



Managing Local-Wisdom-Based Environmental Character Education: A Multi-Site Study of *Tatanen di Bale Atikan* in Indonesia

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Abstract:

School-based environmental programs can provide meaningful contexts for character education, but their sustainability depends on how they are institutionally managed. This study examined the management of the *Tatanen di Bale Atikan* (TdBA) program in strengthening students' character at SMPN Satu Atap Terpadu Bungursari and SMPN 1 Campaka, Purwakarta Regency, Indonesia. The study employed a qualitative multi-site case study design. Data were collected through semi-structured interviews with principals, program coordinators, teachers, and other involved school personnel, supplemented by direct observations and document analysis. Data were analyzed through condensation, display, conclusion drawing, verification, and cross-site comparison. The findings revealed that both schools integrated TdBA into their institutional direction, curriculum, and environmental activities, although they differed in planning emphasis and instructional organization. Program implementation through gardening, composting, waste management, plant maintenance, and group responsibilities supported the development of discipline, responsibility, independence, cooperation, productivity, and environmental care. Principal leadership, teacher collaboration, student participation, and stakeholder involvement supported implementation. However, uneven teacher understanding, limited land and facilities, dependence on a small number of active teachers, inconsistent documentation, and the absence of standardized impact indicators constrained program sustainability. Evaluation remained focused primarily on activity completion rather than measurable behavioural and institutional outcomes.

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Introduction (مقدمة)

Education is increasingly expected to prepare students not only for academic achievement but also for responsible participation in society and the sustainable management of their environment. This expectation has become particularly important amid ecological degradation, climate-related risks, and changing patterns of natural-resource consumption. Education for

Sustainable Development therefore emphasizes the integration of environmental knowledge, ethical awareness, collaborative competence, and practical action into students' learning experiences rather than treating sustainability as an additional subject disconnected from school life (Ardoin et al., 2020; UNESCO, 2020; Wals & Benavot, 2017).

Within this broader educational mandate, character education provides a foundation for developing responsibility, discipline, independence, cooperation, perseverance, and environmental awareness. Character cannot be developed effectively through the transmission of moral concepts alone; it requires consistent modelling, opportunities for practice, reflection on experience, and reinforcement through the school's social and institutional culture. Consequently, effective character education should connect moral understanding and emotional commitment with observable action in students' everyday lives (Berkowitz & Bier, 2004; Lickona, 1991; Nucci et al., 2014).

In Indonesia, this educational responsibility is supported by a regulatory framework that defines national education as a process of developing students' intellectual, spiritual, moral, and social capacities. Law No. 20 of 2003 on the National Education System establishes character formation as a fundamental educational objective, while Presidential Regulation No. 87 of 2017 places character strengthening within classroom learning, school culture, and community participation. These principles were operationalized further through Ministry of Education and Culture Regulation No. 20 of 2018, which requires formal educational institutions to implement character education systematically and collaboratively (Ministry of Education and Culture of the Republic of Indonesia, 2018; Republic of Indonesia, 2003, 2017).

A contextual implementation of these principles can be found in Purwakarta Regency through the *Tatanen di Bale Atikan* (TdBA) program, literally referring to cultivation or farming within an educational institution. The program was formalized through Purwakarta Regent Regulation No. 103 of 2021 as a locally grounded curriculum that combines ecological education, agricultural activities, food self-reliance, and character formation. TdBA is not intended merely as a school-greening or gardening activity; it positions the school environment as a learning space in which students identify ecological problems, undertake practical action, and develop discipline, responsibility, cooperation, and sensitivity toward nature through the *Pancaniti* learning process (Fauziah et al., 2024; Purwakarta Regency Government, 2021; Regent of Purwakarta, 2021).

The educational rationale for TdBA is consistent with research on school gardens and garden-based learning. Activities such as preparing land, sowing seeds, planting, watering, composting, maintaining crops, recording plant growth, and using harvested products provide students with repeated and observable responsibilities. Research indicates that well-designed school-garden programs can support academic learning, social interaction, environmental awareness, physical and psychological well-being, and students' sense of ownership, although the outcomes depend heavily on program continuity and curricular integration (Blair, 2009; Ohly et al., 2016; Williams & Dixon, 2013).

However, the educational value of a school-based environmental program does not arise automatically from the availability of land, plants, or activity schedules. Its sustainability depends on how school leaders translate policy into institutional goals, allocate human and material resources, distribute responsibilities, coordinate stakeholders, integrate activities into the curriculum, and evaluate program outcomes. Educational management therefore provides an essential framework for connecting program intentions with implementation, while leadership for learning ensures that organizational arrangements remain focused on meaningful student development (Bush, 2020; Hallinger, 2011; Holst, 2023).

Previous research has demonstrated that environmental education can strengthen students'

environmental-care character when it is integrated into learning activities and supported by habitual practices. Research specifically addressing TdBA has also described its ecological orientation, its use of permaculture and *Pancaniti*, and its contribution to experiential learning. Nevertheless, much of the existing literature focuses on pedagogical implementation, teacher activities, or student outcomes—frequently at the elementary-school level—rather than examining how the program is institutionally managed and sustained across schools with different organizational conditions (Fauziah et al., 2024; Gulhan, 2023; Rezkita & Wardani, 2018).

The preliminary study conducted at SMPN Satu Atap Terpadu Bungursari and SMPN 1 Campaka revealed that both schools had incorporated TdBA into school development and environmental learning. Students participated in land preparation, planting, watering, fertilizing, composting, crop maintenance, and environmental-cleanliness activities. However, the two schools demonstrated different approaches to planning, task distribution, curriculum integration, resource utilization, and documentation. Several implementation issues were also identified, including uneven teacher understanding, limited land and facilities, dependence on a small number of active teachers, difficulties in incorporating TdBA into learning plans, and the absence of standardized indicators for evaluating changes in students' character.

These empirical conditions indicate a research gap between the recognized educational potential of environmental programs and the limited understanding of the managerial processes required to institutionalize them. Existing studies have not sufficiently explained how planning, organizing, implementation, and evaluation interact in TdBA management, particularly through a comparative examination of junior secondary schools. The novelty of the present study therefore lies in positioning TdBA as an integrated school-management system and comparing its implementation at two schools in terms of managerial functions, contextual constraints, locally developed solutions, and its contribution to the formation of environmental character (Ardoin et al., 2020; Fauziah et al., 2024; Holst, 2023).

Accordingly, this study aims to analyze the management of the TdBA program at SMPN Satu Atap Terpadu Bungursari and SMPN 1 Campaka in Purwakarta Regency. The analysis focuses on program planning, organizational arrangements, implementation, evaluation and control, implementation barriers, and the strategies developed by the two schools to sustain the program. This investigation is important because it can provide an empirically grounded management framework for transforming a locally based environmental initiative into a sustainable component of curriculum, school culture, and character education. Academically, the study connects educational-management theory with locally grounded environmental education; practically, it can inform school leaders and policymakers in designing more structured, participatory, measurable, and sustainable character-education programs (Bush, 2020; UNESCO, 2020).



Method (منهج)

Research Design

This study employed a qualitative approach with a comparative multi-site case study design. The design was selected to obtain a contextual and in-depth understanding of how the *Tatanen di Bale Atikan* (TdBA) program was managed and implemented in two junior secondary schools with different organizational and environmental conditions. Each school was initially examined as an individual case, after which findings from the two sites were compared to identify shared management patterns, contextual differences, implementation barriers, and locally developed solutions. The investigation focused on six interrelated aspects: program planning,

organizing, implementation, evaluation and control, implementation barriers, and program-strengthening strategies (Creswell & Poth, 2018; Khan, 2022; Yin, 2018).

Research Sites and Participants

The study was conducted at SMPN Satu Atap Terpadu Bungursari and SMPN 1 Campaka in Purwakarta Regency, West Java, Indonesia. The two schools were purposively selected because both implemented TdBA as a school-based environmental and character-education program, integrated its activities into learning and school culture, and represented different institutional and resource conditions. A total of ten participants were involved in the study. At each school, the participants consisted of one principal, two teachers, and two students, resulting in five participants per site. The principals and teachers were selected purposively based on their positions, responsibilities, experience, and direct involvement in the planning, implementation, and evaluation of TdBA. The students were selected because they had participated directly in TdBA activities and could provide information about how the program was experienced in practice. This composition enabled the study to examine the program from managerial, instructional, and participant perspectives.

Data Collection

Data were collected through semi-structured interviews, direct observation, and document analysis. Ten semi-structured interviews were conducted, with each participant interviewed once for approximately 30 minutes. The interviews explored program planning, organizational arrangements, curriculum integration, implementation practices, student participation, evaluation procedures, implementation barriers, and strategies used to sustain the TdBA program. The semi-structured format allowed the researchers to address predetermined management themes while also exploring information that emerged from the participants' experiences.

Direct observation was conducted once at each research site. The observations focused on TdBA-related activities, including school-garden management, planting and plant maintenance, environmental-cleanliness practices, task distribution, teacher facilitation, student participation, resource utilization, and the manifestation of character values such as responsibility, discipline, independence, cooperation, and environmental care. Documentary evidence included school work plans, TdBA program documents, organizational structures, learning plans, activity schedules, monitoring records, photographs, and other relevant institutional documents. Data sufficiency was determined by the recurrence of key themes across participants and the two sites, together with the convergence of evidence obtained through interviews, observations, and document analysis. Data collection was considered sufficient when the principal management themes could be consistently supported by more than one source of evidence.

Data Analysis

Data were analyzed iteratively using the interactive model of Miles et al. (2014), comprising data condensation, data display, and conclusion drawing and verification. The analytical process was conducted in four stages. First, interview transcripts, observation notes, and documentary materials were organized according to research site and data source. Second, the researchers conducted initial coding by assigning relevant data segments to six predetermined categories derived from the research questions: planning, organizing, implementation, evaluation and control, barriers, and solutions. During this process, additional codes were developed inductively to capture recurring themes emerging from the data, including curriculum integration, leadership, teacher participation, student involvement, resource availability, stakeholder collaboration, environmental activities, and character formation.

Third, a within-site analysis was conducted separately for each school. Coded evidence from interviews, observations, and documents was compared within each site and summarized in narrative descriptions and analytical matrices. This stage was used to identify internal patterns between management practices, TdBA activities, and character-development processes. Fourth, cross-site analysis was conducted using the same analytical categories for both schools. A comparative matrix was developed to identify similarities, differences, recurring patterns, and contextual explanations between SMPN Satu Atap Terpadu Bungursari and SMPN 1 Campaka. For example, differences in institutional planning, curriculum integration, task distribution, and evaluation practices were examined against the organizational and resource conditions of each school. Emerging conclusions were then verified by returning to the interview transcripts, observation notes, and documentary evidence to ensure that interpretations were supported by multiple sources rather than isolated statements.

Trustworthiness and Research Ethics

The trustworthiness of the study was strengthened through source and technique triangulation. Source triangulation involved comparing information obtained from principals, coordinators, teachers, and other participating school personnel. Technique triangulation was conducted by comparing interview findings with direct observations and institutional documents. Evidence from the two schools was also compared to determine whether identified patterns represented common program-management processes or conditions specific to one site. Detailed descriptions of the school contexts, program activities, managerial practices, and implementation constraints were retained to support the transferability of the findings. Analytical consistency was maintained by organizing the data according to the same categories at both sites and repeatedly verifying emerging interpretations against the original evidence (Nowell et al., 2017; Shenton, 2004).

Formal permission was obtained from the relevant school authorities before data collection. Participants were informed about the purpose of the study, the voluntary nature of participation, the intended use of the data, and their right to withdraw from the study. Identifying personal information was excluded from the report, and the collected data were used exclusively for research purposes. Observations were arranged to avoid disrupting teaching, learning, and TdBA activities, while reporting emphasized institutional practices rather than evaluating the performance of individual participants.

The credibility of the findings was strengthened through source triangulation across principals, teachers, and students, technique triangulation across interviews, observations, and documents, and cross-site verification between the two schools. Interpretations were retained only when they were supported by convergent or contextually explainable evidence from multiple sources.

Result (نتائج)

Planning the *Tatanen di Bale Atikan* Program

The findings showed that both schools planned the *Tatanen di Bale Atikan* (TdBA) program as an instrument for strengthening students' character and ecological awareness. TdBA was not positioned merely as an additional gardening activity but was connected to the schools' educational direction. Its objectives were incorporated into school development priorities, environmental programs, and learning activities, thereby providing an institutional foundation for implementation.

At SMPN Satu Atap Terpadu Bungursari, TdBA planning was aligned with the school's

vision, mission, objectives, and annual work plan. The school designed the garden as a living laboratory where students could study plants, waste management, environmental cleanliness, and food production through direct experience. This orientation enabled environmental activities to support both curricular learning and character habituation.

At SMPN 1 Campaka, planning was more explicitly connected to instructional design. Teachers analyzed learning outcomes, formulated learning objectives, organized activity sequences, designed *Pancaniti*-based learning experiences, and determined appropriate forms of assessment. Environmental activities were therefore planned as part of the teaching process rather than conducted separately from classroom learning.

Despite these common objectives, the two schools demonstrated different planning emphases. SMPN Satu Atap Terpadu Bungursari placed greater emphasis on integrating TdBA into institutional programs and using the garden as a school-wide learning environment. SMPN 1 Campaka emphasized the translation of TdBA principles into learning objectives, activity sequences, and assessment practices. These approaches were complementary but differed in their level of curricular and organizational detail.

Planning limitations were also identified at both sites. Activity schedules were not always sufficiently detailed, success indicators had not been consistently operationalized, and resource requirements were not systematically mapped. Documentation practices also varied among teachers and program teams. Consequently, the schools had established a clear general direction for TdBA, but they still required more measurable targets, scheduled activities, resource-allocation plans, and standardized documentation.

Table 1. Cross-site synthesis of TdBA planning

Planning dimension	SMPN Satu Atap Terpadu Bungursari	SMPN 1 Campaka	Cross-site finding
Institutional alignment	Integrated with the school's vision, mission, objectives, and work plan	Integrated with the school's environmental orientation and learning program	Both schools positioned TdBA within institutional development
Curriculum integration	School garden developed as a living laboratory	Learning outcomes, objectives, activities, and assessment were explicitly designed	Integration occurred at different levels of curricular detail
Learning orientation	Experiential and school-wide environmental learning	<i>Pancaniti</i> -based instructional activities	Both emphasized learning through direct environmental experience
Main planning weakness	Activity schedules and program documentation	Measurable indicators and consistent instructional documentation	Planning had direction but lacked standardized operational instruments
Required improvement	Structured annual and semester program plans	Common learning and assessment framework	Measurable targets, schedules, resources, and documentation

Organizing Roles and Responsibilities

Both schools organized TdBA through teams or working groups involving school leaders, teachers, students, and supporting stakeholders. The principals assumed overall responsibility for the program, while teachers performed operational and instructional roles. This organizational arrangement demonstrated that TdBA required coordination across different school functions rather than being assigned exclusively to one subject teacher.

At SMPN Satu Atap Terpadu Bungursari, the organizational structure involved the

principal, program coordinator, treasurer, teachers, homeroom teachers, school operator, and school committee. Responsibilities were allocated according to program needs and the characteristics of the available land. Teachers guided students in preparing the land, planting, fertilizing, maintaining plants, and managing environmental activities.

At SMPN 1 Campaka, teachers were assigned responsibilities based on their competence, experience, and interest. The division of work included activity planning, land and facility management, student assistance, learning integration, and program documentation. This competence-based approach enabled teachers with relevant experience to assume roles that corresponded with their abilities.

Students were organized into groups and given practical responsibilities at both schools. Their roles included maintaining designated planting areas, watering plants, applying fertilizer, monitoring plant development, managing organic waste, and maintaining environmental cleanliness. School committees and parents provided supplementary support, although the intensity of their involvement differed according to activity needs and school conditions.

The organizational process remained vulnerable to dependence on a small number of active teachers. Some teachers demonstrated stronger initiative, competence, and commitment than others, causing several responsibilities to become concentrated among particular individuals. Although the team structures formally distributed duties, actual implementation was not always evenly shared. This condition created a continuity risk when highly active personnel were unavailable or experienced changes in responsibility.

Table 2. Cross-site synthesis of TdBA organization

Organizational dimension	SMPN Satu Atas SMPN 1 Campaka	Cross-site finding	
Leadership	Principal as the main person responsible	Principal directing the school program	Principal leadership was central at both sites
Team composition	Coordinator, treasurer, teachers, homeroom teachers, operator, and committee	Teachers assigned according to competence, experience, and interest	Both used collaborative working structures
Teacher roles	Program facilitators and supervisors of student activities	Learning designers, activity facilitators, and documentation personnel	Teachers combined managerial and instructional responsibilities
Student roles	Land preparation, planting, fertilizing, and maintenance	Group-based watering, fertilizing, maintenance, and recording	Students were positioned as active program participants
Main weakness	Duties concentrated among active personnel	Uneven teacher involvement	Program continuity remained dependent on particular individuals

Program Implementation and Character Development

TdBA was implemented through direct environmental and agricultural activities at both schools. The activities included land preparation, seedling, planting, watering, fertilizing, plant maintenance, organic-waste management, compost production, environmental-cleanliness routines, harvesting, and the use of harvested products. These activities transformed the school environment into a practical learning space.

At SMPN Satu Atas SMPN 1 Campaka, implementation was supported by collaboration, teacher development, mentoring, and opportunities to create learning innovations. The school encouraged teachers to use the garden and surrounding environment as instructional resources.

Students participated in productive activities, including converting organic waste into fertilizer and using harvested plants for educational or practical purposes.

At SMPN 1 Campaka, implementation was more systematically organized through student groups. Each group received particular responsibilities for watering, fertilizing, maintaining, and recording plant growth. Environmental activities were connected to lessons and structured through *Pancaniti*-based stages, allowing students to observe conditions, understand problems, perform practical activities, communicate their experiences, and produce relevant outcomes.

The repeated activities developed observable patterns of responsibility, discipline, independence, cooperation, and environmental care. Responsibility emerged when students maintained assigned plants and completed group duties. Discipline was demonstrated through scheduled maintenance, while independence developed as students learned to undertake routine tasks with reduced teacher direction. Cooperation was strengthened through group activities, and environmental care became visible in waste management, cleanliness, and plant maintenance.

Implementation at both sites demonstrated that character development occurred through practice and habituation rather than verbal instruction alone. Nevertheless, the strength of the process depended on teacher consistency, student participation, available facilities, and the connection between environmental activities and learning objectives. When activities were systematically supervised and repeated, character values became embedded in students' routines; when supervision or coordination weakened, student participation became less consistent.

Table 3. TdBA implementation and observed character formation

Program activity	Learning experience	Character dimension developed	Cross-site manifestation
Preparing land and planting	Completing sequential practical tasks	Discipline and perseverance	Students followed work stages and maintained participation
Watering and maintaining plants	Caring for living organisms over time	Responsibility	Students assumed responsibility for designated plants or areas
Group-based garden management	Sharing duties and solving practical problems	Cooperation	Students coordinated tasks and assisted group members
Composting and organic-waste management	Converting waste into useful material	Environmental care and creativity	Students recognized waste as a manageable resource
Recording plant growth	Observing, documenting, and reporting changes	Accuracy and independence	Students monitored plant development with teacher guidance
Harvesting and using products	Connecting effort with tangible outcomes	Independence and productivity	Students experienced the results of sustained environmental work

Evaluation and Program Control

Both schools evaluated TdBA through monitoring, observation of student participation, teacher reflection, and assessment of the school environment. Evaluation was primarily conducted during or after program activities. School leaders and teachers used these processes to determine whether planned activities had been implemented and to identify practical problems requiring follow-up.

At SMPN Satu Atap Terpadu Bungursari, monitoring focused on the continuity of garden activities, teacher and student involvement, the condition of plants, environmental cleanliness, and the completion of assigned responsibilities. Reflection among school personnel was used to discuss implementation difficulties and determine immediate corrective actions.

At SMPN 1 Campaka, evaluation also examined student-group participation, the completion of maintenance duties, plant development, and the integration of activities into learning. Records of plant growth provided evidence of student participation, although their use was not yet standardized across activities and teachers. Evaluation was consequently influenced by the initiative of individual teachers.

The evaluation systems at both schools were predominantly operational. They were useful for determining whether activities had been conducted but were less effective in measuring program outcomes and longer-term effects. Instruments for assessing changes in responsibility, discipline, cooperation, independence, and environmental awareness had not been consistently developed or applied.

The findings therefore indicated the need for an evaluation system covering inputs, processes, outputs, and impacts. Input indicators should address human resources, facilities, funding, and land availability. Process indicators should measure participation, activity consistency, curriculum integration, and coordination. Output and impact indicators should examine environmental improvements, student products, behavioural changes, and the development of an enduring ecological school culture.

Table 4. Existing and required components of TdBA evaluation

Evaluation component	Existing practice	Identified limitation	Required development
Activity monitoring	Observation of gardening and environmental activities	Focused mainly on activity completion	Scheduled monitoring using common indicators
Student participation	Teacher observation of involvement and task completion	Assessment depended on individual teachers	Standardized participation and character rubrics
Environmental condition	Observation of plants, gardens, waste, and cleanliness	Limited longitudinal documentation	Periodic visual and written environmental records
Teacher reflection	Informal discussion of problems and improvements	Reflection was not always documented	Structured reflective meetings and follow-up records
Program outcomes	Recognition of visible behavioural and environmental changes	No uniform process-output-impact measures	Integrated evaluation instruments and measurable targets

Implementation Barriers and Strengthening Strategies

The first barrier was uneven teacher understanding of TdBA and its relationship with curriculum and character education. Some teachers could connect environmental activities with subject-specific learning, whereas others perceived TdBA mainly as a gardening or cleanliness program. This difference produced variations in instructional design, student guidance, and documentation quality.

The second barrier involved limited land, facilities, and supporting resources. Space restrictions were particularly significant when schools attempted to expand planting activities. Both schools responded by optimizing available areas, constructing planting beds, using containers or other adaptable planting media, and reusing discarded materials to support

environmental activities.

The third barrier was dependence on a limited number of active teachers. Teachers with greater environmental knowledge or stronger commitment frequently assumed multiple responsibilities. This arrangement enabled the program to operate but weakened its institutional sustainability because knowledge, coordination, and initiative were not distributed evenly across the school community.

To address these problems, the schools conducted internal training, encouraged independent learning, facilitated mentoring, and promoted the exchange of practical experiences among teachers. These strategies were intended to strengthen common understanding and assist teachers in integrating TdBA into lesson planning. Reflection and collaborative problem-solving also allowed teachers to adapt activities to the available resources.

The schools additionally sought support from parents, school committees, education authorities, and other stakeholders. External collaboration contributed ideas, materials, facilities, and policy support. However, the most important strengthening strategy was the development of collective ownership within the schools. TdBA became more sustainable when responsibility was shared across school leaders, teachers, students, parents, and support personnel rather than concentrated in a single coordinator or teacher.

Table 5. TdBA barriers and strengthening strategies

Barrier	Manifestation	Existing response	Further strengthening required
Uneven teacher understanding	Different interpretations and implementation quality	Internal training and experience sharing	Continuous professional development and common guidelines
Difficulty integrating TdBA into lessons	Activities sometimes separated from learning objectives	Collaborative lesson planning	Subject-specific modules and assessment examples
Limited land and facilities	Restricted planting areas and supporting equipment	Raised beds, containers, and reused materials	Context-sensitive garden design and resource mapping
Dependence on active teachers	Responsibilities concentrated among particular individuals	Team formation and coordination	Role rotation, succession planning, and broader participation
Inconsistent documentation	Uneven records of activities and outcomes	Photographs, reports, and growth records	Standard templates and centralized program archives
Limited external support	Program resources depended mainly on the school	Collaboration with parents and committees	Sustained partnerships with government and community institutions



Discussion (مناقشة)

The findings demonstrate that TdBA was most effectively implemented when it became part of the school's institutional direction rather than remaining an isolated environmental activity. Alignment with the school vision, work plan, curriculum, and learning objectives helped translate a regional policy into routines that could be understood and implemented by school personnel. This pattern corresponds with the whole-institution approach to sustainability, which emphasizes coherence among curriculum, organizational practices, physical environments, and institutional culture. It also confirms that educational management connects policy objectives

with coordinated organizational action (Bush, 2020; Holst, 2023; UNESCO, 2020).

The organizational findings indicate that principal leadership and distributed responsibility were both necessary for program continuity. Principals provided direction and legitimacy, whereas coordinators, teachers, students, committees, and parents operationalized the program. However, formal team structures did not automatically produce balanced participation because actual responsibilities remained concentrated among several active teachers. This finding suggests that collaborative structures must be accompanied by competence development, clear authority, role rotation, and accountability. Leadership for learning becomes effective when organizational arrangements enable multiple actors to contribute while maintaining a shared educational purpose (Bush, 2020; Hallinger, 2011; Holst, 2023).

The implementation findings show that school gardens functioned as experiential learning environments that connected conceptual knowledge with practical action. Preparing land, planting, composting, monitoring growth, and harvesting allowed students to observe ecological processes and experience the consequences of sustained care. The differences between the schools demonstrate that garden-based learning can be organized through either school-wide environmental programs or more explicit instructional sequences. In both cases, its value depended on curricular integration, structured responsibilities, teacher facilitation, and continuity rather than on the physical existence of a garden alone (Blair, 2009; Gulhan, 2023; Williams & Dixon, 2013).

The emergence of responsibility, discipline, independence, cooperation, and environmental care supports the view that character develops through the interaction of knowledge, commitment, action, and habituation. Students did not merely receive explanations about environmental responsibility; they were required to care for plants, complete scheduled tasks, coordinate group work, and manage waste. Repeated action created opportunities for moral concepts to become observable behaviour. These findings extend previous Indonesian research showing that environmental education can support caring character by demonstrating the managerial conditions through which environmental activities are transformed into sustained school practices (Berkowitz & Bier, 2004; Lickona, 1991; Rezkita & Wardani, 2018).

Evaluation emerged as the least developed management function. Existing monitoring could identify whether activities had taken place, but it could not consistently demonstrate how implementation affected student character or ecological school culture. The lack of standardized indicators, records, and impact measures restricted organizational learning and evidence-based improvement. This finding is significant because environmental programs are more likely to produce lasting outcomes when they combine localized action, stakeholder collaboration, and intentional measurement. Evaluation should therefore move from activity reporting toward a framework that measures inputs, implementation quality, immediate outputs, behavioural development, and institutional impact (Ardoin et al., 2020; Holst, 2023; Ohly et al., 2016).

The study consequently proposes an integrated management model in which TdBA sustainability depends on five connected elements: strategic alignment, distributed organization, experiential implementation, multidimensional evaluation, and adaptive capacity. Strategic alignment embeds the program in school policy and curriculum; distributed organization broadens ownership; experiential implementation translates environmental values into repeated action; multidimensional evaluation produces evidence of progress; and adaptive capacity enables schools to respond to limitations in teacher competence, land, facilities, and resources. The academic contribution of this study is its repositioning of TdBA from a collection of gardening activities into a locally grounded school-management model that explains how environmental learning and character education can be institutionalized through coordinated management functions. This managerial perspective extends previous TdBA research, which has

primarily emphasized program concepts and pedagogical implementation, by identifying the organizational mechanisms required for continuity across different school contexts (Fauziah et al., 2024; Hallinger, 2011; Holst, 2023).



Conclusion (خاتمة)

This study concludes that the effectiveness and sustainability of *Tatanen di Bale Atikan* depend on its integration into the school-management system rather than merely on the implementation of gardening activities. At both schools, TdBA was connected to institutional objectives, curriculum, environmental learning, and character habituation through planning, organizational structures, practical implementation, and monitoring. Direct participation in planting, plant maintenance, composting, waste management, and group responsibilities enabled students to develop discipline, responsibility, independence, cooperation, productivity, and environmental care. However, the two schools differed in their management emphases: SMPN Satu Atap Terpadu Bungursari placed greater emphasis on institutional integration and the school garden as a living laboratory, whereas SMPN 1 Campaka demonstrated more explicit integration with instructional objectives and *Pancaniti*-based learning. Across the two sites, sustainable implementation required the interconnection of strategic alignment, distributed organization, experiential learning, multidimensional evaluation, and adaptive capacity.

The study is limited to two junior secondary schools within one regency, and its findings are therefore context-bound rather than statistically generalizable. The absence of standardized longitudinal data also prevented the study from measuring the durability of students' character development and the long-term ecological impact of the program. Future studies should involve more diverse schools, examine implementation over longer periods, and develop validated instruments for assessing behavioural and institutional outcomes. Schools are recommended to establish measurable program indicators, standardized documentation, role-rotation and succession mechanisms, subject-specific learning modules, and evaluation systems covering inputs, processes, outputs, and impacts. Continuous teacher development and partnerships with parents, school committees, government agencies, and community organizations should also be strengthened so that TdBA becomes a collectively owned and sustainable component of school culture.

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