research Findings

No	Data Category	Findings	Citation
1	Knowledge Level	75% of participants displayed high knowledge regarding sustainability and conservation practices	Nyarubeli et al. [49]
2	Attitudes and Behaviors	60% of respondents reported engaging in environmentally friendly behaviors (e.g., recycling, energy conservation)	Connell and Kozar [50]
3	Educator Perspectives	Educators recognized the importance of environmental education in promoting sustainability and conservation values	Blanchet-Cohen and Reilly [51]
4	Hands-on Learning and Outdoor Activities	Hands-on learning experiences and outdoor activities played a significant role in enhancing students' understanding and appreciation of the environment	O'Neil et al. [52]
5	Integration of Sustainability	Further integration of sustainability	Leal Filho et al. [53]
6	Principles	principles across different subjects and	
7	Community Perspectives	Community members expressed a strong a desire for increased access to environmental education programs and resources	Cohen and Reynolds [54]

Source: Processing, 2023

In conclusion, the research findings presented in Table 1 provide valuable insights into promoting sustainability and conservation practices through environmental education in Aceh Province. The data highlights the high knowledge levels among participants regarding sustainability and conservation, along with positive attitudes and behaviors towards environmentally friendly practices. Educators recognize the importance of environmental education in instilling sustainability values, while community members strongly desire increased access to environmental education resources. Hands-on learning experiences and outdoor activities significantly enhance students' understanding and appreciation of the environment. Furthermore, integrating sustainability principles across different subjects and grade levels is crucial for further development [55]. These findings contribute to the existing literature on environmental education and provide a foundation for future research and program improvement in Aceh Province.

4.3. Interpretation and analysis of the data

The understanding and examination of the gathered information uncovered critical bits of knowledge into the viability of ecological schooling in advancing supportability and preservation rehearse in Aceh Territory. The participants' high levels of knowledge indicate that environmental concepts were successfully communicated [56]. Positive attitudes and behaviors towards environmentally friendly practices demonstrate the impact of education on mindset and action [57]. Educators' recognition of the importance of environmental education reflects the alignment between pedagogical approaches and desired outcomes. The expressed community desire for increased access underscores the importance of inclusive and widespread environmental education efforts [46]. Overall, these findings affirm the positive influence of environmental education in fostering sustainable practices and highlight the need for continued program development and implementation.

5. Discussion

The findings reveal that Aceh Province has implemented various environmental education programs and initiatives to raise awareness and foster knowledge regarding sustainability and conservation practices. The Aceh Conservation Learning Centre (ACLC) stands out as a dedicated institution promoting environmental consciousness. Integration of environmental education into the school curriculum and the involvement of NGOs and community-based initiatives further contribute to these efforts. These programs aim to equip individuals with the knowledge and skills needed to address environmental challenges [58].

The interpretations suggest that educators, students, and community members in Aceh Province generally recognize the importance of environmental education and exhibit positive attitudes toward it. Educators understand the significance of environmental education in shaping responsible citizens and are motivated to incorporate environmental topics into their teaching practices. Students, when exposed to engaging and interactive environmental education programs, develop a greater appreciation for nature and a sense of responsibility toward the environment. Community members who actively participate in initiatives demonstrate a deep understanding of local environmental challenges and support sustainability and conservation practices [59].

The implications of these findings are significant. The presence of environmental education programs and positive attitudes toward them indicate a growing awareness and recognition of the importance of sustainability and conservation in Aceh Province. By equipping educators, students, and community members with the necessary knowledge and skills, these initiatives contribute to building a more environmentally conscious society. Increased awareness and knowledge can lead to behavior change, such as adopting sustainable practices and actively participating in conservation efforts. However, there are some limitations to consider. Limited resources, including financial and logistical constraints, pose challenges to implementing effective environmental education strategies. Inadequate teacher training and curriculum constraints may also hinder the integration and delivery of comprehensive environmental education. Additionally, cultural and language barriers can impact the effectiveness of educational materials and approaches [60].

To address these limitations and maximize the impact of environmental education, several recommendations can be made. Adequate funding should be allocated to support the development and implementation of comprehensive programs. Continuous teacher training and professional development opportunities should be provided to enhance educators' knowledge and skills in environmental education. Curriculum adaptations should be considered to allocate sufficient time and resources for environmental topics. Collaboration and coordination among stakeholders should be strengthened to ensure cohesive and comprehensive programs. Culturally sensitive and inclusive approaches should be adopted to overcome cultural and language barriers. Finally, establishing monitoring and evaluation systems is essential to assess the impact and effectiveness of environmental education strategies and inform future improvements [61].

In conclusion, the existing environmental education programs in Aceh Province have been effective in raising awareness and fostering knowledge regarding sustainability and conservation practices. Educators, students, and community members generally demonstrate positive attitudes toward environmental education. However, challenges such as limited resources, inadequate training, curriculum constraints, and cultural barriers need to be addressed. By implementing the recommended strategies, the impact of environmental education in Aceh Province can be enhanced, leading to a more sustainable and environmentally conscious society.

5.1. Recommendations and Implications

Based on the findings and discussions, several practical recommendations can be proposed to enhance sustainability and conservation practices through environmental education in Aceh Province. Firstly, it is crucial to strengthen the integration of environmental education across the curriculum at various educational levels, ensuring that sustainability concepts are incorporated into multiple subjects and learning activities [55]. This interdisciplinary approach can foster a holistic understanding of environmental issues and encourage sustainable behaviors among students. Secondly, promoting hands-on learning experiences and outdoor activities should be prioritized. This can be achieved through collaborations with local environmental organizations, field trips to natural sites, and the development of interactive educational materials that engage students in practical applications of sustainability principles [62]. Such experiential learning opportunities have been found to deepen students' connection with the environment and enhance their environmental stewardship.

The research findings have significant policy implications for policymakers and stakeholders in Aceh Province. It is essential to prioritize integrating environmental education into formal education policies and curricula, ensuring it

receives adequate support and resources [63]. Policymakers should collaborate with educational institutions, NGOs, and community members to develop comprehensive environmental education strategies that align with local needs and context. Furthermore, policymakers and stakeholders should consider the importance of capacity-building initiatives for educators. Providing teachers with professional development opportunities, training programs, and resources can enhance their knowledge and pedagogical skills in delivering effective environmental education [64]. This investment in educators will contribute to the long-term sustainability of environmental education programs.

5.2. Even though this study provides valuable insights

There are potential areas for additional research and future directions. First, longitudinal studies could be done to see how environmental education affects students' knowledge, attitudes, and actions over time. The sustainability results and the persistence of environmentally friendly practices over time would be better understood in this way. Secondly, investigating the role of community engagement and involvement in environmental education programs would be beneficial. Exploring the collaborative efforts between schools, local communities, and relevant stakeholders can shed light on effective strategies for fostering community ownership and support for sustainability initiatives. Lastly, exploring innovative technologies and digital platforms in environmental education can be an exciting avenue for future research. Assessing the effectiveness of online resources, educational apps, or virtual reality experiences in enhancing students' environmental literacy and engagement can improve environmental education methodologies.

6. Conclusion

In summary, this research has provided valuable insights into promoting sustainability and conservation practices through environmental education in Aceh Province. The findings indicate that environmental education is crucial in enhancing participants' knowledge, attitudes, and behaviors related to sustainability and conservation. The high information levels, uplifting outlooks, and harmless to the ecosystem ways of behaving seen among the members show the viability of ecological training programs in encouraging natural proficiency and advancing manageable practices. The meaning of this examination lies in its commitment to the headway of manageability and preservation endeavors in Aceh Territory. By highlighting the positive impact of environmental education, this study provides evidence for the importance of integrating environmental education into educational policies and practices. The findings emphasize the need for ongoing support and resources to sustain and expand environmental education initiatives in the region. Moreover, the research underscores the role of educators, policymakers, and stakeholders in promoting and implementing effective environmental education programs that address local environmental challenges.

Closing Remarks and Final Thoughts on the Research

In conclusion, this research on promoting sustainability and conservation practices through environmental education in Aceh Province provides valuable insights and recommendations for stakeholders involved in environmental education initiatives. The study demonstrates that environmental education improves knowledge, attitudes, and actions related to conservation and sustainability. The practical proposals can direct the events and execution of future natural training programs in the Aceh Area. Policymakers and stakeholders can contribute to cultivating a more sustainable and environmentally conscious society by prioritizing environmental education. Acknowledging that environmental education is an ongoing and evolving process is essential. Further examination, joint effort, and constant assessment are essential to guarantee the drawn-out adequacy and effect of natural schooling programs in the Aceh Region. We can work toward a more resilient and ecologically responsible Aceh Province and beyond future by cultivating a culture of environmental awareness and sustainability.

Compliance with ethical standards

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Disclosure of Conflict of interest

The authors have no conflicts of interest to declare.

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