

Managerial Leadership in the Home as Informal Environmental Education: Evidence From Household Sustainable Practices in Southern Philippines

Al-fahad E. Jadjuli, Rosema G. Lukman, Jocelyn J. Muñez
Mindanao State University-Sulu, HBSAT, Jolo, Sulu, Philippines

Joe-An G. Cuaresma
Commission on Higher Education IX, Philippines

Abdel-Ajim M. Salasain
Mindanao State University-Sulu, Philippines

ABSTRACT

Sustainable household management remains an underexplored area of managerial leadership and informal environmental education despite its role in shaping ecological behavior and resource use within households. This study examined how household managerial leadership promotes sustainable practices in a resource-constrained community. Anchored in Albert Bandura's Social Learning Theory, Hidden Curriculum Theory, and David Kolb's Experiential Learning Theory, the study used a descriptive-correlational design involving 179 purposively sampled household respondents in Jolo, Sulu, Philippines. Statistical analyses included descriptive statistics, Spearman's rho, Chi-square, and Kruskal–Wallis tests. Findings revealed consistently high levels of sustainable household practices (overall mean = 4.74). Environmental awareness, family participation, and access constraints showed a moderate positive relationship with sustainability behaviors ($p = .594$, $p < .001$). Training was significantly associated with sustainability practices, while educational attainment showed a non-linear relationship. The study reframes the household as a site of informal environmental education and culturally grounded sustainability learning.

Keywords: environment education, experiential learning, global south education, household managerial leadership, informed pedagogy, sustainability education

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INTRODUCTION

The urgency of sustainable development continues to grow as climate change, resource depletion, and biodiversity loss intensify. Addressing these challenges requires sustainable practices across all levels of society, from global policy to individual behavior (Baker, 2015). Within this framework, the household is a critical micro-unit of environmental impact, as everyday decisions shape resource use, waste generation, and ecological footprints (OECD, 2023). Beyond consumption, households also serve as primary spaces for socialization and value formation, making them essential sites for promoting sustainable development (Munro, 2023b). Thus, strengthening sustainable household management practices is vital to achieving broader environmental goals (Shahbaz et al., 2022).

Leadership is traditionally associated with organizational and corporate settings, where it involves guiding and influencing groups toward strategic goals (Helmold, 2023). This study extends the concept of managerial leadership to the domestic sphere, framing household management as an active, leadership-driven process. In this context, managerial leadership refers to the deliberate coordination of household resources, routines, and behaviors to advance sustainability (Seese & Dióssi, 2024). The household manager, often a parent or guardian, serves as a key agent in modeling environmental stewardship and embedding sustainable practices into daily life (Munro, 2023a). This perspective positions the home as a foundational site for environmental education and the formation of sustainable behavior (Kumari et al., 2026).

Existing literature emphasizes the role of parents and caregivers in Education for Sustainable Development (ESD). As primary socializing agents, they shape children's environmental awareness, values, and practices (Hassan & Khalil, 2024). The home is often the earliest setting where green habits are cultivated, particularly through everyday practices such as waste segregation, energy conservation, water management, and responsible consumption (Faridy et al., 2024; Thapa & Lyttle, 2024). Through these lived experiences, sustainability becomes not only a concept to be taught but a practice to be internalized, strengthening both environmental understanding and motivation (Papa et al., 2025; Wang et al., 2025).

The present study is situated in Jolo, Sulu, a resource-constrained island municipality in the southern Philippines characterized by varying levels of access to water, electricity, waste management services, and other environmental infrastructures. Households in the locality frequently navigate practical resource limitations while meeting daily living needs, making sustainable household management particularly relevant. Examining sustainability practices within this context provides insight into how environmental stewardship may emerge under conditions of resource scarcity, adaptive resource management, and community resilience. The context of Jolo, Sulu, therefore offers a valuable setting for understanding how sustainability is practiced and learned beyond highly urbanized and resource-abundant environments.

However, leadership research in sustainability has largely focused on organizations, businesses, and institutions, particularly through studies of green leadership and environmental management (Huda, 2025; Schäpers et al., 2024). Limited attention has been given to leadership dynamics within households, especially as a formal pedagogical tool for environmental education (Ladkin, 2020). This gap is significant because the household is where sustainable behaviors are first introduced, practiced, and normalized before extending into wider social contexts (Munro, 2023c). Without examining domestic managerial leadership, the role of household decision-making in supporting environmental education and grassroots sustainability remains underexplored (Satterwhite, 2023).

To address this gap, the present study conceptualizes and investigates managerial leadership within the home. It examines how household managers are associated with sustainable practices and how these practices may be linked to environmental education outcomes. By integrating leadership theory, environmental education, and household management, the study proposes a framework for sustainable household leadership. Its contribution lies in moving sustainability leadership beyond the organizational paradigm and positioning the household as a vital site for cultivating environmental literacy, stewardship, and long-term behavior change.

Although situated within household and community contexts, the study has important implications for higher education. Understanding how sustainability practices are learned, modeled, and reinforced within households may inform sustainability education, teacher preparation, community extension programs, and experiential learning initiatives within colleges and universities (Mosneaga et al., 2026). The findings therefore contribute to ongoing discussions regarding Education for Sustainable Development (ESD) and the role of higher education institutions in promoting contextually grounded sustainability learning.

This study, therefore, examines sustainable household management practices as a foundation for environmental education. Specifically, it seeks to answer the following questions:

1. What is the level of sustainable household management practices in terms of waste management, water conservation, energy conservation, food and household consumption, sanitation, and resource-conscious financial management?
2. What factors are associated with these practices in terms of environmental awareness, family support and participation, and access or practical constraints?
3. Is there a significant relationship between influencing factors and sustainable household management practices?
4. Is there a significant association between respondents' profiles—sex, household income, main source of information, and training—and their level of sustainable household practices?
5. Is there a significant difference in sustainable household practices among the highest educational attainment groups of respondents?

LITERATURE REVIEW

Home Leadership: The Domestic Sphere as a Micro-Organization

Conceptualizing the home as a micro-organization requires a transition from viewing domestic labor as mere routine to identifying it as Managerial Leadership. Recent scholarship characterizes the heads of households as "chief executives" of a domestic enterprise, responsible for assigning duties based on the interests and abilities of family members and managing resources such as equipment and materials (Udgata, 2021). This leadership style is increasingly recognized as integrated, simultaneously maintaining a high orientation toward tasks (household operations) and people (family well-being).

Furthermore, the domestic sphere is evolving toward relational leadership styles. Rather than traditional top-down "agentic" management, modern home leadership often emphasizes collaborative strategies that engage family members according to their capabilities (Hoobler & Dowdeswell, 2023). Within this framework, household managers act as "project managers" who facilitate social development and optimize the family budget, balancing necessities with long-term sustainable goals (Chandranathan et al., 2024). This leadership is also heavily gendered; recent literature underscores that women often lead as the primary educators and managers in the home, effectively balancing "humility, excitement, and tactful competence" to maintain a well-ordered family life (Ma'rifah et al., 2023).

Household managerial leadership refers to the deliberate planning, organization, coordination, and monitoring of household resources, routines, and behaviors to achieve desired family and sustainability outcomes. Consistent with contemporary leadership literature, leadership is not restricted to formal organizations but may also operate within domestic settings where household managers influence family practices, allocate resources, establish norms, and model environmentally responsible behaviors (Chandranathan et al., 2024). In sustainability-oriented households, managerial leadership functions as a mechanism through which environmental values are translated into daily routines involving waste management, resource conservation, responsible consumption, and collective family participation (Rubenstein et al., 2026). This conceptualization extends traditional leadership theory into the domestic sphere by recognizing households as micro-organizations where sustainability goals are pursued through everyday managerial decision-making and behavioral influence (Huda, 2025).

Sustainable Practices: Deliberate Managerial Choices in SHM

Sustainable Household Management is no longer seen as a series of isolated "chores" but as a set of deliberate managerial choices that align with organizational goals such as resource conservation and the waste hierarchy (Tan & Yeoh, 2025). Managers in the home exercise leadership by choosing to "refuse, reduce, and reuse," effectively mobilizing informal pedagogical styles—ranging from explicit instruction to didactic modeling—to close circularity loops (Tan & Yeoh, 2025).

Effective SHM requires what is termed "circular literacy," which involves high-level managerial skills in planning meals within financial limits, managing waste, and selecting resources that minimize environmental impact (Erjavšek & Kostanjevec, 2025; Tan & Yeoh, 2025). Research indicates that these sustainable practices are most successful when the household leader acts as a sustainability leader, characterized by system thinking and a holistic perspective on complex household interactions (Barreiro-Gen et al., 2023). For instance, energy-saving home improvements often result from complex marital power dynamics and domestic negotiations, in which the leadership of a more educated partner can shift a household toward more sustainable energy transitions (Bartiaux, 2022).

Environmental Learning: The Home as a Laboratory and the Hidden Curriculum

The home serves as a primary laboratory for informal environmental education, where ecological values are transmitted through a "hidden curriculum" of daily operations. This intergenerational learning occurs as parents model stewardship behaviors like recycling and resource conservation (Hassan & Khalil, 2024). Children do not merely observe; they are active participants whose "lived experiences" and "critical agency" are shaped by the relational orientation of their household (Ravn, 2024).

Recent studies highlight the effectiveness of home study programs and "eco-parenting" initiatives that use daily routines—such as adjusting refrigerator settings or managing plastic consumption—as practical learning tools (Delmas et al., 2024; Kalyanasundaram et al., 2024). These activities foster the "personalization" of global crises, in which children learn ecological responsibility through social-issue-based conversations and direct involvement in household reduction actions (Kalyanasundaram et al., 2024). This socialization process begins as early as age 12, as children become aware of housing costs and resource constraints, providing a critical window for household leaders to impart environmental literacy (Gawrys & Skobba, 2024).

Research Gap: Moving Beyond the Technical Lens

While household sustainability is frequently analyzed through sociological (e.g., gender roles) or technical (e.g., energy efficiency ratings) lenses, there is a distinct lack of research viewing it through the specific lens of Managerial Leadership. Current research on sufficiency often suffers from a "structure-agency gap," failing to account for the specific roles of household actors as strategic managers (Wallnoefer et al., 2024). Most studies on "leadership and sustainability" remain focused on corporate or digital supply chains, leaving the domestic leadership-sustainability nexus largely under-explored (Toft et al., 2022). There is a critical need for research that directly correlates specific managerial leadership styles (integrated vs. relational) with the effectiveness of informal environmental education within the family unit.

THEORETICAL FRAMEWORK

This study is anchored on the premise that sustainability is not only formally taught through instruction but is also socially constructed through managerial practices, organizational culture, and everyday environmental interactions. The framework positions managerial leadership as a pedagogical force capable of shaping ecological consciousness through behavioral modeling, implicit value transmission, and experiential engagement within the household environment.

The study integrates Social Learning Theory, Hidden Curriculum Theory, and Experiential Learning Theory as complementary perspectives explaining how sustainable household management functions as an informal environmental learning system. Social Learning Theory explains how household members acquire sustainability behaviors through observation and imitation of household leaders who model conservation practices. Hidden Curriculum Theory extends this perspective by suggesting that environmental values are transmitted not only through explicit instruction but also through everyday household routines, norms, and organizational practices. Experiential Learning Theory further explains how repeated participation in household sustainability activities enables individuals to transform experience into environmental understanding and long-term behavioral commitment. Together, these theories suggest that sustainable household management serves as a continuous process of behavioral modeling, implicit value transmission, and experiential reinforcement that collectively shapes environmental literacy and pro-environmental behavior.

The study also resonates with Freirean perspectives on critical pedagogy, which emphasize learning through lived experience, reflection, and engagement with real-world social conditions. From this perspective, sustainability learning extends beyond formal instruction and emerges through everyday practices that enable individuals and communities to critically engage with environmental challenges affecting their lives. In resource-constrained contexts, household sustainability practices may therefore be understood not only as conservation behaviors but also as forms of practical knowledge and community-based learning that promote environmental awareness and adaptive action.

Grounded in Bandura's Social Learning Theory, the framework emphasizes behavioral modeling, where a "trickle-down effect" occurs as leaders' voluntary green behaviors establish norms that others are likely to observe and imitate (Mukhtar et al., 2025; Xiao et al., 2024). Within the household context, sustainability-oriented behaviors demonstrated by household managers may serve as models for other family members, fostering environmental awareness and encouraging the adoption of conservation-oriented practices. This eco-centric leadership may be associated with greater environmental sensitivity by building an environmental epistemology at both the individual and group levels (Pichlak, 2024).

Complementing Social Learning Theory is the concept of the Hidden Curriculum, which posits that environmental values are transmitted through unofficial lessons embedded within daily routines, social interactions, and organizational culture (Grădinariu & Vechiu, 2025). Research suggests that these implicit messages—such as resource-use habits, waste management routines, and household norms—may exert a stronger influence on behavior than formal instruction alone (Cotton et al., 2023; Grădinariu & Vechiu, 2025). However, if everyday practices remain inconsistent with sustainability goals, the hidden curriculum may inadvertently reinforce unsustainable behaviors (Brown, 2024).

Finally, the framework incorporates Kolb's Experiential Learning Theory, which asserts that environmental understanding is best developed through active participation rather than passive instruction (Aribowo et al., 2025). Through direct engagement in activities such as waste segregation, water conservation, energy management, and responsible consumption, household members gain concrete experiences that enable reflection and the development of sustainability-oriented knowledge and behaviors (Lo, 2023; Novaes, 2025).

Collectively, these theoretical perspectives explain how sustainability practices are socially learned through observation, reinforced through everyday household norms, and internalized through repeated participation in environmental activities. The integrated framework provides the theoretical basis for examining how household managerial leadership contributes to sustainable household management practices and environmental learning outcomes within resource-constrained communities.

CONCEPTUAL FRAMEWORK

The conceptual framework illustrates the relationship between environmental awareness, family support and participation, access and practical constraints, and sustainable household management practices. Environmental awareness and family participation are treated as factors associated with sustainability-related household behaviors, including waste management, water conservation, energy conservation, sanitation, and responsible resource use. Respondent profile variables, such as age, sex, educational attainment, and household characteristics, are treated as moderating factors that may influence the strength of these relationships.

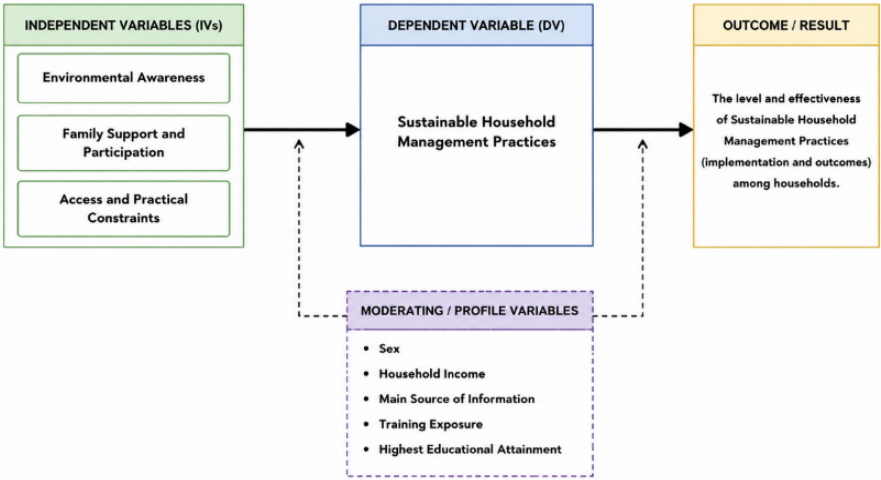
Anchored in Social Learning Theory, Hidden Curriculum Theory, and Experiential Learning Theory, the framework assumes that sustainable household practices are associated with through behavioral modeling, social participation, and experiential engagement embedded within everyday domestic management.

Furthermore, the study draws upon the Resource-Based View (RBV), originally developed by Wernerfelt (1984) and further advanced by Barney (1991), which emphasizes the strategic management and deployment of available

resources to achieve desired outcomes and sustain performance. Although RBV was initially conceptualized within organizational and strategic management contexts, it provides a useful lens for understanding how households in resource-constrained environments mobilize available resources, develop adaptive capabilities, and implement conservation-oriented practices. Within the present study, sustainable household management may be interpreted as a form of resource optimization in which households strategically manage water, energy, finances, and material resources to enhance resilience, efficiency, and sustainability. From this perspective, household sustainability practices represent adaptive responses to resource limitations, enabling families to maximize available assets while maintaining long-term household well-being.

Figure 1 presents the conceptual framework of the study, illustrating the relationship between environmental awareness, family support and participation, access and practical constraints, and sustainable household management practices, with respondent profile variables serving as moderating factors.

Figure 1. *Conceptual Paradigm Showing the Relationship Between Influencing Factors and Sustainable Household Management Practices.*



METHODOLOGY

Research Design

This study employed a primarily quantitative, descriptive-correlational research design to examine sustainable household management practices as expressions of managerial leadership in the home. The descriptive component was

used to determine the respondents' demographic profile and the level of sustainable practices in waste management, water conservation, energy conservation, food management, sanitation, and financial/resource management. The correlational component was used to determine the relationship between influencing factors—environmental awareness, family support and participation, and household constraints—and sustainable household management practices.

The descriptive-correlational design was appropriate because the study sought to examine naturally occurring patterns of sustainable household management practices and their associations with environmental awareness, family participation, and practical constraints within a real-world community setting. This design enabled the researcher to quantify existing sustainability behaviors, identify significant relationships among key variables, and generate contextually grounded insights without altering the social and environmental conditions under which these practices occur. Given the exploratory nature of household sustainability leadership in resource-constrained communities, the design provided an appropriate methodological framework for examining associations among variables while preserving ecological validity.

Participants, Sampling, and Sample Size Justification

The study involved 179 household respondents from Jolo, Sulu, Philippines. The scope was deliberately limited to households within Jolo; therefore, findings should be interpreted as locally contextualized and should not be generalized to the broader Southern Philippines without additional sampling across municipalities or provinces.

Respondents were selected using purposive sampling based on the following inclusion criteria:

1. The respondent was at least 18 years old;
2. The respondent was a household head, adult household representative, or resident with direct knowledge of household management practices;
3. The respondent had lived in the household long enough to provide reliable information on household routines; and
4. The respondent voluntarily consented to participate.

To ensure adequate statistical rigor, an a priori power analysis was conducted using GPower software prior to data collection. The analysis was performed to determine the minimum sample size required to detect statistically meaningful relationships among the study variables while minimizing the likelihood of committing a Type II error. Following Cohen's (1988) recommendations for behavioral and social science research, the analysis assumed a moderate effect size of $f^2 = 0.15$, a significance level of $\alpha = .05$, and a desired statistical power of $1 - \beta > .80$.

The power analysis indicated that the required minimum sample size for detecting moderate effects in correlational and regression-based analyses was sufficiently met by the achieved sample of 179 household respondents. Consequently, the final sample was considered statistically adequate for identifying meaningful relationships among environmental awareness, family support and participation, household constraints, and sustainable household management practices.

The inclusion of statistical power analysis strengthens the methodological robustness of the study by demonstrating that the sample size was not arbitrarily determined but empirically justified. This procedure enhances confidence in the reliability of the inferential findings and reduces the likelihood of false-negative conclusions due to insufficient statistical power.

Table 1: Demographic Profile of the Respondents (N = 179)

Profile Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	84	46.9
	Female	95	53.1
Age	20–29 years old	112	62.6
	30–39 years old	43	24.0
	40–49 years old	18	10.1
	50–60 years old	6	3.4
Civil Status	Single	91	50.8
	Married	69	38.5
	Widowed	9	5.0
	Separated	10	5.6
Highest Educational Attainment of Household Head	No formal schooling	4	2.2
	Elementary level	9	5.0
	Elementary graduate	15	8.4
	High school level	25	14.0
	High school graduate	30	16.8
	College level	80	44.7
	College graduate	14	7.8
	Postgraduate level	1	0.6
	Unspecified/invalid response	1	0.6
Number of Household Members	2 members	11	6.1
	3–4 members	39	21.8
	5–6 members	56	31.3
	7–8 members	35	19.6
	9–10 members	25	14.0
	11–12 members	13	7.3
Monthly Household Income	Below ₱10,000	122	68.2
	₱10,000–₱19,999	31	17.3
	₱20,000–₱29,999	23	12.8
	₱40,000 and above	1	0.6
	Unspecified/invalid response	2	1.1
Main Source of Income	Salaried employment	41	22.9
	Self-employment/business	48	26.8
	Farming/fishing	35	19.6
	Daily wage labor	31	17.3
	Remittance	1	0.6
	Government assistance	12	6.7
	Others	11	6.1

Profile Variable	Category	Frequency (n)	Percentage (%)
House Occupancy Status	Owned	131	73.2
	Rented	9	5.0
	Living with relatives	34	19.0
	Others	3	1.7
	Unspecified/invalid response	2	1.1
Access to Water	Piped water	82	45.8
	Deep well	28	15.6
	Hand pump	20	11.2
	Water delivery	45	25.1
	Others	4	2.2
Access to Electricity	Yes	151	84.4
	No	26	14.5
	Intermittent only	2	1.1
Average Availability of Electricity	Daily	141	78.8
	4–6 days/week	15	8.4
	1–3 days/week	5	2.8
	Rarely	15	8.4
	Unspecified/invalid response	3	1.7

Instrument Validation and Reliability

The research instrument underwent a rigorous content validation process prior to field administration. The questionnaire was evaluated by three independent experts specializing in Educational Management and Environmental Science to establish content validity, construct alignment, linguistic clarity, contextual appropriateness, and cultural sensitivity. The experts examined whether each item adequately represented the dimensions of sustainable household management and managerial leadership practices within the household context. Their recommendations focused on improving item wording, eliminating ambiguity, strengthening construct congruence, and ensuring relevance to the sociocultural realities of households in Jolo, Sulu. Revisions were incorporated accordingly before pilot administration.

A pilot test was subsequently conducted among respondents comparable to the target population but excluded from the final study sample to assess the instrument's internal consistency and psychometric stability. Reliability analysis was performed using Cronbach's alpha coefficient. The obtained reliability coefficients were interpreted using the conventional threshold wherein values equal to or greater than .70 indicate acceptable to robust internal consistency for social science research.

The reliability analysis indicated satisfactory internal consistency across all study constructs. Cronbach's alpha coefficients ranged from .841 to .855, exceeding the recommended threshold of .70 for social science research and demonstrating good reliability of the measurement scales. Detailed reliability coefficients for each construct are presented in the table below.

Table 2: *Instrument Reliability Coefficients of the Research Instrument*

Construct	Cronbach's Alpha	Interpretation
Waste Management Practices	.855	Good
Energy Conservation Practices	.841	Good
Household Sanitation and Clean Environment Practices	.843	Good
Water Conservation and Management	.847	Good
Food Management and Household Consumption	.851	Good
Financial and Resource-Conscious Household Management	.853	Good
Family Support and Participation	.841	Good
Environmental Awareness	.853	Good
Access and Practical Constraints	.849	Good

Data Collection Procedure

After preparing the questionnaire, the researcher obtained the necessary permission and informed the respondents of the study's purpose. Participation was voluntary, and confidentiality of responses was assured.

To minimize potential social desirability bias and response inflation, respondents were informed that participation was anonymous and that no personally identifiable information would be collected. Participants were advised that there were no correct or incorrect answers and were encouraged to provide honest responses based on their actual household practices and experiences. These procedures were implemented to promote authentic reporting and reduce the likelihood of socially desirable responding.

The questionnaires were administered to qualified household respondents who had sufficient knowledge of their household's daily management practices. Completed questionnaires were checked for completeness, coded, and encoded for statistical analysis. Open-ended responses were organized separately for thematic review.

Statistical Analysis

Data were analyzed using descriptive and inferential statistics. Frequency counts and percentages were used to describe respondents' demographic characteristics, while weighted means assessed levels of sustainable household management practices and influencing factors. Spearman's rho was used to determine the relationship between influencing factors and sustainable household practices. Chi-square tests and the Kruskal–Wallis test were employed to examine associations and group differences across selected demographic variables. Post hoc pairwise comparisons using the Mann–Whitney U test with Bonferroni correction were conducted following significant omnibus results. Open-ended responses were

analyzed thematically to identify recurring household sustainability challenges and support needs.

RESULTS

The Results section presents the empirical findings of the study in accordance with the research questions. First, the levels of sustainable household management practices across various domains are presented. Second, the factors associated with sustainable household management practices are examined. Third, the relationships between influencing factors and sustainable household practices are analyzed, followed by tests of association and differences across selected demographic characteristics. Collectively, these findings provide an overview of the sustainability practices, associated factors, and demographic patterns observed among households in Jolo, Sulu.

Table 3 presents the summary of sustainable household management practices across six domains, including waste management, water conservation, energy conservation, food and household consumption, sanitation, and resource-conscious financial management.

Table 3: *Summary of Sustainable Household Management Practices by Domain*

Domain	N	Grand Mean	Verbal Description
Waste Management Practices	179	4.77	Strongly Agree
Water Conservation and Management	179	4.80	Strongly Agree
Energy Conservation Practices	179	4.77	Strongly Agree
Food Management and Household Consumption	179	4.72	Strongly Agree
Household Sanitation and Clean Environment Practices	179	4.75	Strongly Agree
Financial and Resource-Conscious Household Management	179	4.66	Strongly Agree
Overall Grand Mean	179	4.74	Strongly Agree

Note. 1.00-1.80- Strongly Disagree, 1.81-2.60- Disagree, 2.61-3.40-Neutral, 3.41-4.20- Agree, 4.21-5.0- Strongly Agree

Table 3 indicates that respondents demonstrated consistently high levels of sustainable household management practices across all measured domains, as reflected in the overall grand mean of 4.74, verbally interpreted as Strongly Agree. The uniformly elevated mean scores suggest that sustainability-oriented behaviors are not isolated practices but are systematically embedded within routine household management and daily resource governance. Among the domains, Water Conservation and Management had the highest mean ($M = 4.80$), followed closely by Energy Conservation Practices and Waste Management Practices ($M =$

4.77), indicating that respondents most strongly prioritized conservation behaviors directly related to immediate household resource use and operational efficiency.

Table 4 presents the respondents' perceptions regarding the factors associated with sustainable household management practices, specifically environmental awareness, family support and participation, and access and practical constraints.

Table 4: *Summary of Factors Influencing Sustainable Household Management Practices*

Factor	N	Grand Mean	Verbal Description
Environmental Awareness	179	4.68	Strongly Agree
Family Support and Participation	179	4.67	Strongly Agree
Access and Practical Constraints	179	4.70	Strongly Agree
Overall Grand Mean	179	4.68	Strongly Agree

Note. 1.00-1.80- Strongly Disagree, 1.81-2.60- Disagree, 2.61-3.40-Neutral, 3.41-4.20- Agree, 4.21-5.0- Strongly Agree

Table 4 demonstrates that respondents perceived the identified factors as highly influential in shaping sustainable household management practices, as reflected in the overall grand mean of 4.68, verbally interpreted as Strongly Agree. The consistently elevated ratings across all factors suggest that household sustainability behaviors are influenced by an interdependent combination of cognitive, social, and structural conditions rather than by a single dominant determinant. Among the factors, Access and Practical Constraints obtained the highest mean ($M = 4.70$), indicating that respondents viewed material conditions, resource availability, and practical feasibility as the most influential drivers of sustainability-related behavior.

Table 5 presents the results of the Spearman's rho analysis examining the relationship between influencing factors and sustainable household management practices.

Table 5: *Relationship Between Factors and Sustainable Household Practices*

Variable Pair	N	Spearman's rho	p-value	Decision	Interpretation
Factors and sustainable household practices	179	.594**	< .001	Significant	Moderate positive relationship

Note. Spearman's rho was used to determine the relationship between factors and sustainable household practices. $p < .01$.

Table 5 indicates a statistically significant positive relationship between the identified influencing factors and sustainable household management practices, as reflected in the obtained Spearman's rho coefficient ($\rho = .594$, $p <$

.001). The magnitude of the coefficient suggests a moderate positive association, indicating that respondents with higher levels of environmental awareness, stronger family support and participation, and greater access to practical resources also tended to report higher levels of sustainable household management practices. This pattern implies that household sustainability behaviors are reinforced by the interaction among cognitive, social, and structural conditions rather than by isolated individual actions. The computed coefficient of determination ($p^2 = .353$) further demonstrates that approximately 35.3% of the variance in ranked sustainable household management practices was explained by the identified influencing factors, representing a substantial explanatory contribution in behavioral and social science research.

Table 6 presents the results of the chi-square tests examining the association between selected respondent profile variables and sustainable household management practices.

Table 6: *Chi-Square Test of Association Between Respondents’ Profile and Sustainable Household Practices Level*

Variable	χ^2	p-value	Approximate Cramér’s V	Practical Meaning
Sex	0.058	.810	0.018	Negligible association
Household income	0.460	.977	0.051	Negligible association
Main source of information	4.508	.608	0.159	Small association
Training	13.548	.009	0.275	Small-to-moderate association

Table 6 indicates that among the respondent profile variables examined, only training demonstrated a statistically significant association with sustainable household management practices, $\chi^2(4, N = 179) = 13.548, p = .009$, with an approximate Cramér’s V of .275, suggesting a small-to-moderate practical association. This finding implies that exposure to training-related interventions was significantly associated with variations in sustainability-oriented household behavior, potentially by strengthening practical competencies, behavioral reinforcement, and applied environmental decision-making skills. In contrast, no statistically significant associations were observed between sustainable household management practices and sex, $\chi^2(1, N = 179) = 0.058, p = .810$, household income, $\chi^2(4, N = 179) = 0.460, p = .977$, or main source of information, $\chi^2(6, N = 179) = 4.508, p = .608$. The corresponding Cramér’s V coefficients for sex (.018) and household income (.051) indicate negligible practical associations. In contrast, the coefficient for the main source of information (.159) suggests only a small association, collectively implying that household sustainability practices may not be strongly differentiated by demographic characteristics or passive exposure to environmental information alone

Table 7 presents the results of the Kruskal-Wallis test examining differences in sustainable household management practices across educational attainment groups.

Table 7: *Kruskal–Wallis Test of Difference in Sustainable Household Practices by Highest Educational Attainment Group*

Grouping Variable	Group	N	Mean Rank	Kruskal–Wallis H	df	p-value	Decision	Interpretation
Highest educational attainment	Low: Elementary Level/Graduate	28	65.11	9.416	2	.009	Significant	There is a significant difference.
	Moderate: Secondary Level/Graduate	56	100.66					
	High: College Level/graduate and postgraduate	95	91.05					
	Total	179						

Note. The Kruskal–Wallis H test was used because the grouping variable had more than two independent groups and the assumptions of parametric ANOVA were not met.

Table 7 reveals a statistically significant difference in sustainable household management practices across educational attainment groups, $H(2) = 9.416$, $p = .009$, indicating that sustainability-related behaviors varied according to respondents’ highest educational attainment. The obtained effect size ($\epsilon^2 = .053$) suggests a small-to-moderate practical effect. Examination of the mean ranks showed that respondents with moderate educational attainment obtained the highest mean rank (MR = 100.66), followed by those with high educational attainment (MR = 91.05), while respondents with low educational attainment obtained the lowest mean rank (MR = 65.11). These findings indicate variation in sustainable household management practices across educational attainment groups.

Table 8 presents the post hoc pairwise comparisons conducted to further examine differences among educational attainment groups following the significant Kruskal-Wallis test.

Table 8: *Post Hoc Pairwise Comparisons of Sustainable Household Practices by Educational Attainment Using Mann–Whitney U Test with Bonferroni Correction*

Comparison	U Value	p-value	Interpretation
Low vs Moderate	13.000	.437	Not Significant
Low vs High	16.500	.174	Not Significant
Moderate vs High	52.000	.352	Not Significant

Table 8 presents the post hoc pairwise comparisons conducted using the Mann–Whitney U test with Bonferroni correction to identify which educational

attainment groups differed significantly in sustainable household management practices following the significant Kruskal–Wallis result. To control for inflated Type I error across the three pairwise comparisons, the adjusted significance threshold = 0.05 over 3, or .0167. The results revealed no statistically significant differences between the low and moderate educational attainment groups ($U = 13.000$, $p = .437$), the low and high educational attainment groups ($U = 16.500$, $p = .174$), or the moderate and high educational attainment groups ($U = 52.000$, $p = .352$), as all obtained p -values exceeded the adjusted alpha level. These findings suggest that although the omnibus Kruskal–Wallis test detected statistically significant variation across educational attainment categories, the observed differences were not sufficiently concentrated between any specific pair of groups after controlling for multiple comparisons.

DISCUSSION

Sustainable Household Management as an Integrated System of Domestic Governance

The findings revealed consistently high levels of sustainable household management practices across all measured domains, with water conservation, energy conservation, and waste management receiving the highest ratings. This pattern is consistent with recent studies suggesting that sustainable consumption has increasingly become embedded within everyday lifestyles rather than being practiced as isolated environmental actions. Contemporary research highlights the emergence of integrated household sustainability systems in which energy, water, food, and waste management are approached as interconnected aspects of daily resource governance (Kehayova-Stoycheva et al., 2023). The prominence of water conservation and energy conservation in the present study further aligns with global evidence identifying resource-efficiency practices as among the most common forms of household sustainability behavior (Liu et al., 2024).

The prominence of water conservation and energy conservation may also reflect the adaptive normalization of conservation-oriented routines in response to resource-sensitive living conditions, wherein water and energy management become integral to maintaining household stability and minimizing resource strain. The finding that water conservation received the highest rating is also consistent with studies demonstrating that strong environmental awareness may be associated with actual conservation practices despite structural and economic constraints (Prajapati et al., 2025). In contrast, Financial and Resource-Conscious Household Management received the lowest mean rating, although it remained within the “Strongly Agree” category. This finding suggests that while respondents actively practice sustainability in financial and resource allocation decisions, these

activities may involve more complex forms of planning, prioritization, and long-term trade-off management than routine conservation behaviors.

Moreover, the relatively narrow variation across sustainability domains suggests a high degree of behavioral consistency, reflecting how household sustainability may function as a coherent lifestyle system shaped by recurring routines, household motivations, and everyday resource-management practices (Ambaum et al., 2024; Burningham & Venn, 2024). The consistency across domains further reinforces the interpretation that sustainable household management functions as an interconnected system of domestic governance rather than a fragmented collection of environmentally oriented actions.

Factors Associated with Sustainable Household Management Practices

The findings further suggest that sustainable household management practices are associated with a combination of cognitive, social, and structural factors. Access and practical constraints emerged as the highest-rated factor, followed closely by environmental awareness and family support and participation. This pattern supports contemporary perspectives that conceptualize household sustainability as a multidimensional phenomenon shaped by the interaction of awareness, social engagement, and structural opportunities (Vuong, 2024). The prominence of access and practical constraints is particularly noteworthy because it highlights the importance of resource availability and perceived behavioral control in enabling environmentally responsible actions within everyday life (Innocent et al., 2023).

The prominence of access and practical constraints further suggests that sustainable household management in resource-sensitive settings may be strongly conditioned by adaptive responses to infrastructural and economic realities, wherein conservation practices emerge as practical necessities rather than solely ideological commitments. Environmental awareness, which followed closely in importance, highlights the continuing role of ecological knowledge and sustainability consciousness in guiding environmentally responsible decision-making and reinforcing conservation-oriented routines. Likewise, the strong rating for family support and participation indicates that collaborative household engagement and shared responsibility remain important mechanisms for sustaining environmental practices within domestic settings. Collectively, these findings suggest that sustainable household management is shaped through the interaction of awareness, collective participation, and structural accessibility operating within an integrated household management system.

The significant positive relationship between influencing factors and sustainable household management practices further reinforces this interpretation. The findings may also be understood through the attitude-behavior gap framework proposed by Kollmuss and Agyeman (2002), which argues that environmental

awareness alone does not automatically translate into pro-environmental behavior. Instead, behavior emerges through the interaction of internal factors, such as values and knowledge, and external factors, such as social support and structural conditions. The present findings support this perspective by demonstrating that environmental awareness, family participation, and practical accessibility collectively contribute to sustainability-oriented household behavior.

Consistent with Social Learning Theory, sustainability practices may be reinforced when household members observe and participate in environmentally responsible routines modeled within the family. Similarly, the findings support the Hidden Curriculum perspective, wherein environmental values are transmitted implicitly through daily household routines rather than solely through explicit instruction. The strength of the observed relationship further suggests that environmental sustainability in domestic settings may be associated with the combined effects of ecological consciousness, collaborative household engagement, and practical access to resources operating within an integrated system of household governance. Nevertheless, the correlational nature of the study does not permit causal inference, and additional contextual, socioeconomic, and cultural factors not directly measured may also contribute to variations in sustainable household management practices.

Training, Experiential Learning, and Sustainability Behavior

Among the demographic variables examined, only training demonstrated a statistically significant association with sustainable household management practices. This finding is consistent with Experiential Learning Theory, which posits that meaningful learning occurs through active participation and direct experience rather than passive information acquisition. Recent studies suggest that participatory learning experiences, practical demonstrations, and community-based sustainability activities are more effective than purely theoretical instruction in strengthening environmental competencies and resource-management behaviors (Aribowo et al., 2025; Novaes, 2025). The findings therefore suggest that sustainability-related training may serve as an important mechanism for translating environmental awareness into practical action. This interpretation is further supported by contemporary capacity-building approaches emphasizing skill development and behavioral engagement as critical components of sustainability education (Atthakorn et al., 2024).

These findings further suggest that sustainable household behavior may be more effectively strengthened through experiential and capacity-building mechanisms that translate environmental awareness into actionable practices. This pattern reinforces the view that sustainability in domestic settings is not merely a function of socio-demographic characteristics but may depend more substantially

on opportunities for applied learning and adaptive behavioral engagement within resource-constrained household environments.

Educational Attainment and the Education Paradox

An important theoretical implication emerging from the study is the presence of an “education paradox” in sustainable household management. While conventional environmental literature often assumes a linear relationship between educational attainment and sustainability behavior, the present findings suggest a more complex and context-dependent pattern. Respondents with moderate educational attainment demonstrated higher-ranked sustainable household practices than those with higher educational attainment, although post hoc comparisons revealed no statistically significant pairwise differences among educational groups.

This pattern is consistent with studies suggesting that formal educational attainment is often a weak predictor of specific sustainability behaviors when compared with broader contextual and socioeconomic factors (Peterson, 2025). Research indicates that individuals with moderate educational attainment may adopt more disciplined conservation practices due to practical resource constraints and greater exposure to everyday budgeting and resource-management challenges (Kanayo & Muazu, 2022). Conversely, higher educational attainment may sometimes be accompanied by increased purchasing power and consumption flexibility, potentially offsetting some conservation-oriented behaviors despite higher environmental awareness (Prajapati et al., 2025).

Applying the Resource-Based View (RBV) (Barney, 1991; Wernerfelt, 1984), the inconsistent provision of electricity, water, and other utilities in the locality may be interpreted as contextual conditions that encourage adaptive household governance and resource optimization. From this perspective, households function as resource-managing systems that continuously mobilize available assets, develop adaptive capabilities, and implement conservation-oriented practices to maintain stability and resilience. In resource-constrained environments such as Jolo, Sulu, sustainable household management may therefore represent a strategic response to limited resource availability rather than solely an expression of environmental awareness or ideology. Under such circumstances, conservation-oriented practices become practical mechanisms for maximizing available resources, reducing vulnerability, and strengthening household resilience. This interpretation suggests that sustainability within resource-constrained communities may emerge through adaptive necessity and resource stewardship, highlighting the capacity of households to transform constraints into opportunities for sustainable living.

Implications for Higher Education, Policy, and Practice

Beyond the household context, the findings offer important implications for environmental education and higher education sustainability initiatives. The significant associations among environmental awareness, family participation, training, and sustainable practices support contemporary educational approaches emphasizing experiential learning, community engagement, and sustainability competencies. Higher education institutions may strengthen environmental literacy by incorporating household-based sustainability projects, service-learning programs, community immersion activities, and locally grounded sustainability initiatives into teaching and extension programs. Such approaches may help bridge the gap between environmental knowledge and environmental action by connecting formal instruction with real-world sustainability practices experienced within households and communities.

Implications for Environmental Education and Higher Education

The findings of the study carry significant implications for environmental education and higher education institutions, particularly for sustainability learning in resource-constrained communities. The findings suggest that sustainable household management practices may function not only as domestic routines but also as informal pedagogical processes through which environmental values, conservation behaviors, and adaptive resource management are socially learned and reinforced within everyday life. This suggests that environmental education should not be confined solely to formal classroom instruction but should also recognize households and communities as critical learning environments where sustainability practices are modeled, practiced, and internalized.

In teacher education, the findings highlight the importance of preparing future educators to integrate contextualized, experiential sustainability education into both formal and informal learning settings. Teacher education programs may benefit from incorporating community-based environmental learning, household sustainability case studies, and culturally responsive ecological practices into pre-service and in-service training. By emphasizing experiential and socially situated approaches to sustainability, teacher preparation institutions can strengthen educators' ability to connect environmental concepts to learners' lived realities, particularly in geographically and economically vulnerable communities. The findings further suggest that teachers should be trained not only as transmitters of environmental knowledge but also as facilitators of sustainability-oriented behavioral change grounded in local experiences and adaptive household practices.

The study also contributes to sustainability curriculum development by demonstrating that environmental literacy can be strengthened when sustainability concepts are connected to practical household management experiences, such as

water conservation, energy efficiency, waste reduction, sanitation, and resource-conscious consumption. Curriculum developers may therefore consider integrating applied sustainability learning tasks, reflective environmental activities, and community-centered ecological problem-solving into environmental education courses. Such approaches may help bridge the gap between theoretical environmental awareness and actual sustainability behavior by situating learning within the daily realities of students and families. The findings also support the integration of interdisciplinary sustainability education that links environmental science, social studies, economics, leadership, and community development within a unified framework of ecological responsibility.

In higher education, the findings reinforce the value of community-extension programs as mechanisms for strengthening environmental stewardship and localized sustainability practices. Colleges and universities, particularly those engaged in community outreach and extension services, may utilize the study's findings to design sustainability training programs focused on household resource management, waste segregation, conservation practices, and adaptive environmental leadership. Since training has emerged as a significant factor in sustainable household practices, higher education institutions may serve as catalysts for community-based environmental capacity-building initiatives that translate sustainability knowledge into practical action. Such extension programs may be especially relevant in underserved or resource-constrained communities where sustainability practices are closely connected to household resilience and adaptive survival strategies.

The study also strengthens the theoretical relevance of experiential learning within environmental education. Consistent with experiential learning principles, the findings indicate that sustainability behaviors are reinforced through repeated participation in concrete household practices rather than through abstract environmental instruction alone. This suggests that environmental education programs may become more effective when learners are actively engaged in applied sustainability activities such as household conservation projects, community clean-up campaigns, ecological monitoring, and participatory environmental problem-solving. Experiential learning approaches may therefore help learners develop stronger environmental responsibility, ecological awareness, and long-term behavioral commitment through direct interaction with sustainability-related challenges and practices.

Furthermore, the findings underscore the educational importance of informal pedagogy and the hidden curriculum operating within domestic environments. Households function as informal educational spaces where sustainability values are implicitly transmitted through observation, participation, modeling, and routine family practices. The study, therefore, expands existing environmental education discourse by emphasizing that ecological learning occurs not only through institutional curricula but also through everyday social

interactions embedded in family and community life. Recognizing the pedagogical role of households may encourage educators, policymakers, and curriculum planners to adopt more holistic approaches to environmental education that integrate formal, nonformal, and informal learning systems.

Finally, the study highlights the importance of culturally grounded sustainability education within the Global South and resource-sensitive contexts. The findings challenge Western-centric sustainability assumptions that often associate environmentalism primarily with affluence, post-material values, and lifestyle preference. In contrast, the study demonstrates that sustainability practices in Jolo, Sulu, are frequently shaped by adaptive necessity, household resilience, and resource limitations. This suggests that environmental education frameworks should be culturally and contextually responsive, recognizing local knowledge systems, survival-oriented conservation practices, and community realities as legitimate forms of sustainability learning. Higher education institutions and environmental educators may therefore need to design sustainability programs that are locally relevant, socially inclusive, and grounded in the lived experiences of marginalized or resource-constrained populations rather than relying exclusively on imported environmental models.

The findings also provide empirical support for the growing emphasis on Education for Sustainable Development (ESD) within higher education. By demonstrating that sustainability behaviors are cultivated through informal learning environments such as households, the study suggests that higher education institutions should adopt a broader ecological perspective of learning that extends beyond classroom boundaries. Universities may therefore benefit from designing sustainability programs that recognize households and communities as valuable learning ecosystems capable of complementing formal sustainability education and advancing institutional sustainability goals.

LIMITATIONS AND RECOMMENDATIONS

Several methodological limitations should be considered when interpreting the study's findings. First, the study employed purposive sampling rather than probability-based sampling; therefore, the findings are context-specific to households in Jolo, Sulu, and should not be generalized to broader populations without caution. Although procedural safeguards such as standardized respondent screening and clearly defined inclusion criteria were implemented to reduce selection bias, external validity remains inherently limited.

Second, the study relied primarily on self-reported data gathered through Likert-scale questionnaires. The overall grand mean of 4.74, interpreted as “Strongly Agree,” indicates a very high level of reported alignment with sustainability and environmentally responsible household practices. While this finding may reflect genuine awareness and positive household behavior, the

possibility of Social Desirability Bias cannot be entirely excluded. Respondents may have been inclined to provide socially favorable answers because of the environmental and moral implications of sustainability-related behaviors.

To mitigate this potential bias, several procedural controls were implemented during data collection. Participation was conducted anonymously, and respondents were explicitly informed that there were no “correct” or “incorrect” answers. Participants were encouraged to answer honestly based on their actual household practices rather than perceived socially acceptable behaviors. These safeguards were intended to reduce response inflation and encourage authentic disclosure.

Nevertheless, future studies may further strengthen methodological rigor by incorporating triangulation techniques such as direct household observation, mixed-method interviews, community-based validation, or longitudinal monitoring of household practices. The inclusion of objective sustainability indicators, such as utility consumption records or waste segregation audits, may also help validate self-reported behavioral measures and reduce common-method bias.

Finally, the study was conducted within a localized sociocultural and economic context characterized by varying access to utilities, environmental services, and support from local governance. Future research may therefore expand the geographic scope and employ probability sampling techniques to improve generalizability and comparative analysis across municipalities or regions in Southern Philippines.

CONCLUSION

The findings suggest that sustainable household management in Jolo, Sulu operates not merely as a collection of environmental routines but as an adaptive system of domestic governance shaped by environmental awareness, family participation, practical resource constraints, and experiential learning. Sustainability practices related to water conservation, energy management, waste reduction, sanitation, and resource-conscious consumption were consistently embedded within everyday household life, suggesting that ecological behavior in resource-constrained environments is closely tied to household resilience and adaptive survival strategies rather than solely to environmental ideology. The significant relationship suggests that sustainability behaviors are associated with the interaction of cognitive, social, and structural conditions operating within the household as a micro-organizational setting. Notably, the study identified an education paradox in which respondents with moderate educational attainment demonstrated higher-ranked sustainability practices than those with higher educational attainment, challenging linear assumptions that greater education automatically produces stronger environmental behavior. This finding suggests a

process of socio-economic decoupling whereby increased educational attainment and consumption flexibility may partially offset conservation-oriented practices. The study, therefore, contributes to interdisciplinary sustainability scholarship by reframing the household as a site of managerial leadership, informal environmental pedagogy, and adaptive governance, while also challenging Western-centric sustainability models that often privilege affluence-driven environmentalism over necessity-based conservation practices emerging within resource-sensitive communities.

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Al-fahad Esmail Jadjuli, MAEd, CRS is a graduate student pursuing a Doctor of Philosophy in Educational Management at Mindanao State University–Sulu. He earned his Master of Arts in Education major in School Administration from the same institution. His research interests include educational management, artificial intelligence in education, project-based learning, educational technology, English for Specific Purposes, and school administration. He has authored and co-authored scholarly publications in these areas and serves as a peer reviewer for international academic journals. Email: fahadliafourteentwentytwo1422@gmail.com.
ORCID: <https://orcid.org/0009-0006-1306-0821>.

Rosema G. Lukman, MPA, is a prominent educational administrator. She currently serves as the Vocational School Superintendent II and head of Hadji Butu School of Arts and Trades (HBSAT) in Jolo, Sulu. She has actively led initiatives in strategic planning, infrastructure and resource management, and institutional coordination. She is also an SDC I, II, and III completer, reflecting her commitment to professional growth and leadership development in education. Email: lukmanrosema74@gmail.com. ORCID: <https://orcid.org/0009-0004-2945-9250>.

Joe-An G. Cuaresma, Ed. D is an education specialist, consultant, and educator with extensive expertise in Physics, Mathematics, and Educational Management. She currently serves as an Education Supervisor II for the Teacher Education Program at the Commission on Higher Education (CHED) Regional Office IX in the Philippines. She earned her Doctor of Education major in Educational Management from Southern Mindanao College and her Master of Arts in Teaching College Physics (MATCP) from the University of Immaculate Conception, Davao City, as a CHED-FAFE scholar. She is also a KOICA scholar, a Texas International Education Consortium (TIEC) scholar completer, and a recipient of the Honoris Causa Doctor of Humanities from the Global Ministry and Discipleship Institute in Uganda, Africa. In addition, she serves as Vice President for Mindanao of Leadership Education in Academy and Development Global (LEAD Global), Board Director of the Academy Development for Global Leadership in Education-Philippines (ADGLE), member of the Southeast Asian Institute of Educational Training, Inc. (SEAIETE), and Consultant-Adviser of the Council of Deans for Teacher Education Region IX (CODTE9). She has published papers in Stratworks Research, Inc., and in the International Journal of Advanced Multidisciplinary Studies. She has served as a local editor and consultant for journals such as *Science Asia Review*, *UZ Graduate Studies*, *Philippine Journal of Basic Research*, and *International Social Science Review*. Her contributions to education and public service have earned her recognition as an Outstanding Education Supervisor and Peace Education Advocate. Email: Joeangcuaresma@gmail.com. ORCID no.: 0000-0002-3642-1926.

Jocelyn J. Muñoz, LPT, is an educator in the Philippines and currently serves as the Senior High School Coordinator at Hadji Butu School of Arts and Trades (HBSAT). She plays an active leadership role in coordinating senior high school programs and activities and has been recognized for her contribution to school-based initiatives. Her professional work reflects her commitment to educational leadership, student development, and the continuous improvement of school programs. Email: jmunez56@gmail.com. ORCID: <https://orcid.org/0009-0003-8713-7092>.

Abdel Ajim Mandangan Salasain, PhD, is the Vice Chancellor for Research, Innovation, and Extension at Mindanao State University–Sulu, where he also serves as Associate Professor V. He previously held key leadership positions as Campus Secretary and Dean of the College of Education, contributing significantly to academic governance and institutional development. His research interests include educational leadership, language education, applied linguistics, curriculum and instruction, and community-engaged research. Dr. Salasain has published scholarly works in linguistics and education, including studies on Tausug and English language structures and localized language teaching. As an academic leader, he actively promotes research excellence, innovation, and extension programs that contribute to educational advancement and community development in the Bangsamoro region.
