

Ecopedagogy and Entrepreneurship Education on Green Entrepreneurship Intention: A Study of Senior High School Students

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Received: 21 Juli 2026 | Revised: 24 Juli 2026 | Accepted: 28 Agustus 2026

Keywords:

Ecopedagogy;
Entrepreneurship
Education; Self-
Efficacy; Green
Entrepreneurial
Intention

Abstract

Low green entrepreneurship among senior high school students remains a fundamental issue amid the pressing agenda of sustainable development, positioning it as a strategic educational agenda in Indonesia. However, empirical evidence on how ecopedagogy-based learning and entrepreneurship education shape students' green entrepreneurial intention, and whether self-efficacy strengthens this relationship, remains limited. This study employed a quantitative explanatory approach involving 490 senior high school students selected through proportional stratified random sampling. Data analysis used hierarchical Moderated Regression Analysis (MRA). Ecopedagogy and entrepreneurship education positively influenced green entrepreneurial intention, while self-efficacy emerged as the strongest direct predictor. Moreover, self-efficacy significantly moderated the relationship between both independent variables and green entrepreneurial intention, amplifying the effect of ecopedagogy and entrepreneurship education among students with higher self-efficacy. Green entrepreneurship curricula should therefore deliberately cultivate students' self-efficacy both as a core competency in its own right and as a condition that maximizes the impact of ecopedagogy and entrepreneurship education, while also opening avenues for further research using mediation-based models.

Kata Kunci:

Ecopedagogy;
Pendidikan
Kewirausahaan; Self-
Efficacy; Intensi
Green
Entrepreneurship

Abstrak

Rendahnya green entrepreneurship pada siswa SMA masih menjadi persoalan mendasar di tengah mendesaknya agenda pembangunan berkelanjutan sebagai agenda pendidikan strategis di Indonesia. Namun, bukti empiris mengenai bagaimana pembelajaran ecopedagogy dan pendidikan kewirausahaan membentuk intensi green entrepreneurship siswa, serta apakah self-efficacy memperkuat hubungan tersebut, masih terbatas. Penelitian ini menggunakan pendekatan kuantitatif eksplanatori dengan melibatkan 490 siswa SMA yang dipilih melalui proportional stratified random sampling. Analisis Data menggunakan MRA secara hierarkis. Ecopedagogy dan pendidikan kewirausahaan berpengaruh positif terhadap intensi green entrepreneurship, sementara self-efficacy sebagai prediktor langsung terkuat. Selain itu, self-efficacy terbukti memoderasi secara signifikan hubungan kedua variabel independen tersebut terhadap intensi green entrepreneurship, memperkuat efek ecopedagogy dan pendidikan kewirausahaan pada siswa dengan self-efficacy yang lebih tinggi. Kurikulum green entrepreneurship perlu secara sengaja menumbuhkan self-efficacy siswa, baik sebagai kompetensi inti tersendiri maupun sebagai prasyarat yang memaksimalkan dampak ecopedagogy dan pendidikan kewirausahaan, serta membuka ruang penelitian lanjutan dengan model mediasi.

INTRODUCTION

The low intention toward green entrepreneurship among senior high school students, including in Kuningan Regency, West Java, remains a fundamental issue in Indonesian education. Most students still view entrepreneurship purely as profit-generating activity rather than linking it to environmental sustainability, leaving their intention to build environmentally oriented ventures lower than general entrepreneurial intention. Yet green entrepreneurship is an important paradigm that should be promoted from the secondary level onward, as it integrates economic, social, and environmental dimensions in creating sustainable ventures (Ashraf, 2024). This urgency is reinforced by recent bibliometric studies showing that green entrepreneurship intention research has grown rapidly among students, but remains concentrated at the higher education level with limited attention to secondary education (Azharuddin et al., 2026).

This low intention can be traced to weak learning processes that integrate ecological awareness with entrepreneurial skills. Ecopedagogy, a transformative and critical education approach, offers an effective way to instill ecological awareness while fostering entrepreneurial skills (Misiaszek, 2021), encouraging students toward real pro-environmental entrepreneurial action and thereby shaping attitudes and intentions as explained by the Theory of Planned Behavior, where intention is a function of attitude, subjective norms, and perceived behavioral control (Ajzen, 1991); (Ajzen, 2020). Cross-country studies similarly show that exposure to green curricula and sustainability awareness consistently strengthens students' green entrepreneurship intention (Man Seong et al., 2025; Widiatmaka et al., 2025).

Beyond ecopedagogy, entrepreneurship education also contributes theoretically to green entrepreneurship intention by building technical knowledge alongside positive attitudes and mental readiness to start a venture, as emphasized in the Entrepreneurial Event Theory's focus on perceived desirability and feasibility (Shapero & Sokol, 1982). However, this relationship is not always direct, as it is also shaped by students' self-efficacy their belief in their own ability to run a venture. The Stimulus-Organism-Response model explains that educational stimuli interact with such internal factors before shaping intention (Mehrabian & Russell, 1974), a framework widely used in recent studies on university students' green entrepreneurship intention (Ghi et al., 2026; Ghi & Van, 2025).

Previous studies on self-efficacy in green entrepreneurship show varied, not yet convergent theoretical positions some treat it as a direct predictor (Ahmad et al., 2015; Shabeeb Ali et al., 2023), others as a mediator between institutional or educational support and intention (Man Seong et al., 2025; Yunikawati & Febrianti, 2024; Zhang et al., 2023), while studies testing it as a moderator between ecopedagogy or entrepreneurship education and green entrepreneurship intention remain scarce, especially among secondary school students. This variation suggests the mechanism underlying self-efficacy's role still needs further empirical testing, particularly in Indonesian secondary education, which prior research has not extensively addressed.

This study therefore examines the effect of ecopedagogy learning and entrepreneurship education on senior high school students' green entrepreneurship intention, while testing whether self-efficacy moderates both relationships. Its novelty lies in explicitly testing this moderating role on a relatively large sample of senior high school students (490 respondents) within the ecopedagogy context a test rarely conducted at the secondary level in Indonesia. The

study aims to contribute theoretically by clarifying self-efficacy's position in the causal chain toward green entrepreneurship intention, and practically by informing more effective ecopedagogy and entrepreneurship education curricula at the senior high school level.

METHODS

This study employed a quantitative approach with an explanatory survey design to empirically test the causal relationships among variables (Hair et al., 2017). The study involved four main variables: the effectiveness of ecopedagogy learning (X1) and entrepreneurship education (X2) as independent variables, self-efficacy (M) as the moderating variable, and green entrepreneurship intention (Y) as the dependent variable.

The study population consisted of twelfth-grade students from Adiwiyata-status senior high schools in Kuningan Regency, West Java, with a sample of 490 students selected through proportional stratified random sampling. Data were collected using a closed-ended, five-point Likert-scale questionnaire (Sari, 2021). Ecopedagogy was measured with 16 items (Misiaszek, 2021), entrepreneurship education with 14 items (Sari, 2021), self-efficacy with 11 items (Bandura, 2020) and green entrepreneurship intention with 17 items (Ajzen, 2020; Ashraf, 2024).

All four instruments were adapted from established international scales rather than constructed anew, preserving their theoretical grounding while ensuring relevance for Indonesian senior high school students. Adaptation followed forward translation into Indonesian, back-translation, and a conceptual equivalence check against the source instruments (Ajzen, 2020; Ashraf, 2024; Bandura, 2020; Misiaszek, 2021; Sari, 2021), followed by expert judgment from economics education lecturers and language experts, who assessed content relevance, clarity, and cultural fit rewording business- or university-oriented items into more concrete, school-relevant illustrations of green entrepreneurial activity. A pilot test on students outside the main sample checked readability and response variance before the finalized instrument was distributed to all 490 respondents, with its validity and reliability re-examined empirically as reported next. Data analysis was conducted in stages: validity and reliability testing (item-total correlation and Cronbach's Alpha), classical assumption testing (normality, multicollinearity, heteroscedasticity), followed by a three-model hierarchical Moderated Regression Analysis (MRA) to test the direct and moderating effects, with mean-centering applied to the predictor variables (Hair et al., 2017; Sarstedt et al., 2020). All analyses were conducted using R (RStudio) with the psych, car, and lmtest packages to ensure reproducibility.

RESULTS AND DISCUSSION

This study involved 490 senior high school students. Descriptive statistics showed that all four variables ecopedagogy, entrepreneurship education, self-efficacy, and green entrepreneurship intention fell into the high category, with mean scores ranging from 70.2% to 73.6% of the maximum theoretical scale (Table 1), indicating fairly good ecological awareness, entrepreneurial understanding, self-belief, and green entrepreneurship intention among students, though room remains toward the very high category. This is consistent with higher-education studies finding relatively high intention scores where institutions actively support green practices (Kaur & Panda, 2024; Melati et al., 2025; Widiatmaka et al., 2025). However,

these descriptive scores alone do not guarantee the strength of causal relationships among variables, as the subsequent regression results will show (Iffat et al., 2026).

Table 1. Descriptive Statistics of Study Variables

Variable	Number of Items	Theoretical Scale	Mean	SD	Category
<i>Ecopedagogy (X1)</i>	16	16-80	57.14	11.31	<i>High</i>
<i>Entrepreneurship Education (X2)</i>	14	14-70	51.49	10.44	<i>High</i>
<i>Self-Efficacy (M)</i>	11	11-55	39.74	8.85	<i>High</i>
<i>Green Entrepreneurship Intention (Y)</i>	17	17-85	59.71	12.99	<i>High</i>

Validity testing using corrected item-total correlation showed nearly all items were valid ($r > 0.30$), except item X2_8 on entrepreneurship education ($r = 0.257$), while all variables demonstrated excellent reliability with Cronbach's Alpha values of 0.911–0.954, well above the 0.70 threshold (Hair et al., 2017) reliability that is especially important for the self-efficacy instrument given its sensitivity as a psychological construct, consistent with evidence that robust, valid self-efficacy instruments are essential for distinguishing entrepreneurially oriented individuals (Guilherme et al., 2025). Classical assumption testing further supported the regression model: the Kolmogorov-Smirnov and Shapiro-Wilk tests showed significant results ($p < 0.05$) at $N = 490$, expected given both tests' sensitivity to minor deviations at larger sample sizes (Hair et al., 2017; Sarstedt et al., 2020), the highest VIF (6.52, for the interaction term) remained below the threshold of 10, indicating no serious multicollinearity despite interaction terms typically showing higher VIF than main variables (Hair et al., 2017); and the Breusch-Pagan test yielded $p = 0.341$ ($p > 0.05$), confirming the model was free from heteroscedasticity.

The regression results for Model 1 showed that X1, X2, and M_cat jointly had a significant effect on Y, with an F value of 322.2 ($df = 3, 486$; $p < 0.05$) and the model explaining 66.5% of the variance in Y ($R^2 = 0.665$; Adj. $R^2 = 0.663$). Partially, X1 had a positive and significant effect on Y ($\beta = 0.228$; $t = 4.40$; $p = 0.011$), as did X2 ($\beta = 0.397$; $t = 7.88$; $p = 0.003$) and the high-moderator category (M_catHigh) ($\beta = 9.761$; $t = 9.45$; $p = 0.017$). These findings indicate that, prior to considering the interaction effect, all three variables independently contributed to an increase in Y. After entering the interaction terms (Model 2), explained variance in Y increased to 68.1% ($R^2 = 0.681$; Adj. $R^2 = 0.677$; $F = 208.6$, $df = 5, 484$; $p < 0.05$). Both interactions were significant $X1 \times M_cat$ ($\beta = 0.485$; $t = 2.31$; $p = 0.021$) and $X2 \times M_cat$ ($\beta = 0.563$; $t = 2.68$; $p = 0.008$) indicating M_cat moderates and strengthens the relationships of both X1 and X2 with Y, with a greater effect among respondents in the high-moderator category.

Table 2. Results of the Moderated Regression Analysis

Model 1 (without interaction): $Y = \beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 M_cat$, $df = 486$

Predictor	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	19.815	2.432	8.15	0.001
X1	0.228	0.052	4.40	0.011
X2	0.397	0.050	7.88	0.003

M_catHigh	9.761	1.033	9.45	0.017
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$R^2 = 0.665$; Adj. $R^2 = 0.663$; $F = 322.2$ (df 3, 486); $p < 0.05$

Model 2 (with interaction, both moderation effects significant):

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 M_cat + \beta_4 (X_1 \times M_cat) + \beta_5 (X_2 \times M_cat), df = 484$$

Predictor	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	21.830	3.179	6.87	0.000
X1	0.265	0.072	3.67	0.001
X2	0.329	0.064	5.12	0.011
M_catHigh	-25.507	7.873	-3.24	0.004
X1 × M_catHigh	0.485	0.210	2.31	0.021
X2 × M_catHigh	0.563	0.210	2.68	0.008

$R^2 = 0.681$; Adj. $R^2 = 0.677$; $F = 208.6$ (df 5, 484); $p < 0.05$

Comparison of Model 1 and Model 2: $F = 12.14$; $p < 0.05 \rightarrow$ significant

Figures 1 and 2 illustrate these interaction effects, presenting simple slope plots for ecopedagogy (X1) and entrepreneurship education (X2) on green entrepreneurship intention (Y) across low and high self-efficacy (M_cat) categories, based on Model 2's unstandardized coefficients with the other predictor held at its mean. The slope of X1 on Y is markedly steeper for high self-efficacy students ($b = 0.750$) than low self-efficacy students ($b = 0.265$) (Figure 1), and similarly for X2, steeper in the high self-efficacy group ($b = 0.892$) than the low group ($b = 0.329$) (Figure 2) confirming that self-efficacy amplifies, rather than substitutes for, the benefit of ecopedagogy and entrepreneurship education on students' green entrepreneurship intention.

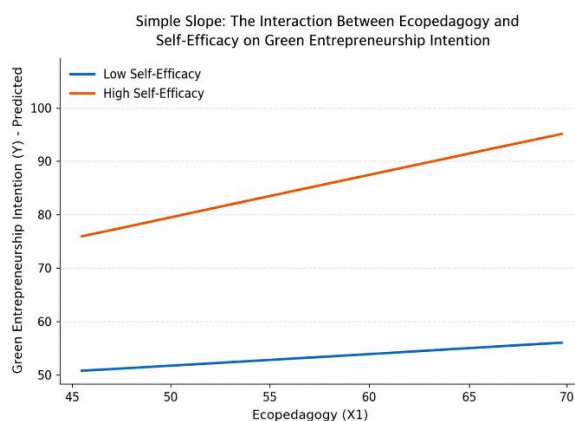


Figure 1. Simple Slope of X1 on Y by Self-Efficacy Category

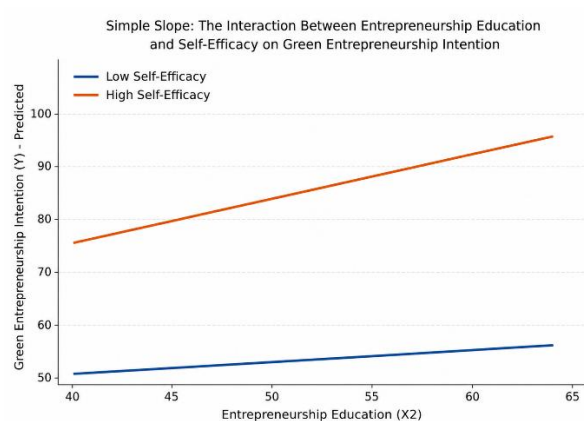


Figure 2. Simple Slope of X2 on Y by Self-Efficacy Category

a. Effect of Ecopedagogy and Entrepreneurship Education on Green Entrepreneurship Intention

Both ecopedagogy and entrepreneurship education positively influencing green entrepreneurship intention in the base model reinforces established sustainability-education theory: learning that instills ecological awareness alongside entrepreneurial skills shapes students' attitudes and intentions toward sustainable entrepreneurship (Ashraf, 2024; Misiaszek, 2021; Sari, 2021), consistent with the Theory of Planned Behavior's view of intention as a function of attitude, subjective norms, and perceived behavioral control (Ajzen,

1991, 2020) with ecopedagogy specifically shaping positive environmental attitudes through critical, transformative education (Kollmuss & Agyeman, 2002). This aligns with findings at other education levels that green education consistently builds students' green entrepreneurial orientation, both directly and through school-based practice (Melati et al., 2025, 2026) and reinforces the argument that effective entrepreneurship education must integrate personal values and environmental concern rather than business content alone (Adjimah et al., 2026), consistent with meta-analytic evidence that integrative models predict entrepreneurial intention more strongly than single-factor models (Liñán & Chen, 2009; Schlaegel & Koenig, 2014).

Notably, unlike the common pattern where educational variables' direct effects weaken once psychological factors are controlled for, both ecopedagogy and entrepreneurship education retained meaningful effects even after self-efficacy and the interaction terms were added indicating relatively independent pathways of influence that are strengthened, not displaced, by self-efficacy. This resilience is consistent with evidence that entrepreneurship education's impact on attitudes and intention persists into the medium term (Fayolle & Gailly, 2015), with findings among Riau students that green techno-entrepreneurship models drive competitive advantage and business performance (Purwati et al., 2023) and with educational factors as a consistent determinant of green entrepreneurship intention across cultural contexts (Sharma & Singh, 2023). In short, ecopedagogy and entrepreneurship education's effectiveness depends not just on additive exposure, but on students' self-belief to translate learning into genuine green entrepreneurial intention.

b. Self-Efficacy as Both a Direct Predictor and a Moderator

The significance of high self-efficacy as a predictor in the base model aligns with Bandura's view that self-belief is a core cognitive mechanism shaping choices, effort, and persistence in challenging tasks like venture creation (Bandura, 1977, 2020), and reinforces prior evidence that entrepreneurial self-efficacy instruments reliably distinguish strongly entrepreneurial individuals (Chen et al., 1998) now extended to the green entrepreneurship context at the secondary level. This is consistent with findings among Peruvian high school students, where extracurricular and state support strengthen green entrepreneurial self-efficacy as a predictor of intention (Perez-Luyo et al., 2023); Turkish university students, where learning-platform usability boosts self-efficacy and subsequently intention (Kement et al., 2023); and Indian and Generation Y business students, both affirming self-efficacy as a consistent determinant of green entrepreneurship intention in developing-country contexts (Ahmad et al., 2015; Iffat et al., 2026).

The findings go beyond confirming this direct role, however. The high self-efficacy coefficient turning negative once interaction terms were added does not indicate a counterproductive effect, but reflects a change in the coefficient's meaning it now represents self-efficacy's effect when ecopedagogy and entrepreneurship education are zero, and must be interpreted jointly with the interaction coefficients (Hair et al., 2017). This central role of self-efficacy echoes research identifying it as one of the most significant predictors among six antecedents of green entrepreneurship intention in higher education, alongside attitude, green consumption commitment, and institutional and social support (Shabeeb Ali et al., 2023) and supports the Entrepreneurial Event Theory's premise that perceived feasibility is a more decisive psychological prerequisite than desirability instilled through education alone (Shapero & Sokol, 1982).

c. The Moderating Role of Self-Efficacy

The key finding and novelty of this study is confirming self-efficacy as a moderating variable that strengthens the relationship between ecopedagogy and entrepreneurship education and green entrepreneurship intention. Both interaction terms were statistically significant, and the model comparison confirmed their addition meaningfully improved explanatory power clarifying self-efficacy's position within the Stimulus-Organism-Response framework as both an organismic component shaping intention directly and a boundary condition altering the strength of the stimulus-response relationship (Ghi et al., 2026; Ghi & Van, 2025; Mehrabian & Russell, 1974).

This is consistent with recent studies showing that entrepreneurship education's relationship with sustainable entrepreneurial intention depends heavily on accompanying psychological characteristics like experience and readiness (Talukder et al., 2025), and with findings on gender as a moderator between entrepreneurship education and green entrepreneurial intention among Tanzanian business students (Makuya & Changalima, 2024). This study extends that pattern, showing self-efficacy one of Bandura's most fundamental psychological resources likewise functions as a moderating factor, similar to other dispositional variables in moderation-mediation studies of entrepreneurial intention (Amani et al., 2024).

Methodologically, detecting this interaction effect is also attributable to the study's relatively large sample size, which provided adequate power to detect small-to-moderate effects often missed in smaller studies (Baranger et al., 2023), consistent with a systematic review emphasizing that educational and psychological factors should be considered jointly rather than as separate additive effects (Azharuddin et al., 2026).

Substantively, students with high self-efficacy derive proportionally greater benefit from ecopedagogy and entrepreneurship education than those with low self-efficacy a theoretical contribution showing self-efficacy functions as both a direct pathway and an amplifying moderator, a dual pattern rarely reported at the secondary level, unlike studies positioning it solely as a mediator (Man Seong et al., 2025; Yunikawati & Febrianti, 2024). Practically, this implies self-efficacy development through green business simulations, mentoring, and mastery experiences should be a prerequisite rather than a complement to maximizing ecopedagogy and entrepreneurship education's impact, in line with recommendations from creativity- and literacy-based ecopreneurship models (Armianti et al., 2026), university green support frameworks in Indonesia (Widiatmaka et al., 2025), teacher perspectives on school-level green entrepreneurship (Perez-Luyo et al., 2023) and innovative business models in Mexican higher education (Palos Cerda et al., 2026) relevant even in challenging contexts, as shown by research on university support for women's green entrepreneurship in unstable environments (Saleh et al., 2025).

These findings have direct implications for ecopedagogy-based curricula under Indonesia's Kurikulum Merdeka. Ecopedagogy can be embedded through the *Projek Penguatan Profil Pelajar Pancasila* (P5), giving students structured opportunities to design and pilot small-scale green ventures rather than studying environmental and entrepreneurial concepts separately. Since self-efficacy amplifies rather than merely accompanies these effects, P5 modules should sequence mastery experiences early starting with low-risk, guided simulations before more autonomous projects, while cross-disciplinary courses in economics, biology, and *Pendidikan Pancasila* reinforce the link between environmental issues and entrepreneurial

problem-solving, consistent with ecopedagogy's transformative orientation (Misiaszek, 2021). At the policy level, teacher training and accreditation frameworks like Adiwiyata should explicitly assess how well schools cultivate self-efficacy alongside ecological and entrepreneurial knowledge, rather than treating these as disconnected agendas.

Overall, these findings confirm that ecopedagogy and entrepreneurship education intertwine with self-efficacy, which plays a dual role as both a direct antecedent and a moderating variable strengthening both pathways enriching theoretical understanding of how educational and psychological factors reinforce one another, and affirming that self-belief is essential for translating learning into concrete green entrepreneurial action.

CONCLUSION

This study shows that ecopedagogy and entrepreneurship education have a positive effect on senior high school students' green entrepreneurship intention, with self-efficacy playing a dual role as both a direct predictor and a moderating variable that strengthens the influence of both educational variables. Accordingly, students' self-belief proves to be the key factor determining the extent to which ecopedagogy and entrepreneurship education become internalized into sustainability-oriented entrepreneurial intention. This finding affirms that the role of self-efficacy can no longer be regarded as a mere by-product of ecopedagogy or entrepreneurship education, but rather as a determining factor that must be deliberately and purposefully cultivated. Without strengthening students' self-belief, however well-designed the ecopedagogy and entrepreneurship education curriculum may be, its impact on sustainable entrepreneurial intention risks falling short of its potential making the strengthening of self-efficacy a strategic priority, not merely a complement, in the development of green entrepreneurship curricula at the secondary school level.

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