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Ecology-Based School Principal Leadership Model to Improve the Quality of Education

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ABSTRACT

Purpose-Ecologically oriented leadership models are becoming increasingly important for fostering environmental awareness, integrating sustainability values into the curriculum, and building a school culture that values its ecosystem. This study aims to analyze the strategy, implementation, and impact of ecology-based principal leadership in building a sustainable school culture at SMA Negeri 6 Yogyakarta.

Methodology-The approach employed was qualitative, utilizing a case study design that involved four key informants through in-depth interviews, non-participatory observations, and documentation studies. The data were analyzed using Miles and Huberman's model, which involves the stages of data reduction, data presentation, and data conclusion, by triangulating sources and methods to maintain credibility.

Findings-The results of the study demonstrate that ecological leadership is implemented through an environmentally cultured vision and policies, the integration of ecological issues into the project-based curriculum, and the active participation of school residents in the Muda Wijaya Green School Community (MWGSC) program. Key supporting factors include the principal's commitment, collaboration among school residents, and external support, while constraints include limited resources and the adaptation of new students.

Contribution-This model has been shown to have a positive impact on learning motivation, environmental care character, and the improvement of holistic education quality, while also highlighting the need for ecological leadership training and support for sustainable education policies in schools.

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INTRODUCTION

Improving the quality of education is inseparable from the strategic role of school principals as leaders (Estiyani & Hasanah, 2022; Jean Dwi Ritia Sari & Giatman, 2021), who also plays a role as a motivator, *Educator* (Ali, 2019; Asyari et al., 2024; Estiani & Hasanah, 2022) as well as becoming a strategic center (Nhlapo, 2020) in providing services and managing the school ecosystem to create a conducive and sustainable learning environment (Lestari et al., 2024; Setyorini & Asmonah, 2023). Therefore, there needs to be a leadership model approach for school principals who have concern and concrete steps, and can adapt to every change, emphasize awareness and responsibility for the reciprocal relationship between humans and their environment (Ghufron, 2020) and position themselves on the environment in an ecosystem manner, in this case known as ecological leadership (Azmi et al., 2018a; Muntaha, 2021; Suherni et al., 2023).

In implementing the ecological leadership model in schools, several challenges remain in carrying out the process in a sustainable manner, including low awareness among school residents of the importance of the environment and sustainability of life, as well as limited resources to support the sustainability of the program (Azmi et al., 2018). The obstacles experienced by school principals in implementing ecology-based education are influenced by several factors, including limited resources such as teaching aids, books, and facilities according to standards, in addition to a dense curriculum and lack of training that make teachers less optimal in implementing ecology-based learning (Blair Niblett & Tara Flynn, 2024). In addition, the application of ecology-based education in schools often overlooks the philosophical dimension (Karrow, 2024). This occurs due to the limited knowledge and skills of principals and teachers, which in turn impacts students' exploratory and curious nature (Bernett et al., 2023).

Then, more broadly, problems related to the environment are the process of urbanization that turns cities into centers of social interaction, so that it affects air and water quality, reduces green open space, and has a negative impact on the quality of human life (McPhearson et al., 2021; Pineda-Pinto et al., 2021). In addition, according to Thoreau (1996), the problem of the dynamics of modernity actually traps humans in various demands that are actually not important in life. Therefore, the issue of environmental sustainability is not only the responsibility of environmental sector policymakers, but must also be integrated into the education system as an effort to build ecological awareness from an early age (Hamit et al., 2025; Murti et al., 2023).

Thus, policymakers can contribute to realizing progressive ecology-based education by paying special attention to curriculum ideology and the conditions of educators in policy-making. The results of the study (Priyatna, 2017; Sulistyaningrum et al., 2023) stated that the cultivation of character and ecological values has an impact on student behavior so that they become religious, honest, respectful individuals, have independence/independent attitudes, love peace, and care for the social environment, so that the application of an ecology-based school principal leadership model is a strategic step in overcoming environmental problems that continue to develop dynamically (Ardoin et al., 2020; Miftachul et al., ed.).

Data from the Ministry of Environment and Forestry of the Republic of Indonesia indicate that IKLH experienced fluctuations from 2011 to 2021, with a decrease, and has not yet reached its target, despite an increase. The decline is influenced by community activities, economic growth, mortality and birth rates, political policies, transportation, and energy consumption, all of which affect environmental quality (Fakher, 2019; Wijethunga et al., 2023; Kondolele & Mustari, 2023).

The environmental quality index on the island of Java exhibited a significant downward trend between 2011 and 2014**,** with the index decreasing from 51.54 to 48.7**.** This decline indicates a decline in environmental quality, mainly due to increasing population density, rapid urbanization, overexploitation of natural resources, and limited effectiveness of environmental management policies during the period.

However, from 2015 to 2021**,** the trend gradually improved, with the IKLH rising from 56.18 to 63.61**.** These improvements coincide with the implementation of various environmental initiatives, including the Adiwiyata green school program, enhanced waste management**,** water conservation efforts**,** and reforestation projects in major cities on the island of Java. Despite this progress, the annual IKLH value generally remains

below the national target, suggesting that the implemented programs have not achieved optimal and sustainable results.

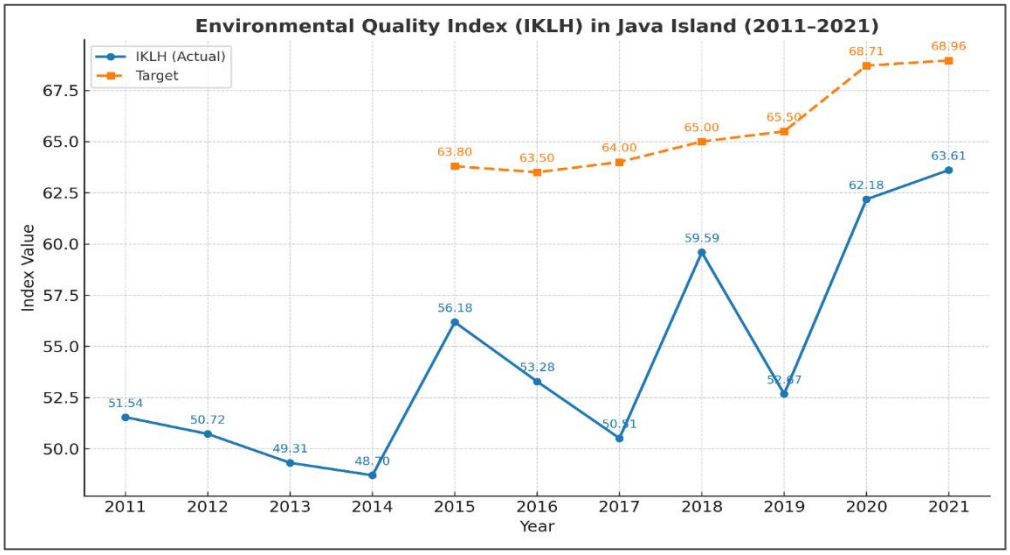

Figure 1. Environmental Quality Index in Java Island in 2011-2021 (Bubun Kondolele & Mustari, 2023)

Overall, this fluctuating pattern of IKLH reflects the ongoing challenge of balancing economic growth with environmental sustainability. This highlights that although environmental awareness has increased, consistent and integrated leadership efforts are still needed to achieve long-term ecological stability on the island of Java. Thus, a study is needed that can identify the root of the problem regarding environmental quality and how solutions can be applied in the educational environment as a sustainable effort.

Several studies have demonstrated the positive contributions of applying ecological leadership models. The results of the study (Simatupang et al., 2023) demonstrate that the application of ecology-based leadership encompasses not only academic aspects but also the development of students' character through an awareness of environmental care. A holistic approach is one of the key factors in the success of school principal leadership (Ariyani & Suyatno, 2020; Syarifudin, 2022). Collaboration is also necessary to support environmental education programs, as it represents a strategic and innovative step in achieving a superior environment, society, and education (Glackin & Greer, 2021; Kahyaoğlu et al., 2021; Lucas, 1972).

Furthermore, the study's results (Agustini et al., 2025) indicate that ecology-based schools and outdoor learning, particularly through outdoor-based discovery learning, can enhance critical thinking skills and positively impact students' learning abilities and goals. Subsequent research (Çakirlar-Altuntaş & Levent Turan, 2025) found that the application of documentary-based augmented reality in environmental education is more effective than direct instruction methods supported by question-and-answer techniques. Next, the research conducted by Glenn (2000) is based on case studies in several schools in Texas, North Carolina, Wisconsin, Minnesota, Kentucky, and Florida that utilize the environment to encourage students in learning activities, giving meaning and new life to the students' school experience. The study was strengthened by the results of a study (Ardoin et al., 2020), which found that ecology-based schools have a positive impact on students' academic performance compared to conventional educational methods. In addition, research conducted by Glackin & Greer (2021) highlights that policies related to ecology-based education have shifted in their discourse regarding global competition, thereby ignoring education for environmental and sustainable development.

Based on this context, this study aims to analyze the strategies, constraints, and impact of the ecology-based principal leadership model in improving the quality of education. Additionally, this study aims to identify best *practices* that can be replicated in the development of sustainable schools in Indonesia. In particular, this study aims to investigate how school principals' strategies for implementing an ecology-based

leadership model, the factors that support and hinder its implementation in schools, and the resulting impact on the quality of education and the development of a sustainable school culture. Thus, the results of this research are expected to make a real contribution to strengthening the ecological leadership paradigm in the national education system and supporting the achievement of the Sustainable Development Goals (SDGs).

METHODOLOGY

Research Design

This study uses a qualitative method with a case study approach (Pade-Khene, 2018). Case studies are understood as research strategies that seek to obtain comprehensive information about a subject through various data collection procedures (Charli et al., 2022). This approach was chosen because the research focuses on an in-depth exploration of the phenomenon of ecology-based principal leadership in a real-world school environment. The case study approach enables researchers to gain a comprehensive understanding of the dynamics, strategies, and constraints faced by schools.

This design is suitable for answering research questions that emphasize the implementation of ecological leadership strategies, identifying supporting factors and obstacles, and understanding their impact on the quality of education (Ummah, 2019). With its naturalistic and contextual nature, case studies provide researchers with a space to capture social realities, utilizing various sources and data collection techniques, such as in-depth interviews and observations (Charli et al., 2022; Ummah, 2019).

Participants

In this study, the researcher involved several informants who have a strategic role in the implementation of ecology-based school programs. The informants consist of the head of curriculum, the head of student affairs, the head of facilities and infrastructure, and the head of the extracurricular Wijaya Green School Community (MWGSC). The selection of informants was conducted through *purposive sampling*, taking into account the direct involvement of respondents in the planning, implementation, and evaluation of ecological leadership programs in schools. This approach aims to obtain comprehensive and in-depth information on the leadership practices of ecology-based school principals in improving the quality of education.

The school where the research is located is SMA Negeri 6 Yogyakarta, which offers an extracurricular program based on environmental education, specifically the Muda Wijaya Green School Community (MWGSC), serving as an environmental driving community under the school's coordination. This school was chosen because it has an urban context with a large number of students, approximately 866, organized into 24 study groups, and has achieved an A accreditation. Based on these qualifications, SMAN 6 Yogyakarta shows a strong quality of school management and commitment to continuous education. In addition, MWGSC has been known to be active in developing environmentally friendly programs that are integrated into the curriculum and extracurricular activities such as the acquisition of the general champion of the Adiwiyata school and is currently preparing for an *Asian-level* green school competition (Warta, n.d. 2025), so that it becomes a relevant representation to explore the leadership practices of ecology-based school principals in depth. Thus, the context of this school supports the research objective of understanding the strategies, challenges, and impacts of ecological leadership on improving the quality of education.

To provide a clearer picture of the characteristics of the informants, the following is presented a demographic table that includes the position, work experience, length of office, and educational background of each informant:

Table 1. The Informants of the Research

Initial Respondents	Informant Position
R1	Deputy Principal of Curriculum
R2	Deputy Principal for Student Affairs
R3	Deputy Principal for Facilities and Infrastructure
R4	The head of Muda Wijaya Green School

The table above indicates that all informants possess adequate professional experience and hold strategic positions relevant to the research context. Their diversity of positions and educational backgrounds strengthens the validity of the data obtained and provides diverse perspectives on the implementation of ecological leadership in schools.

Data Collection

The data collection method in this study employs systematic in-depth interviews and observations to gain a contextual understanding of the implementation of ecology-based principal leadership. The interview process was conducted face-to-face in the school environment for four primary informants: the head of curriculum, the head of student affairs, the head of facilities and infrastructure, and the head of the Wijaya Green School Community (MWGSC). Each informant was interviewed for two to three sessions with an average duration of 45–60 minutes per session. The interview is conducted in a semi-structured manner using guidelines that contain several open-ended questions.

The researcher then observed various activities in schools related to environmentally friendly programs. Observations include environmental project-based learning activities (P5), waste management practices, school park maintenance, and environmental program coordination meetings**.** The aspects observed include the principal's role in directing activities, the participation of school residents, forms of collaboration between fields, and the atmosphere of the learning environment. All field data was recorded in detail through field notes**,** recorded using digital recording devices**,** and transcribed verbatim after each interview and observation session.

Instruments

The primary instrument in this study is an in-depth interview guide compiled based on the research focus on the principal's ecology-based leadership model aimed at improving the quality of education. The interview guide contains several open-ended questions that direct the informant to explain the experiences, strategies, constraints, and impacts of ecological leadership in schools. These questions were developed based on the study of ecological leadership theory, educational management, and the results of previous research.

Data Analysis

The data analysis in this study was conducted manually, following the model proposed by Miles and Huberman (1994), which comprises three main stages: data reduction, data presentation, and conclusion. In the reduction stage, the researcher selects and groups data from interviews, observations, and documentation based on central themes related to leadership strategies, implementation challenges, and impacts on the quality of education. The reduced data are presented in the form of thematic narratives and intervariable relationship matrices to facilitate the interpretation of the findings patterns. Conclusions are drawn after the data reaches a saturation point**,** which is when no new information emerges from the additional data collection process. To ensure the credibility and validity of the findings**,** this study applied triangulation of sources, methods, and researchers by comparing the results of various informants, data collection techniques, and interpretive confirmation with peers. This procedure ensures that the results of the analysis reflect a deep, objective, and contextual understanding of the leadership practices of ecology-based school principals in improving the quality of education.

FINDINGS

The research findings were obtained through in-depth interviews with the head of student affairs, curriculum, facilities, and infrastructure, as well as the chairman of the Muda Wijaya Green School Community (MWGSC). This research aims to explore in depth how the ecology-based leadership model of school principals is implemented in the school environment, to improve the quality of education. The data collected were then analyzed using a thematic approach, with an emphasis on policy aspects, implementation

strategies, school community participation, and the resulting impact. The presentation of the results was focused on six main themes that form an environmentally friendly school ecosystem.

Ecological Vision and Values in Principal Leadership

The principal plays a central role in formulating the vision of "The realization of intelligent, superior, and environmentally cultured people" as the basis of all school policies. The vision is implemented through decision-making and sustainable principles. R2 stated this as the Deputy Head of Student Affairs.

> *"The vision of this school changed from environmentally friendly to environmentally cultured. That means that all programs must instill ecological values,"* (R2).

Then the statement was strengthened by the deputy head of student affairs R3, who stated that,

> "*Every school policy is directed to support the Adiwiyata program and maintain environmental sustainability,*" (R3).

Based on the findings from the interviews, school principals strive to instill ecological awareness in the entire school community through exemplary behavior, consistent policies, and budgetary support for environmental programs.

Integration of Ecological Values in Curriculum and Learning

Ecological values are systematically integrated into the curriculum and learning activities, primarily through the *Pancasila* Student Profile (P5) program. Teachers are encouraged to relate subject matter to environmental issues and use project-based learning methods that emphasize collaboration and empathy for the natural world. Based on the statement of the deputy head of student affairs R2 and the head of MWGSC R4, the environmental culture program at SMAN 6 Yogyakarta is integrated through the national curriculum of the P5 project and Environmental Education activities (PRLH)

> *"We are implementing Zero Waste and the theme of renewable energy in the P5 project,"* (R2).
> *"PRLH activities every Friday are a form of direct learning about environmentally friendly behavior,"* (R4).

This approach helps students understand the importance of sustainability through real-life experiences. Learning not only transfers knowledge but also instills an attitude of care, responsibility, and ecological leadership from an early age.

Participation of MWGSC School and Community Citizens

The principal's ecological leadership efforts, as demonstrated by fostering participation among school residents through the *Muda Wijaya Green School Community (MWGSC)* forum, involve teachers, students, and education staff in various environmental programs, including waste management, greening, and water conservation. This was expressed by the chairman of *Muda Wijaya Green School Community (MWGSC)* and the deputy head of curriculum.

> "*The MWGSC program runs because of the support of the principal who provides space for students to take initiative,*" (R4).
> "*We involve students in every activity so that they learn responsibility,*" (R1).

Through the support and participation of school residents, environmental education programs in schools can run optimally, thanks to the involvement of each party, which is a crucial aspect for the effectiveness and efficiency of these activities. In this case, collaboration is an effort to strengthen a sense of belonging to environmental programs and make schools a vibrant and dynamic ecological learning community.

School Environmental Facilities and Management Support

Facilities and infrastructure management are important aspects of implementing ecological leadership. The principal ensures the availability of facilities such as green parks, *greenhouses*, waste banks, and rainwater management systems used in learning activities.

> "*We have green gardens, infiltration wells, and greenhouses that are used for learning,*" *(R4).*" *The school also uses rainwater to water plants and perform ablution. All of this is part of ecological management,*" *(R1).*

These facilities not only enhance the environment but also serve as a learning resource that instills ecological values practically and contextually. In implementing the Adiwiyata program and promoting environmental sustainability, support is required from school residents, as well as from school management, facilities, and infrastructure, to facilitate every activity related to environmental sustainability.

Supporting Factors and Obstacles to Implementation

A strong school culture, teacher-student collaboration, and policy support support the implementation of ecological leadership. However, challenges arise due to limited funds, time, and the need for habituation among new students.

"*The obstacle is habituation, because students keep changing, so they have to be re-campaigned,*" (R1).

"*Environmental programs often rely on external funding,*" (R3).

The principal seeks to overcome these obstacles by strengthening motivation, fostering cross-field collaboration, and adopting an award-based approach to maintain the participation of school residents.

The Impact of Ecological Leadership on Education Quality

Ecological leadership has a significant impact on improving the quality of education, both in academic aspects and in the development of student character. The school's green and well-organized environment creates a comfortable and productive learning atmosphere.

"*The school culture is more disciplined and participatory after there is an environmental program,*" (R2).

"*The school becomes more comfortable without the need for air conditioning, and students are more concerned about cleanliness,*" (R4).

Environmental activities have been proven to strengthen students' social awareness, sense of responsibility, and collaborative skills, while improving the school's image as a sustainability-oriented educational institution.

DISCUSSION

Implementation of Ecological Leadership in Schools

The implementation of ecology-based principles shows that the leadership model makes a positive contribution (Charli et al., 2022). The vision of an environmental culture has been successfully implemented into strategic policies and programs that have a direct impact on school activities (Cebrián et al., 2020). This vision is realized through environmental conservation programs, such as maintaining cleanliness, organizing school parks, and engaging all school residents in environmentally focused activities. So that this has a positive impact on the school environment's comfort. In addition, school principals play a crucial role in organizing and mobilizing the participation of teachers, students, and educational personnel to create schools with an environmental culture (Cebri, 2020).

The implementation aligns with transformational leadership theory, where a leader serves as an agent of change, inspiring and motivating members of the organization to achieve a shared vision (Zhao et al., 2024). Principals encourage behavior changes in school citizens to be ecologically aware, in line with transformational leadership characteristics that include motivational inspiration and intellectual stimulation (de Klerk & Smith, 2021).

In addition, the practices found also reflect ecological leadership (Sulich et al., 2021), which views schools as part of an educational ecosystem that must be managed sustainably (Ahmed et al., 2024). School principals act as a liaison between school policies and real environmental actions (Maclaren et al., 2020), ensuring that every strategic program, such as the Environmentally Friendly Program (PRLH), tree planting, and waste bank management, is not just a ceremonial activity, but part of a school culture that is continuously instilled (Pihkala, 2020).

These findings confirm that transformationally implemented ecological leadership can shape sustainable school cultures. A clear vision, policy support, and the involvement of all school stakeholders are key to success in building a conducive and education-oriented learning environment (Beller et al., 2020).

Integration of Ecological Education in Curriculum and Learning

The study's findings reveal that schools incorporate ecology education into their curricula and learning processes through various strategies (Reed et al., 2021). First, environmental issues are addressed in the Learning Implementation Plan (RPP) (Sunassee et al., 2021), particularly in the subjects of Biology and Sociology, by emphasizing the connection between academic content and environmental sustainability practices. Second, strengthening ecology-based learning is carried out through the Pancasila Student Profile Strengthening Project (P5), where students participate in contextual activities that promote ecological awareness and behavior.

This integration aligns with the concept of Education for Sustainable Development (ESD) recommended by UNESCO (2017), which emphasizes the importance of integrating knowledge, skills, and sustainability values within each subject (Sunassee et al., 2021). Through this approach, students not only gain knowledge about the environment but also internalize the values of environmental conservation through applicable learning activities (Edwards, 2021).

In addition, the implementation of an ecology-based curriculum reflects the principles of contextual learning (Contextual Teaching and Learning) (Dormann & Mello, 2023), where students learn through real-life experiences relevant to their lives. In the context of this study, activities such as waste management practices, school ecosystem observations, and small-scale research on the quality of the surrounding environment serve as learning experiences that develop cognitive abilities and foster an environmental care ethic.

Thus, the integration of ecological education into the curriculum and learning not only supports the achievement of academic competence but also fosters a profile of graduates with an ecological character (Liu et al., 2024). These findings reinforce the theory that schools that integrate environmental issues into the curriculum will be more effective in building a sustainable ecological culture, while supporting the achievement of holistic educational quality.

School Ecological Programs and Activities

The study's results reveal that the implementation of ecological leadership in schools is also achieved through structured ecological programs and activities (Larson et al., 2023). Additionally, extracurricular activities can enable students to be the driving force behind environmental initiatives (Bozzoli et al., 2025). Based on the results of the research activities carried out by students and the adiwiyata team, participatory management in the school context is shown, where the principal facilitates the active involvement of all stakeholders, including teachers, students, education staff, and external partners.

Participatory management in education fosters a sense of ownership among school residents towards the programs carried out, thereby ensuring the sustainability of these activities. The findings of this study also support the view (Islam et al., 2023) that extracurricular activities and community-based programs play an important role in shaping the character and culture of schools. Furthermore, these routine and structured ecological activities provide students with experiential learning, which aligns with the theory of experiential learning.

Through active involvement in environmental activities, students not only acquire practical knowledge but also internalize the values of environmental concern (Kahyaoğlu et al., 2021). This is evident from the emergence of student initiatives in conducting simple research related to waste management and other environmental innovations, which are indicators of the formation of environmental care characters in schools. Thus, school ecological programs and activities are not only ceremonial but have become an integral part of the school culture, consistent with the principles of continuous education (Bintang Kejora et al., 2025). This

success is inseparable from the principal's role as a coordinator and facilitator of change, who can connect policy with real-world practices in the field.

Supporting and Inhibiting Implementation Factors

The results of the study indicate that the implementation of ecological leadership in schools is influenced by various factors that support and inhibit it. Supporting factors include the commitment of school principals, the participation of school staff and students, and the support of external stakeholders, such as environmental agencies and non-governmental organizations. The availability of this collaborative network allows schools to overcome internal resource limitations and expand the impact of environmental programs.

Meanwhile, the inhibiting factors that have emerged include limited funds, a lack of supporting infrastructure, and habituation for new students who are unfamiliar with the school's ecological culture. This constraint aligns with the findings (Ardoin et al., 2020; Miftachul et al., ed.) that state the successful implementation of environmental programs in schools is greatly influenced by the availability of financial and non-financial resources, as well as the internalization of school culture.

Referring to the input-process-output model in educational management (Barnett, 2011), limitations in input aspects, such as funding and infrastructure, can be overcome through collaborative management process strategies. In the context of this study, school principals employ participation-based management to engage teachers, students, and external partners in support of the sustainability of ecological programs (Simatupang et al., 2023). This approach asserts that effective ecological leadership necessitates adaptive management, which involves managing internal challenges while maximizing the potential for external support.

Thus, the identified supporting and inhibiting factors suggest that the successful implementation of ecological leadership depends not only on the individual leadership of the principal but also on the collaborative ecosystem that supports the ecological culture in schools.

The Impact of Ecological Leadership on the Quality of Education

The implementation of ecological leadership has been proven to have a positive impact on the quality of education in schools. The study's findings indicate that creating a visually appealing and comfortable learning environment enhances students' motivation to learn and fosters a more effective learning process. In addition, student involvement in environmental research activities and simple innovations, such as waste management and composting, reflects the development of 21st-century competencies that include creativity, collaboration, and problem-solving.

This positive impact aligns with the theory of a conducive learning environment (Ridha Ulfitrah Hamzah et al., 2024), which emphasizes that the physical and psychosocial conditions of the school environment significantly contribute to learning outcomes. In addition, the study's results also support the view that ecology-based education can increase critical awareness and promote sustainable behavior in students (Yunansah & Herlambang, 2017), thereby contributing to the achievement of holistic education quality.

Furthermore, the formation of a character of caring for the environment through direct experience and active involvement in ecological programs shows that the leadership of school principals not only has an impact on academic achievement, but also on strengthening the character and culture of the school (Azmi et al., 2018b; Muntaha, 2021). Thus, the implementation of ecological leadership has a dual contribution: improving the quality of education academically and non-academically, and creating schools as sustainable educational ecosystems.

CONCLUSION

This research confirms that ecology-based leadership among school principals significantly contributes to improving the quality of education by integrating an environmental vision into school policies, curriculum, and culture. Based on field findings, ecological leadership fosters increased learning motivation and ecological awareness among students, strengthens their character in environmental care, and creates a collaborative,

orderly, and sustainable learning environment. School principals play a crucial role in implementing environmentally friendly policies, promoting the participation of school residents, and optimizing green facilities as practical learning tools. These findings enrich the educational leadership literature by emphasizing the importance of the ecological dimension in transformational leadership in schools, especially in the context of continuing education in Indonesia.

Nonetheless, this study has limitations in its qualitative design and the scope of a single case, which have the potential to lead to subjective bias and limitations in generalization. Further studies are suggested using cross-school quantitative and comparative approaches to measure the long-term impact of ecological leadership on the quality of education, as well as developing principal training models and instruments to assess students' ecological character. Practically, policy support, funding, and continuous mentoring programs are necessary for school principals to integrate ecological leadership indicators into performance evaluation and national education quality planning.

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