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ANALYSIS OF THE ROLE OF ENTREPRENEURSHIP EDUCATION AND DIGITAL LITERACY IN IMPROVING THE SUSTAINABILITY OF MSMEs IN INDONESIA

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Abstract

Entrepreneurship education plays a vital role in encouraging the sustainability of Micro, Small, and Medium Enterprises (MSMEs) amid rapid digital transformation and green economic demands. This study aims to analyze the contribution of entrepreneurship education to the sustainability of MSMEs in Indonesia by integrating the *Triple Bottom Line* framework (economic, social, and environmental aspects). Through a *mixed-methods approach* that brings together regression quantitative data analysis and structural equation modeling (SEM-PLS) as well as qualitative analysis of case studies on MSME actors in various regions, this study evaluates the dynamics of entrepreneurial learning. The results of the quantitative analysis showed that entrepreneurship education had a significant direct effect on business sustainability with a path coefficient ranging from 0.249 to 0.894. The synergy between entrepreneurship education and digital literacy as a moderating variable can significantly increase the model determination coefficient. However, the analysis of the *Triple Bottom Line* dimension detected a sharp disparity, where the environmental (*planet*) and economic (*profit*) dimensions are still in the medium to low category compared to the social dimension (*people*). This is due to the conventional educational approach that is too oriented to short-term profits and the complexity of green certification procedures for small-scale business actors. This study recommends restructuring the national entrepreneurship curriculum towards an *experiential learning method* oriented towards SDGs in order to build dynamic capabilities and environmentally friendly technology readiness in an inclusive manner.

Keywords: Entrepreneurship Education, MSME Sustainability, Triple Bottom Line, Digital Literacy, Experiential Learning.

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) are the main pillars of the national economy in Indonesia. This sector is not only a social safety valve through massive labor absorption, but also an engine of Gross Domestic Product (GDP). Based on data from the Central Statistics Agency (BPS) until the first quarter of 2026, the number of MSME business actors in Indonesia has exceeded around 59 million business units. The scale of the spread of MSMEs is dominated by the West Java region with a total of 5.4 million units, followed by East Java with 4.58 million units, and Central Java with 4.45 million units. In response to the massive number of business actors, the government officially launched the Micro, Small, and Medium Business Service Application System (SAPA-MSMEs) in May 2026 to integrate data, services, and access to financing across agencies.

Despite having a large strategic contribution, the MSME sector in Indonesia is still faced with high operational vulnerabilities. Economic fluctuations and fierce competition in the era of the digital ecosystem require business actors to continue to adapt. However, the real portrait shows that most MSME actors do not have a solid managerial capacity to maintain the continuity of their business. Data shows that only about 19% of MSME actors in Indonesia have more than five years of operational experience, while the rest are vulnerable to early bankruptcy. This vulnerability is rooted in low levels of financial and managerial literacy, where only one in five business actors understand basic accounting

concepts such as net profit calculation and debt management. In addition, only 8% of MSME actors have accessed formal entrepreneurship training.

1 The challenge of business continuity is increasingly complex with the global demand to adopt sustainable development principles or *Sustainable Development Goals* (SDGs). MSMEs are expected to be able to contribute to the achievement of SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 12 (Responsible Consumption and Production). However, the transition to green practices or the green economy still faces enormous structural barriers. Research from Gadjah Mada University shows that as many as 87.81% of MSMEs in Indonesia have not adopted green business practices. Most of the MSME manufacturing industry (89%) still relies on fossil energy, and only 12% manage their business waste responsibly. This adoption inequality is triggered by the digital divide (73% of MSME actors are not yet digitally literate), limited guarantees for access to financing, and the assumption that green technology systems require high initial investment, ranging from IDR 5 million to IDR 15 million per business unit.

In responding to the dual obstacles in the form of digitalization and ecological demands, entrepreneurship education emerged as a strategic intervention. Entrepreneurship education is no longer just about teaching how to start a business, but should be focused on strengthening the dynamic capabilities of business actors to read market trends, manage risk, and adopt green technologies. In global comparison, integrated programs such as *Start Up Loans* and *Be the Business* in the UK have been shown to increase the sustainability of small businesses by up to 35% in the first three years through a combination of funding assistance and intensive entrepreneurship training. Therefore, the reconstruction of the entrepreneurship education curriculum in Indonesia towards a more tactical, digital, and ecologically sustainable model is an urgent need to ensure that MSMEs not only survive, but also upgrade in a sustainable manner.

6 LITERATURE REVIEW

Human Capital Theory

14 Human capital theory postulates that investment in education, knowledge, and skills will increase the productive capacity of individuals, which in turn increases their efficiency and economic potential. In the context of entrepreneurship, education serves as an instrument for human capital developers who train critical thinking, risk analysis, and rational decision-making in the midst of an uncertain market situation. An increase in human capital is not only obtained from formal schooling, but also through tactical training and practical experience. Business actors with rich human capital tend to have sharper market intuition and are able to formulate effective adaptation strategies to avoid repeated managerial mistakes.

Dynamic Capabilities Theory

7 Dynamic capability theory describes an organization's capacity to intentionally build, integrate, and reconfigure internal and external competencies in order to cope with a highly dynamic changing environment. For MSMEs, dynamic capabilities are reflected in *marketing agility* and speed in responding to digital technology innovations. Entrepreneurship education acts as an *enabler* of dynamic capabilities by equipping entrepreneurs with the ability to detect opportunities, seizing, and *transform traditional business processes towards more modern and environmentally friendly operations* (transforming).

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Organizational Learning Theory

Organizational learning theory distinguishes the learning process into two main forms: *exploratory learning* and *exploitative learning*. Exploratory learning is oriented towards the search for new ideas, technological experimentation, and radical innovation to capture future opportunities. In contrast, exploitative learning focuses on improving the efficiency of existing processes, reducing operational costs, and incremental improvements. The sustainability of MSMEs requires the ability to ambidexterity, namely the capacity of entrepreneurs to balance exploration and exploitation activities in harmony to maintain current financial stability while securing future competitiveness.

Triple Bottom Line (TBL) Based Sustainability Concept

Business *sustainability* is no longer measured solely through the parameters of financial profit, but through the integration of the *Triple Bottom Line* pillar initiated by John Elkington, namely:

1. **Economic Aspect (Profit):** Focus on adding value, cost efficiency, sound cash flow management, and ethical market share growth.
2. **Social Aspect (People):** Concerns ethical responsibility for employee welfare, ensuring occupational safety, and active contribution to the local community around the operational area.
3. **Environmental (Planetary) Aspect:** Requires business actors to reduce carbon emissions, adopt new and renewable energy, and apply the concept of circular economy in production waste management.

In a society with strong collectivist values such as Indonesia, the social dimension (*people*) is often prioritized in daily practice, but is often not supported by a stable economic dimension (*profit*), thus threatening the survival of the business itself. In addition, the integration of Islamic economic principles such as zakat, alms, and fair transaction ethics can enrich the implementation of TBL by providing a deeper dimension of blessing and social justice to MSME operations.

METHOD

This study uses a *mixed-methods approach* through sequential explanatory strategies to evaluate the impact of entrepreneurship education on the sustainability of MSMEs in Indonesia. Quantitative data collection was first carried out to map the strength of influence between variables, which was then deepened through qualitative analysis of case studies to understand sociological and practical mechanisms in the field.

Quantitative data was compiled from the results of a structured survey on several sample groups of MSME actors in Indonesia, which included active entrepreneurial students ($N = 250$), micro entrepreneurs in the culinary sector ($N = 150$), and fostered business actors in rural areas. Quantitative model testing was carried out using multiple linear regression analysis and *variance-based Structural Equation Modeling* (SEM-PLS). The indicators evaluated included regression coefficient, determination coefficient (R^2), t-test significance level (p-value), and model feasibility value (*Goodness of Fit / GoF*).

Qualitative data were obtained through in-depth interviews, participatory observations, and analysis of sustainability report documents in three selected case studies that represented the characteristics of MSMEs in Indonesia:

1. **Cute By.Me:** Creative MSMEs in the youth craft/fashion sector that integrates practical design innovations with local community collaboration.
2. **UD. Firman:** MSMEs in the broiler chicken farming sector that evaluate the challenges of waste management, dirt odor and social relations with the surrounding community.

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3. **Indonesian Women with Disabilities Association (HWDI):** An experiential *learning-based micro-entrepreneurship training program* to increase the *self-efficacy* of people with disabilities.

Table 1 summarizes the details of the research variables, measurement indicators, and theoretical bases used as analytical instruments in this study.

Variable Name (Code)	Variable Type	Measurement Indicators	Main Theoretical Foundations
Entrepreneurship Education (PK)	Independent (X)	Innovative mindset, basic bookkeeping understanding, risk analysis skills, mastery of daily marketing strategies.	Human <i>Capital Theory</i> .
Digital Literacy (LD)	Moderate (M)	Mastery of digital marketing, management of online transactions, use of QRIS, and utilization of consumer data analytics.	Dynamic <i>Capabilities Theory</i> .
Business Sustainability (KU)	Dependent (Y)	Level of operational innovation, efficiency of internal management, customer satisfaction and loyalty.	Triple <i>Bottom Line Framework</i> (Economic, Social, Environmental).

RESULT AND DISCUSSION

Quantitative Analysis of the Direct Influence of Entrepreneurship Education on Business Sustainability

Based on the results of statistical testing from several empirical databases, consistent evidence was found that entrepreneurship education has a very significant direct positive impact on the sustainability capacity of MSMEs in Indonesia. In a simple linear regression model that isolates the direct influence of entrepreneurship education (X) on business sustainability indicators (Y) in the group of young entrepreneurs, the following estimation equations were obtained:

$$Y = 1.689 + 0.894X + e$$

The regression equation is supported by a very strong significance value, with a t-calculated value of 12.506 ($p < 0.001$). A constant value of \$1.689 indicates a baseline level of sustainability when the training intervention is minimal, while a regression coefficient of \$0.894\$ confirms that every one unit improvement in the quality of

entrepreneurial learning will significantly boost the business resilience of the business actor.

In another study that analyzed micro business actors in the culinary sector using SEM-PLS structural modeling, entrepreneurship education independently recorded a *path coefficient* value of $\beta = 0.249$ (t-statistic = 3.521, $p < 0.01$). Although the value of this coefficient is smaller when compared to the variables of individual creativity ($\beta = 0.335$) and innovation orientation ($\beta = 0.312$), its role remains crucial as a foundation for shaping managerial capabilities. The overall model yielded a determination coefficient value (R^2) of 0.612, indicating that the collaboration of education, innovation, leadership, and creativity factors was able to explain 61.2% of the sustainability variability of micro enterprises, while the rest was influenced by other external factors. To dissect in more detail which dimensions of business sustainability are most influenced by educational interventions, Table 2 presents the achievement scores of business sustainability indicators processed by SPSS data.

Business Sustainability Indicators	Average Score	Median Score	Categories	Theoretical & Practical Implications
Business Innovation	39,11	28,00	Good	Successful entrepreneurship education stimulates the courage of business actors to give birth to product updates and new design variations.
Human Resource Management (HR)	29,23	28,00	Good	Business actors are able to manage the division of teamwork and motivate employees in a more structured manner.
Customer Satisfaction and Loyalty	16,09	28,00	Bad	Budding entrepreneurs still have fundamental weaknesses in building long-term relationships and maintaining consumer retention.

The findings in Table 2 expose a very important tactical gap. Although conventional entrepreneurship education has succeeded in equipping the cognitive aspects to create innovative products and manage internal teams, the existing curriculum still fails to provide practical skills regarding customer relationship *management*. As a result, many new MSMEs are able to create quality products but have difficulty maintaining customer loyalty, so their daily revenue cycle remains unstable.

The Role of Digital Literacy as a Catalytic Moderation Variable

Interaction analysis proves that the benefits of entrepreneurship education will not reach the optimal point if business actors are lagging behind technology. Digital literacy acts as a *moderating variable* that multiplies the impact of entrepreneurial education on business performance.

The results of *moderated regression analysis* showed a very significant increase in the coefficient of determination (Delta $R^2 = 0.15$, $p < 0.01$) when the interaction between the variables of entrepreneurship education and digital literacy was included in the estimation model. MSME actors who have a competitive advantage in these two dimensions recorded business turnover growth and market adaptation agility up to 2.3 times higher than those who only mastered one aspect.

Conceptually, this synergy works through a complementary role sharing mechanism:

- **Entrepreneurship Education as a Strategic Mindset:** Provides in-depth insights into financial governance, business law, market research, and basic pricing strategies.
- **Digital Literacy as a Tactical Toolkit:** Provides daily operational instruments to realize the strategic plan efficiently. A real example is the ability to execute scalable digital marketing campaigns, operate cashless transactions via e-commerce, and manage customer digital databases.

Without the support of digital literacy, entrepreneurs with higher education will only produce business plans on paper that stagnate due to limited physical market reach. On the other hand, mastery of digital technology without being equipped with mature entrepreneurial business logic will only trigger the waste of operational capital due to digital marketing strategies that are not on target.

Evaluation of Disparities in Triple Bottom Line (TBL) Implementation

An in-depth analysis of sustainable business practices in Indonesia detected a wide disparity between the three pillars of TBL. Table 3 shows a comparison of the average index score of TBL dimensions in MSME actors under the guidance of the Yogyakarta SOE House.

Triple Bottom Line Pillar	Average Index Score	Reach Categories	Operational Characteristics in the Field
People (Social Aspect)	2,987	High/Moderate Top	Driven by the collective social values of local culture. Business actors maintain excellent kinship relationships with daily workers and neighboring communities.
Planets (Environmental Aspects)	2,918	Moderate	Basic environmental awareness is beginning to grow, but actions are still limited to simple waste handling that does not

Triple Bottom Line Pillar	Average Index Score	Reach Categories	Operational Characteristics in the Field
			require high costs (such as regular watering of chicken manure).
Profit (Economic Aspect)	2,107	Low	Business actors still experience great difficulties in maintaining neat financial records, stabilizing monthly cash flow, and achieving safe net profit margins.

This disparity in achievement triggers the phenomenon of "hidden vulnerability". The high score of the social dimension (*people*) in Indonesia is a reflection of the culture of mutual cooperation and close community ties, where MSMEs are often established with the noble intention of providing jobs for close families and neighbors. However, this high social commitment is not balanced by adequate financial health (*profit*). Without stable cash flow and healthy profitability, business operations are in danger of stalling halfway through, ultimately triggering layoffs and social losses for the local communities they were initially helped.

This condition is exacerbated by the low adoption of environmental (*planetary*) pillars comprehensively. Many businesses are reluctant to adopt green practices because the procedure for obtaining green certification is considered too convoluted, time-consuming, and requires expensive certification costs for small businesses. In addition, there is a general assumption that green financing is only provided for large-scale renewable energy projects, so MSME actors do not see its relevance to the scale of their business. This low understanding shows that the entrepreneurship education that has been held so far is still too conventional, namely only focusing the material on short-term turnover maximization without integrating environmental risk management and green financial literacy into the core teaching materials.

The Effectiveness of Experiential Learning

To overcome the gap between theoretical mastery and the reality of execution in the field, the methodology for delivering entrepreneurship education materials must be shifted from the one-way method (*classical lecturing*) to *experiential learning*. Based on Kolb's theory, experiential learning provides a much deeper knowledge retention impact because it forces participants to go through a whole learning cycle: act directly, conduct critical reflection, construct new conceptualizations, and retest them in the real market.

Two qualitative case study examples illustrate the advantages of this methodology:

1. **The case of the "Cute By.Me" Creative Community:** This craft MSME implements a direct learning method (*learning by doing*) without requiring its members to take a long formal education. The youth are taught to make aesthetically pleasing handmade products directly and immediately sell them to the local market. The power of social networks and community collaboration has proven to be able to accelerate the exchange of information on market trends, thereby increasing *the resilience* of these micro businesses from market shocks.

2. **Indonesian Women's Disability Association (HWDI) training:** Using a 3-session intervention design developed contextually (Knowing Self-Potential, Basic Management, and Product Communication). Through active simulation methods, self-reflection, and hands-on communication of product excellence, this training has proven to be effective in boosting the *self-efficacy* and readiness to act independently of participants with disabilities who were previously only passive.

Through this *experiential learning* model, entrepreneurship education not only transfers pure cognitive knowledge, but also builds psychological confidence (*self-efficacy*). This confidence in one's ability to manage uncertainty is the determining factor in whether a budding entrepreneur will be able to survive finding creative solutions when facing their first operational failure.

G. Conclusions and Suggestions

Conclusion

This study confirms that entrepreneurship education plays a very strategic role in strengthening the sustainability of MSMEs in Indonesia. Increasing human capital and dynamic capabilities through educational interventions has been proven to make a direct positive contribution to the improvement of the business sustainability index. However, the effectiveness of entrepreneurship education will not reach its maximum point if it runs partially without technology integration. Digital literacy acts as a catalytic moderation variable that multiplies the impact of entrepreneurial education by providing an efficient operational tactical instrument to execute the strategic business plan of business actors in the digital market.

On the other hand, this study also found a sharp disparity in the application of the Triple Bottom Line (TBL) concept in national MSMEs. The social dimension (people) is recorded very high because it is supported by local cultural values, but it is not balanced by a stable economic pillar (profit) and an adequate environmental (planet) pillar. The low adoption of green businesses is triggered by limited start-up capital, lack of technical support, bureaucratic complexity of certification, and conventional entrepreneurship education curriculum that is still biased towards short-term profits. The transformation of learning methodologies towards a contextual and hands-on practice-based experiential learning model has proven to be much more effective in building self-efficacy and operational resilience of MSME actors in the midst of rapidly changing market dynamics.

Suggestions

Tactical and policy recommendations were formulated to strengthen the role of entrepreneurship education for the sustainability of MSMEs in Indonesia:

For Governments and Policymakers:

1. Reforming the national entrepreneurship curriculum at the vocational school and higher education levels by integrating mandatory modules of daily digital literacy, circular economy principles, sustainable business ethics, and basic financial literacy.
2. Simplifying the registration procedure for Business Identification Numbers (NIB) and bureaucracy for environmental product certification for micro businesses, supported by integrated data integration platforms such as SAPA-MSMEs.
3. Allocating special stimulus funds in the form of an environmentally friendly microfinance scheme (SDG Green Microfinance) with low interest rates for MSMEs that are proven to implement green businesses based on the results fostered by educational institutions.

For Educational Institutions and Academics:

1. Abandon one-way theoretical teaching methods and switch to experiential learning-based curriculum designs that require students or trainees to conduct production, marketing, and customer satisfaction evaluation practices directly in the real market.
2. Strengthening the role of campus business incubators as a bridge of triple-helix partnerships that brings together student micro entrepreneurs with professional industry mentors, digital technology providers, and formal financial institutions.

For MSME Actors:

1. Changing the business management approach from instinct-based to data-driven management by recording every daily cash flow in a disciplined manner through digital bookkeeping applications and evaluating customer loyalty periodically.
2. Begin to adopt small green transition steps gradually, such as reducing plastic packaging waste, daily energy efficiency, and utilizing circular local raw materials, which have been proven to be able to cut long-term operational costs while improving the brand's reputation in the eyes of modern consumers.

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