

Entrepreneurship and Startups in Education: Innovative Strategies for Sustainable Tourism Sector Development

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ABSTRACT

This study aims to examine the influence of Entrepreneurship Education on Sustainable Tourism Development by considering the mediating role of Startups among university students. Although the tourism sector contributes significantly to economic growth, it continues to face challenges in implementing sustainability principles from environmental, social, and cultural perspectives. The research was conducted among university students from institutions that integrate entrepreneurship into their vision, mission, and curriculum. This study employed a quantitative research approach. Data were collected from 137 respondents using purposive sampling, involving students who had completed entrepreneurship courses. The data were analysed using Structural Equation Modelling–Partial Least Squares (SEM-PLS) with WarpPLS. The findings reveal that Entrepreneurship Education has a positive and significant direct effect on Startups and Sustainable Tourism Development. Startups also have a positive and significant effect on Sustainable Tourism Development and significantly mediate the relationship between Entrepreneurship Education

and Sustainable Tourism Development. These findings indicate that entrepreneurship education contributes more effectively to sustainable tourism development when entrepreneurial knowledge is translated into startup creation and innovative business activities. This study contributes to the literature by providing empirical evidence on the strategic role of startups as a mechanism linking entrepreneurship education with sustainable tourism development. The findings also provide practical implications for higher education institutions in strengthening

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entrepreneurship education, business incubation, and startup development initiatives to support sustainable tourism and the achievement of the Sustainable Development Goals (SDGs).

Keywords: Education, entrepreneurship, innovative strategies, startup, sustainable tourism

INTRODUCTION

The tourism sector is one of the main drivers of the global economy and has become a strategic contributor to sustainable economic growth. According to the World Travel & Tourism Council (WTTC), the tourism industry contributed approximately 9.2% of global Gross Domestic Product (GDP) in 2023 and generated employment for more than 300 million people worldwide (Global Travel & Tourism Catapults Into, 2023). Likewise, projections from the United Nations World Tourism Organisation (UNWTO) indicate that international tourist arrivals recovered to between 80% and 95% of pre-pandemic levels in 2023, with Europe and the Middle East expected to

achieve the strongest recovery. These figures demonstrate not only the resilience of the tourism industry but also its increasingly important role in supporting sustainable economic development. As illustrated in Figure 1, international tourist arrivals experienced a substantial decline during the COVID-19 pandemic, followed by a gradual recovery in 2022 and a positive outlook for 2023.

In Indonesia, the tourism sector also plays a significant role in national economic development. Data from the Ministry of Tourism and Creative Economy indicate that tourism contributed 3.76% to national GDP in 2022 and is projected to increase to 4.1% in 2024.

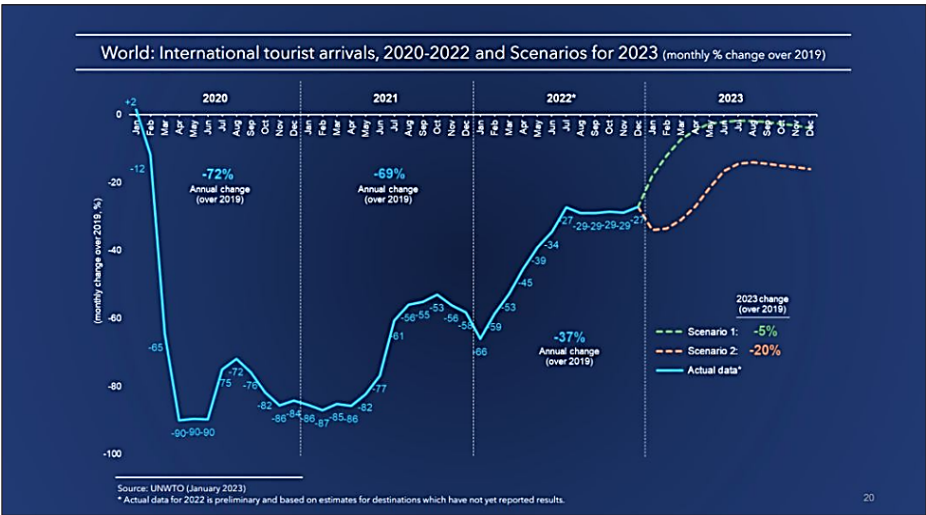


Figure 1. World: international tourist arrivals, 2020-2022 and scenarios for 2023
Source: World Tourism Barometer: January 2023 | UN Tourism

Beyond its contribution to national income, tourism has become an important catalyst for regional economic growth through increased local government revenue, employment creation, and the expansion of micro, small, and medium enterprises (MSMEs) (Ahmad et al., 2022). At the same time, the rapid development of digital technology has transformed the tourism industry. Technology-based startups such as Traveloka, Tiket.com, and Airy Rooms demonstrate how digital platforms improve market accessibility, facilitate tourism transactions, and strengthen destination competitiveness through broader dissemination of tourism information (Peixoto et al., 2023; Savin et al., 2022). Previous studies further indicate that digitalisation through startup platforms improves operational efficiency and enhances the competitiveness of tourism destinations, particularly for destinations that previously had limited access to global markets (Page & Holmström, 2023).

In response to these developments, Entrepreneurship Education has received increasing attention as an important strategy for preparing graduates capable of responding to technological and socio-economic changes. Previous studies consistently report that Entrepreneurship Education positively influences entrepreneurial self-efficacy, entrepreneurial intention, and business creation among university students (Gao & Lu, 2024; Li et al., 2022; Sá et al., 2025; Wu et al., 2022). Furthermore, entrepreneurial learning experiences encourage students to transform

innovative ideas into business opportunities while developing creative thinking and problem-solving skills (Rasoolimanesh et al., 2024). In the context of tourism, Entrepreneurship Education integrated with digital technology encourages students to develop startups based on local tourism potential, including natural attractions, cultural heritage, and culinary tourism (McCarthy et al., 2023). Such startups have the potential to become an effective mechanism for promoting sustainable and inclusive tourism development by integrating technological innovation with local economic empowerment (Freiberg & Matz, 2023; Usman & Sun, 2023).

Universities therefore occupy a strategic position in producing graduates capable of generating innovative solutions to development challenges, including those faced by the tourism sector (Shao et al., 2022; Szathmári et al., 2024). Through initiatives such as the *Merdeka Belajar-Kampus Merdeka* (MBKM) programme, university business incubators, and collaborations with industry, higher education institutions increasingly encourage students to establish entrepreneurial ventures with social and environmental orientations (Chen, 2025). According to the Directorate of Belmawa of the Ministry of Education, Culture, Research and Technology, more than 60% of students participating in the MBKM entrepreneurship programme have developed business ideas related to tourism and the creative economy. This indicates that universities possess considerable potential to contribute to sustainable tourism

through entrepreneurship-driven innovation. Consequently, strengthening the relationship between Entrepreneurship Education, startup development, and sustainable tourism has become an increasingly important issue for higher education institutions and policymakers (Santos et al., 2021; Stefia et al., 2024).

Despite the rapid expansion of the tourism industry, tourism development continues to face significant sustainability challenges. Previous studies have reported that conventional tourism development frequently generates environmental degradation, social inequality, and the commercialisation of local culture (Annual Report, 2021; Huang & Hu, 2024). Similar conditions can be observed in several Indonesian tourism destinations, including Bali and Labuan Bajo, where increasing tourist arrivals have intensified environmental pressures, increased land prices, and affected local socio-cultural dynamics (Results of susreg report, 2023). These challenges demonstrate that sustainable tourism requires innovative approaches capable of balancing economic growth with environmental conservation and community well-being. Digital entrepreneurship and technology-based startups therefore offer promising opportunities to support more sustainable tourism development (Norouzi et al., 2023).

Although previous studies have examined Entrepreneurship Education, startup development, and sustainable tourism independently, important issues

remain insufficiently explored. Existing studies have predominantly investigated Entrepreneurship Education as a determinant of entrepreneurial intention and entrepreneurial performance (Indrianti et al., 2024; Liu et al., 2022), while research on startups has primarily emphasised digital innovation and business performance. Likewise, studies on sustainable tourism have generally focused on destination management and sustainability strategies (Novita et al., 2024). However, limited empirical evidence explains how Entrepreneurship Education contributes to Sustainable Tourism Development through the creation and development of startups within higher education institutions. Moreover, the mediating role of startups in linking Entrepreneurship Education with Sustainable Tourism Development remains insufficiently investigated, particularly within the context of Indonesian universities. This research gap provides the primary rationale for conducting the present study.

Government support and higher education policies are increasingly recognised as important drivers of sustainable tourism development (Phung, 2023; Li et al., 2025). Universities function not only as educational institutions but also as centers of innovation capable of generating knowledge, technology, and entrepreneurial human resources that contribute to national development. Through entrepreneurship-oriented education, students can become agents of change by creating innovative solutions that

simultaneously preserve environmental sustainability, strengthen local culture, and improve community welfare. Consequently, strengthening the integration between education, entrepreneurship, and sustainable tourism represents an important strategy for addressing contemporary tourism challenges.

This study contributes to the existing literature by empirically examining the relationship between Entrepreneurship Education and Sustainable Tourism Development while simultaneously explaining the mediating role of Startups in this relationship. The findings are expected to provide empirical evidence that supports universities in strengthening entrepreneurship education and startup ecosystems for sustainable tourism development, while also offering practical insights for policymakers in developing entrepreneurship programmes that contribute to the achievement of the Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education), Goal 8 (Decent Work and Economic Growth), Goal 13 (Climate Action), and Goal 15 (Life on Land). Accordingly, the objective of this study is to examine the influence of Entrepreneurship Education on Sustainable Tourism Development mediated by Startups.

Problem Statement

Although the tourism sector contributes significantly to global and national economic growth, its development continues to face major challenges in achieving environmental, social, and

cultural sustainability. At the same time, Entrepreneurship Education has been widely recognised as an effective approach to developing entrepreneurial competencies, innovation, and business creation among university students, including within the tourism sector. However, its implementation remains largely oriented toward commercial objectives, with relatively limited attention given to sustainability-oriented entrepreneurship. Likewise, startups have become increasingly important drivers of innovation and digital transformation in the tourism industry; however, their role in translating Entrepreneurship Education into Sustainable Tourism Development has not yet been sufficiently explained through empirical evidence. Consequently, the relationships among Entrepreneurship Education, Startups, and Sustainable Tourism Development remain inadequately understood, particularly within the context of higher education. Addressing this gap, the present study examines the direct effects of Entrepreneurship Education on Startups and Sustainable Tourism Development, as well as the mediating role of Startups in explaining the relationship between Entrepreneurship Education and Sustainable Tourism Development.

Research Questions

Based on the problem statement, this study addresses the following research questions:

1. Does Entrepreneurship Education have a positive and significant effect on Startups?

2. Does Entrepreneurship Education have a positive and significant effect on Sustainable Tourism Development?
3. Do Startups have a positive and significant effect on Sustainable Tourism Development?
4. Do Startups mediate the relationship between Entrepreneurship Education and Sustainable Tourism Development?

METHODS

This study employed a quantitative cross-sectional research design to examine the hypothesised relationships among Entrepreneurship Education (X), Startups (Z), and Sustainable Tourism Development (Y) using Structural Equation Modelling–Partial Least Squares (SEM-PLS). A quantitative approach was considered appropriate because the study aimed to test the proposed hypotheses and examine both the direct and indirect relationships among the research variables. The target population comprised undergraduate students at the Indonesian National Islamic University, Aceh. Based on the 2025 Higher Education Database, the total population consisted of 4,047 undergraduate students.

The sample size was determined using the Slovin formula, $= \frac{N}{1+Ne^2}$, with a 10% margin of error, resulting in a minimum sample size of 137 respondents. Accordingly, 137 valid questionnaires were obtained and included in the final analysis. Respondents were selected using purposive sampling based on two inclusion criteria: (1) having completed an Entrepreneurship course and (2) possessing basic knowledge of startup

businesses. These criteria ensured that the respondents possessed sufficient knowledge of the research constructs and were therefore able to provide reliable responses relevant to the objectives of this study.

Primary data were collected using a structured self-administered questionnaire. All measurement items were assessed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire consisted of measurement items representing three latent constructs: Entrepreneurship Education, Startups, and Sustainable Tourism Development. The collected data were analysed using Structural Equation Modelling–Partial Least Squares (SEM-PLS) with WarpPLS software. The analysis followed the standard two-stage SEM-PLS procedure. The first stage evaluated the measurement model by assessing indicator reliability, internal consistency reliability, convergent validity, and discriminant validity to establish the adequacy of the measurement instruments. The second stage evaluated the structural model by estimating the path coefficients to test the proposed hypotheses and examine the mediating effect of Startups on the relationship between Entrepreneurship Education and Sustainable Tourism Development.

Hypotheses

- H₁: Entrepreneurship Education has a positive and significant influence on Startups
- H₂: Entrepreneurship Education has a positive and significant influence on Sustainable Tourism Development

- H₃: Startups have a positive and significant influence on Sustainable Tourism Development
 - H₄: Startups mediate the relationship between Entrepreneurship Education and Sustainable Tourism Development, in other words, Entrepreneurship Education indirectly has a positive and significant influence on Sustainable Tourism Development through startups.
- The conceptual framework illustrating the proposed relationships among Entrepreneurship Education, Startups, and Sustainable Tourism Development is presented in Figure 2.

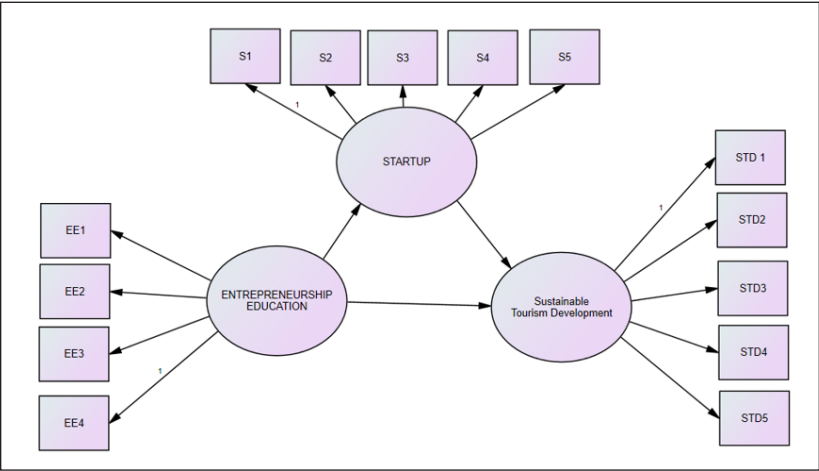


Figure 2. Conceptual framework
Note. Independent variable (X) : Entrepreneurship Education
Intervening Variable (Z) : Startup
Dependent Variable (Y) : Sustainable Tourism Development

SEM-PLS (WarpPLS) Model Test Results

Convergent validity was assessed by examining the standardised factor loadings and the statistical significance of each reflective indicator. In SEM-PLS, indicators are considered acceptable when they exhibit loadings greater than 0.70 and statistically significant *p*-values. Nevertheless, indicators with loadings between 0.40 and 0.70 may be retained provided that their inclusion does not adversely affect Composite Reliability (CR)

and Average Variance Extracted (AVE) (Mahfud & Dwi, 2013). The standardised loading estimates for all indicators are presented in Table 1.

Table 1 demonstrates that the majority of the indicators achieved standardised loadings above the recommended threshold of 0.70, indicating satisfactory convergent validity. Two indicators, namely Z3 (0.561) and STD1 (0.653), exhibited loadings below 0.70 but remained above the minimum acceptable threshold of 0.40.

Table 1
Confirmatory Factor Analysis (CFA) testing based on loading values

	Entrepreneur	Startup	STD	Type	Pv.Value
EEI	(0.754)	0.055	-0.012	Reflective	<0.001
EE2	(0.762)	0.012	-0.016	Reflective	<0.001
EE3	(0.797)	-0.007	0.000	Reflective	<0.001
EE4	(0.811)	-0.056	0.026	Reflective	<0.001
Z1	0.143	(0.798)	-0.127	Reflective	<0.001
Z2	-0.042	(0.801)	-0.134	Reflective	<0.001
Z3	-0.338	(0.561)	0.310	Reflective	<0.001
Z4	0.020	(0.728)	0.096	Reflective	<0.001
Z5	0.127	(0.745)	-0.047	Reflective	<0.001
STD1	0.094	0.447	(0.653)	Reflective	<0.001
STD2	0.183	-0.180	(0.747)	Reflective	<0.001
STD3	-0.124	-0.131	(0.806)	Reflective	<0.001
STD4	-0.002	-0.012	(0.724)	Reflective	<0.001
STD5	-0.122	-0.055	(0.794)	Reflective	<0.001

Source: Warp PLS 7.0 data processing results (2025)

Table 2
Construct reliability test

	Entrepreneur	Startup	STD
R Square		0.075	0.462
Composite reliability.	0.862	0.850	0.862
Cronbach's Alpha	0.787	0.778	0.800
Avg.var.extract.	0.610	0.535	0.558
Full Colin VIF	1,293	1,418	1,757
Q Square		0.080	0, 463

Source: Warp PLS 7.0 Data Processing Results (2025)

Since both indicators were statistically significant ($p < 0.001$) and their retention did not reduce the reliability or convergent validity of their respective constructs, they were retained in the final measurement model. Overall, the measurement model demonstrates adequate convergent validity, indicating that all indicators appropriately represent their corresponding latent constructs.

Construct Reliability Test

Construct reliability and validity were assessed using Composite Reliability (CR), Cronbach's Alpha, Average Variance Extracted (AVE), Full Collinearity Variance Inflation Factor (Full Collinearity VIF), coefficient of determination (R^2), and predictive relevance (Q^2). The results are presented in Table 2.

The results presented in Table 2 indicate that all constructs satisfy the recommended reliability and validity criteria. Composite Reliability values range from 0.850 to 0.862, exceeding the recommended threshold of 0.70 and demonstrating satisfactory internal consistency. Likewise, Cronbach's Alpha values range from 0.778 to 0.800, confirming that the measurement scales are reliable.

Convergent validity is further supported by the Average Variance Extracted (AVE) values, which range from 0.535 to 0.610, all exceeding the recommended threshold of 0.50. Furthermore, the Full Collinearity VIF values range between 1.293 and 1.757, remaining well below the recommended maximum value of 3.33. These findings indicate that multicollinearity is not a concern in the proposed model.

Regarding the structural model, the Startup construct achieved an R² value of 0.075, indicating that Entrepreneurship Education explains 7.5% of the variance in Startup. Meanwhile, Sustainable Tourism Development obtained an R² value of 0.462, indicating that Entrepreneurship Education and Startup jointly explain 46.2% of its

variance. In addition, the positive Q² values (0.080 for Startup and 0.463 for Sustainable Tourism Development) demonstrate that the structural model possesses acceptable predictive relevance. Discriminant Validity Based on the Fornell-Larcker Criterion Based on the discussion of the findings presented in Table 3.

As presented in Table 3, the square root of the AVE for each construct exceeds its correlations with the other constructs. Specifically, the square roots of the AVE are 0.781 for Entrepreneurship Education, 0.732 for Startup, and 0.747 for Sustainable Tourism Development. These findings satisfy the Fornell-Larcker criterion, confirming adequate discriminant validity among the latent constructs.

The cross-loading results presented in Table 4 indicate that every measurement indicator loads more strongly on its corresponding construct than on the remaining constructs. These findings provide additional evidence of discriminant validity and demonstrate that each indicator adequately represents its intended latent construct.

Table 3
Discriminant validity based on the Fornell-Larcker Criterion

Correlations among 1.vs. witch sq. rts. Of AVEs			
	Enterepeneur	Startup	STD
Enterpreneur	(0,781)	0.178	0.468
Startup	0.178	(0.732)	0.536
STD	0.468	0.536	(0.747)

Note. Square roots of average variances extracted (AVEs) shown on diagonal

Table 4
Discriminant validity testing based on cross-loading approach

	Enterepeneur	Startup	STD
EE1	(0.754)	0.186	0.360
EE2	(0.762)	0.126	0.350
EE3	(0.797)	0.133	0.379
EE4	(0.811)	0.113	0.372
Z1	0.213	(0.798)	0.400
Z2	0.070	(0.801)	0.339
Z3	-0.045	(0.561)	0.355
Z4	0.160	(0.728)	0.466
Z5	0.212	(0.745)	0.412
STD1	0.320	0.584	(0.653
STD2	0.471	0.286	(0.747
STD3	0.311	0.382	(0.806
STD4	0.334	0.372	(0.724
STD5	0.318	0.408	(0.794

Note. Loadings and cross-loadings are unrotated

Structural Model Analysis (Inner Model)

The structural model was evaluated by examining the direct effects, indirect effects, coefficient of determination (R^2), and overall model fit indices generated using WarpPLS.

Direct Effects

The direct effects of the exogenous variables on the endogenous variables are presented in Table 5.

As presented in Table 5, Entrepreneurship Education has a positive and significant effect on Startup ($\beta = 0.275$, $p < 0.001$), thereby supporting H1. Entrepreneurship Education also has a positive and significant effect on Sustainable Tourism Development ($\beta = 0.418$, $p < 0.001$), supporting H2. Furthermore, Startup positively and significantly influences Sustainable Tourism Development ($\beta = 0.448$, $p < 0.001$), confirming H3.

Table 5
Direct effects

	Variables	Coefficients	P
Entrepreneurship Education	-> Startup	0.275	0.001
Entrepreneurship Education	-> Sustainable Tourism Development	0.418	0.001
Startup	-> Sustainable Tourism Development	0.448	0.001

Source: Data Processing Results, 2025

Table 6
R-squared result

	Entrepreneur	Startup	STD
R-Squared		0.075	0.462
Adj. R-squared		0.069	0.454

The R² value indicates the proportion of variance in the endogenous construct explained by its predictor variables. As shown in Table 6, the R² value for Startup is 0.075, indicating that Entrepreneurship Education explains 7.5% of the variance in Startup. Meanwhile, the R² value for Sustainable Tourism Development is 0.462, indicating that Entrepreneurship Education and Startup jointly explain 46.2% of the variance in Sustainable Tourism Development.

Indirect Effects

The mediation analysis results presented in Table 7 indicate that the indirect effect of Entrepreneurship Education on Sustainable Tourism Development through Startup is positive and statistically significant ($\beta = 0.123$, $p = 0.019$). These findings confirm that Startup significantly mediates the relationship between Entrepreneurship Education and Sustainable Tourism Development, thereby supporting H4.

Table 7
Total effects

	Entrepreneur	Startup	STD	sig.
Total effects			-	
startup	0.123	-	-	0.019
Sustainable tourism development			-	

Model Goodness-of-Fit Assessment

The structural model was further evaluated using WarpPLS model to fit indices to determine whether the proposed model adequately represented the observed data.

The next stage is to conduct a structural evaluation (inner *model*) which includes a model fit test, path *coefficient*, and model fit R, there are 8 test indices, namely *average path coefficient (APC)* <0.05 , *average R-squared (ARS)* <0.05 , *Average adjusted R-squared (AARS)* <0.05, *average variance factor (AVIF)* < 5, *Simpson's paradox ratio (SPR)* > 0.7, *R-squared contribution ratio (RSCR)* > 0.9, *Statistical suppression ratio (SSR)* > 0.7, *NLBCDR* > 0.7. (Mahfud & Dwi, 2013). The following are the output results of the fit indices model presented in Table 8.

As presented in Table 8, all model fit indices satisfy the recommended WarpPLS criteria. APC, ARS, and AARS are statistically significant ($p < 0.001$), while AVIF, SPR, RSCR, SSR, and NLBCDR all meet the recommended threshold values.

Table 8
Model fit indices

Fit Indices	Index	P -Value	Criteria	Caption
Average Path Coefficient (APC)	0.380	p < 0.001	p < 0.05	Accepted
Average R-squared (ARS)	0.269	p < 0.001	p < 0.05	Accepted
Average adjusted R-squared (AARS)	0.261	p < 0.001	p < 0.05	Accepted
Average Variance Inflation Factor (AVIF)	1,057		AVIF < 5	Accepted
Simpson's paradox ratio (SPR)	1,000		SPR > 0.7	Accepted
R-squared contribution ratio (RSCR)	1,000		RSCR > 0.9	Accepted
Statistical suppression ratio (SSR)	1,000		SSR > 0.7	Accepted
NLBCCR	1,000		NLBCCR > 0.7	Accepted

Source: Data processing results, 2025

These findings indicate that the proposed structural model demonstrates an acceptable overall model fit and is therefore suitable for hypothesis testing.

Coefficient of Determination (R²)

The coefficient of determination (R²) indicates the proportion of variance in each endogenous construct that is explained by its predictor variables. Higher R² values indicate greater explanatory power of the structural model. The adjusted R² values for each endogenous construct are presented in Table 9.

Table 9
Adjusted R² values of endogenous constructs

Latent Variables	Adjusted R Square	Conclusion
Startup	0.069	low
Sustainable tourism development	0.454	Tall

Source: Data processing results, 2025

As presented in Table 9, the adjusted R² value for Startup is 0.069, indicating that Entrepreneurship Education explains 6.9% of the variance in Startup. Meanwhile, the adjusted R² value for Sustainable Tourism Development is 0.454, indicating that Entrepreneurship Education and Startup jointly explain 45.4% of the variance in Sustainable Tourism Development. These findings suggest that the proposed model has relatively low explanatory power for Startup and moderate explanatory power for Sustainable Tourism Development.

Structural Model Path Analysis (SEM WarpPLS)

To illustrate the structural relationships among Entrepreneurship Education, Startup, and Sustainable Tourism Development, the estimated structural model generated using WarpPLS is presented in Figure 3.

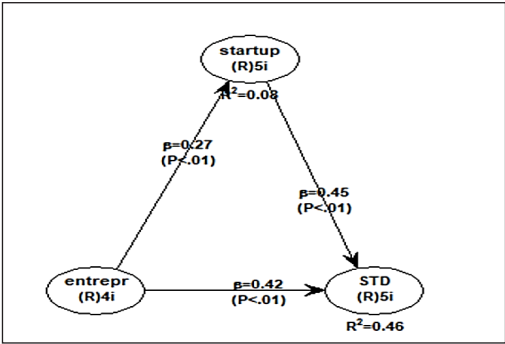


Figure 3. Structural model results and WarpPLS calculation results

The structural model was estimated using WarpPLS to examine the direct and indirect relationships among Entrepreneurship Education, Startup, and Sustainable Tourism Development. In this model, Entrepreneurship Education acts as the exogenous variable, Startup as the mediating variable, and Sustainable Tourism Development as the endogenous variable. The structural equations are expressed as follows.

$$\begin{aligned} S &= P_1 EE + e_1 \\ STD &= P_1 EE + P_1 S + e_1 \\ STD &= \text{Sustainable tourism development} \\ S &= \text{Startup} \\ EE &= \text{Entrepreneurship Education} \end{aligned}$$

Based on the WarpPLS estimation results, the structural equations are as follows:

$$\begin{aligned} S &= 0.27 + e_1 \\ STD &= 0.42 + 0.45 + e_1 \end{aligned}$$

The structural equations indicate the following relationships:

1. The path coefficient of Entrepreneurship Education on Startup is positive ($\beta = 0.275$),

indicating that higher levels of Entrepreneurship Education are associated with higher levels of Startup development.

2. The path coefficient of Entrepreneurship Education on Sustainable Tourism Development is positive ($\beta = 0.418$), indicating that Entrepreneurship Education contributes positively to Sustainable Tourism Development.
3. The path coefficient of Startup on Sustainable Tourism Development is positive ($\beta = 0.448$), indicating that higher Startup development contributes positively to Sustainable Tourism Development.

DISCUSSION

Entrepreneurship Education has a Positive and Significant Influence on Startups

The results indicate that Entrepreneurship Education has a positive and significant effect on Startup ($\beta = 0.275$, $p < 0.001$). Therefore, Hypothesis 1 is accepted.

These findings indicate that the implementation of entrepreneurship education in higher education not only fosters entrepreneurial awareness among students but also significantly contributes to the establishment of innovative startups, particularly those based on local potential. Entrepreneurship education encourages students to develop entrepreneurial mindsets characterised by creativity, adaptability, opportunity recognition, and problem-solving abilities. Through various strategic programmes such as Merdeka Belajar-Kampus Merdeka (MBKM),

business incubation, and practice-based entrepreneurship learning, students not only acquire theoretical knowledge but are also encouraged to transform their business ideas into real entrepreneurial ventures, including digital startups in the tourism sector.

Students who master business model development, market segmentation analysis, and sustainability principles demonstrate greater readiness to establish startups capable of responding to contemporary challenges in the tourism sector. These findings reinforce the important role of Entrepreneurship Education in building a contextually relevant and sustainable entrepreneurial ecosystem within higher education institutions.

Entrepreneurship Education has a Positive and Significant Influence on Sustainable Tourism Development

The results indicate that Entrepreneurship Education has a positive and significant effect on Sustainable Tourism Development ($\beta = 0.418, p < 0.001$). Therefore, Hypothesis 2 is accepted.

The positive relationship between entrepreneurship education and sustainable tourism development confirms the strategic role of higher education in promoting sustainable economic and social transformation. Through entrepreneurship education, students internalise values related to environmental conservation, cultural preservation, and community empowerment, which are subsequently reflected in the business initiatives they develop.

Entrepreneurship education does not merely emphasise economic profit but also encourage students to integrate social and environmental values into entrepreneurial activities. As reported by Sánchez-Limón et al. (2025), entrepreneurship is increasingly developed by both male and female entrepreneurs, demonstrating that entrepreneurial opportunities are becoming more inclusive. Furthermore, entrepreneurial innovation, creativity, and technological advancement contribute significantly to improving educational practices and strengthening sustainable entrepreneurial development (Ansari, 2025). Consequently, entrepreneurship education enables students to integrate Sustainable Development Goals (SDGs) into business initiatives that support inclusive, environmentally responsible, and locally based tourism development.

Startups have a Positive and Significant Influence on Sustainable Tourism Development

The results indicate that Startup has a positive and significant effect on Sustainable Tourism Development ($\beta = 0.448, p < 0.001$). Therefore, Hypothesis 3 is accepted.

These findings suggest that technology-based startups have an important role in transforming the tourism sector into a more efficient, innovative, inclusive, and sustainable system. Students who establish tourism startups utilise digital technologies such as online booking applications, interactive digital maps, tourism information systems, and social media marketing to

increase destination visibility, strengthen local MSMEs, and expand tourism market access.

In addition, startups function as bridges connecting local communities with wider tourism markets while preserving local wisdom and cultural values. Many student-developed startups collaborate with local communities to develop ecotourism, cultural tourism, and traditional culinary tourism that promote environmental sustainability and community welfare. These findings are consistent with Jorzik et al. (2024), who emphasise the strategic role of technology-based startups in tourism transformation. Likewise, Cano and Londoño-Pineda (2020) explain that startups represent an important form of entrepreneurial innovation capable of generating sustainable economic development.

Startups Mediate the Relationship Between Entrepreneurship Education and Sustainable Tourism Development

The results indicate that the indirect effect of Entrepreneurship Education on Sustainable Tourism Development through Startup is positive and statistically significant ($\beta=0.123$, $p = 0.019$). Therefore, Hypothesis 4 is accepted.

These findings demonstrate that Startup significantly mediates the relationship between Entrepreneurship Education and Sustainable Tourism Development. Although entrepreneurship education equips students with entrepreneurial knowledge, competencies, and business perspectives, these competencies require practical

implementation to generate broader impacts on sustainable tourism development. In this study, Startup functions as the medium through which entrepreneurial competencies acquired during the learning process are translated into innovative business initiatives within the tourism sector.

The significant mediating effect indicates that entrepreneurship education contributes more effectively to sustainable tourism development when students are encouraged to establish startups that apply entrepreneurial knowledge in real business activities. Through startup development, students not only become entrepreneurs but also contribute to social, economic, and environmental transformation by creating tourism businesses that emphasise sustainability principles. This finding supports Raman et al. (2025), who argue that entrepreneurship can accelerate the achievement of the Sustainable Development Goals (SDGs) in Indonesia.

Furthermore, the significant mediation pathway (Entrepreneurship Education → Startup → Sustainable Tourism Development) confirms the strategic position of startups in connecting academic learning with the practical needs of sustainable tourism development. Sustainable tourism requires continuous innovation, technological adaptation, and entrepreneurial initiatives capable of creating long-term value for local communities and tourism destinations (Lupoae et al., 2024). Therefore, startups serve as an important mechanism through which entrepreneurship education contributes to sustainable tourism development.

CONCLUSION

This study concludes that Entrepreneurship Education plays an important role in promoting Startup development and Sustainable Tourism Development among university students. The findings demonstrate that Entrepreneurship Education has a positive and significant direct effect on Startup and Sustainable Tourism Development, while Startup also positively contributes to Sustainable Tourism Development. Furthermore, Startup significantly mediates the relationship between Entrepreneurship Education and Sustainable Tourism Development, indicating that entrepreneurial knowledge becomes more effective in supporting sustainable tourism when it is implemented through startup creation.

The findings contribute to the growing body of knowledge on entrepreneurship education by demonstrating the strategic role of startups as a mechanism linking entrepreneurial learning with sustainable tourism development. Practically, the results suggest that higher education institutions should strengthen entrepreneurship education through business incubation programmes, startup development initiatives, and digital innovation to support the achievement of sustainable tourism goals.

This study is limited by its focus on university students and the variables included in the proposed model. Future research is recommended to include additional factors influencing startup development and sustainable tourism, such

as entrepreneurial ecosystems, government support, technological readiness, and institutional collaboration, while involving broader research settings to improve the generalisability of the findings.

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REFERENCES

- Annual report. 2021. *United Nations Environment Programme*. Retrieved May 4, 2025, from <https://www.unep.org/resources/annual-report-2021>
- Ansari, M. S. A. (2025). Innovation and green entrepreneurship are catalysts for sustainability in Oman. *Cleaner Waste Systems*, 11, Article 100281. <https://doi.org/10.1016/J.CLWAS.2025.100281>

- Cano, J. A., & Londoño-Pineda, A. (2020). Scientific literature analysis on sustainability with the implications of open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 6(4), Article 162. <https://doi.org/10.3390/joitmc6040162>
- Chen, P.-J. (2025). Teaching tourism: Innovative, values-based learning experiences for transformative practices. *Journal of Teaching in Travel & Tourism*, 25(1), 70-71. <https://doi.org/10.1080/15313220.2025.2461494>
- Freiberg, B., & Matz, S. C. (2023). Founder personality and entrepreneurial outcomes: A large-scale field study of technology startups. *Proceedings of the National Academy of Sciences*, 120(19), Article e2215829120. <https://doi.org/10.1073/pnas.2215829120>
- Gao, Y., & Lu, J. (2024). Entrepreneurship education and self-efficacy among Chinese college students mediated by harmonious passion and moderated by parental psychological control. *Scientific Reports*, 14(1), Article 31892. <https://doi.org/10.1038/s41598-024-83426-z>
- Global travel & tourism catapults into 2023, says WTTC. (2023). *World Travel & Tourism Council*. Retrieved May 4, 2025, from <https://wttc.org/news/global-travel-and-tourism-catapults-into-2023-says-wttc>
- Huang, J., & Hu, H. (2024). Utilising Yin-Yang approach to strengthen fuzzy front-end activities and manufacturing startups' growth performance. *PLOS ONE*, 19(10), Article e0306779. <https://doi.org/10.1371/journal.pone.0306779>
- Indrianti, Y., Sasmoko, Abdinagoro, S. B., & Rahim, R. K. (2024). A resilient startup leader's personal journey: The role of entrepreneurial mindfulness and ambidextrous leadership through scaling-up performance capacity. *Heliyon*, 10(14), Article e34285. <https://doi.org/10.1016/j.heliyon.2024.e34285>
- Jorzik, P., Antonio, J. L., Kanbach, D. K., Kallmuenzer, A., & Kraus, S. (2024). Sowing the seeds for sustainability: A business model innovation perspective on artificial intelligence in green technology startups. *Technological Forecasting and Social Change*, 208, Article 123653. <https://doi.org/10.1016/J.TECHFORE.2024.123653>
- Li, Q., Zhang, Z., & Xiao, S. (2025). A psychological perspective on entrepreneurship and innovation in universities: The role of educators and tutors in enhancing motivation, interest, and academic success. *Acta Psychologica*, 255, Article 104870. <https://doi.org/10.1016/j.actpsy.2025.104870>
- Li, Y. Y., Wang, R. X., & Yang, C. (2022). Who is more likely to start a business? Analysis of the factors influencing undergraduates' entrepreneurial intentions. *Frontiers in Psychology*, 13, Article 829955. <https://doi.org/10.3389/fpsyg.2022.829955>
- Liu, Y., Li, M., Li, X., & Zeng, J. (2022). Entrepreneurship education on entrepreneurial intention: The moderating role of personality and family economic status. *Frontiers in Psychology*, 13, Article 978480. <https://doi.org/10.3389/fpsyg.2022.978480>
- Lupoae, O. D., Wilk, V., & Radu, R. I. (2024). Sustainable entrepreneurship in equine services. *Journal of Business Research*, 170, Article 114361. <https://doi.org/10.1016/J.JBUSRES.2023.114361>
- Mahfud Sholihin & Dwi Ratmono. (2013). Analisis SEM-PLS dengan WarpPLS 3.0 : untuk Hubungan Nonlinier dalam Penelitian Sosial dan Bisnis. Yogyakarta. CV Andi Offset. <https://repository.telkomuniversity.ac.id/pustaka/121095/analisis-sem-pls-dengan-warppls-3-0.html>
- McCarthy, P. X., Gong, X., Braesemann, F., Stephany, F., Rizoio, M.-A., & Kern, M. L. (2023). The impact of founder personalities on startup success. *Scientific Reports*, 13(1), Article 17200. <https://doi.org/10.1038/s41598-023-41980-y>

- Norouzi, A., Sadighi, H., Abbasi, E., Fami, H. S., & Aski, H. M. (2023). Strategic analysis of startup ecosystem in Iran's agricultural sector. *Journal of Global Entrepreneurship Research*, 13(1), Article 1. <https://doi.org/10.1007/s40497-023-00346-4>
- Novita, M., S., Hermana, R., & S. (2024). Sustainable tourism business recovery strategies post-pandemic: A case study of Doplang Village tourist destination. *KnE Social Sciences*, 239-251. <https://doi.org/10.18502/kss.v9i6.15271>
- Page, A., & Holmström, J. (2023). Enablers and inhibitors of digital startup evolution: A multi-case study of Swedish business incubators. *Journal of Innovation and Entrepreneurship*, 12(1), Article 35. <https://doi.org/10.1186/s13731-023-00306-y>
- Peixoto, A. R., de Almeida, A., António, N., Batista, F., & Ribeiro, R. (2023). Diachronic profile of startup companies through social media. *Social Network Analysis and Mining*, 13(1), Article 52. <https://doi.org/10.1007/s13278-023-01055-2>
- Phung, T. M. T. (2023). Vietnam fintech industry and government support: A role of fintech entrepreneurial intention. *Public Organization Review*, 125. <https://doi.org/10.1007/s11115-023-00708-2>
- Raman, R., Alka, T. A., Suresh, M., & Nedungadi, P. (2025). Social entrepreneurship and sustainable technologies: Impact on communities, social innovation, and inclusive development. *Sustainable Technology and Entrepreneurship*, 4(3), Article 100110. <https://doi.org/10.1016/J.STAE.2025.100110>
- Rasoolimanesh, S. M., Chee, S. Y., & Ragavan, N. A. (2024). From mindset to practice: How employees' attitudes impact tourism businesses' sustainability practices. *International Journal of Hospitality & Tourism Administration*, Advance online publication. <https://doi.org/10.1080/15256480.2024.2344224>
- Sá, C., Cowley, S., & Husain, A. (2025). Who becomes an entrepreneur after university? Evidence from Canada. *PLOS ONE*, 20(1), Article e0308949. <https://doi.org/10.1371/journal.pone.0308949>
- Sánchez-Limón, M., Severino-González, P., Rebolledo-Aburto, G., Dote-Pardo, J., & Scott-Kinney, I. (2025). Female entrepreneurship and sustainability: Behavioral insights and sustainable development goals. *Sustainable Futures*, Article 100695. <https://doi.org/10.1016/J.SFTR.2025.100695>
- Santos, V., Sousa, M. J., Costa, C., & Au-Yong-Oliveira, M. (2021). Tourism towards sustainability and innovation: A systematic literature review. *Sustainability*, 13(20), Article 11440. <https://doi.org/10.3390/su132011440>
- Savin, I., Chukavina, K., & Pushkarev, A. (2022). Topic-based classification and identification of global trends for startup companies. *Small Business Economics*, 60(2), 659-689. <https://doi.org/10.1007/s11187-022-00609-6>
- Shao, K., Ma, R., Zhao, L., Wang, K., & Kamber, J. (2022). Does cyberspace foster the entrepreneurship of women with children in rural China? *Frontiers in Psychology*, 13, Article 1039108. <https://doi.org/10.3389/fpsyg.2022.1039108>
- Stefia, C. M., Haryanto, B., Wahyudi, L., & Setiawan, A. I. (2024). The impact of dynamic marketing capabilities (DMCs) and strategic information management (SIM) on international start-up success: A meta-narrative analysis. *Heliyon*, 10(23), Article e40541. <https://doi.org/10.1016/j.heliyon.2024.e40541>
- Szathmári, E., Varga, Z., Molnár, A., Németh, G., Szabó, Z. P., & Kiss, O. E. (2024). Why do startups fail? A core competency deficit model. *Frontiers in Psychology*, 15, Article 1299135. <https://doi.org/10.3389/fpsyg.2024.1299135>

- Usman, M. A., & Sun, X. (2023). The impact of digital platforms on new startup performance: Strategy as moderator. *Heliyon*, 9(12), Article e22159. <https://doi.org/10.1016/j.heliyon.2023.e22159>
- UN Tourism. (2023). *World Tourism Barometer: January 2023*. <https://en.unwto-ap.org/news/tourismbarometer-jan2023/>
- Wu, L., Jiang, S., Wang, X., Yu, L., Wang, Y., & Pan, H. (2022). Entrepreneurship education and entrepreneurial intentions of college students: The mediating role of entrepreneurial self-efficacy and the moderating role of entrepreneurial competition experience. *Frontiers in Psychology*, 12, Article 727826. <https://doi.org/10.3389/fpsyg.2021.727826>