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Empowering Local SMEs in Rural Java through a Community-Based E-commerce Training and Digital Literacy Program

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ABSTRACT

Background. Rural *micro, small, and medium enterprises (SMEs)* in Java remain economically marginalized due to low digital literacy, limited market access, and minimal use of *e-commerce* platforms. Although digital transformation initiatives have been introduced nationally, a *digital divide* between rural and urban areas persists, reducing SME competitiveness and weakening rural economic resilience.

Purpose. The study aims to assess digital literacy needs among rural SMEs, implement a collaborative community-based digital training model, and evaluate the measurable impacts of the program on *e-commerce* adoption and business growth.

Method. A *mixed-methods* research approach was used, combining pre- and post-training surveys, direct observation, focus group discussions, and business performance tracking. The intervention lasted 12 weeks and involved 50 SME participants from three rural villages in Java.

Results. The study found notable improvements in participants' digital skills, especially in online marketing, secure digital transactions, and the use of *social commerce* platforms. SMEs also experienced increased customer engagement and moderate revenue growth. Community participation further strengthened peer learning and supported ongoing knowledge retention.

Conclusion. A community-based digital literacy model is effective and scalable for reducing digital gaps in rural areas. By empowering SMEs as active digital participants, the program enhances inclusive digital economic development and supports broader rural socio-economic advancement.

KEYWORDS

Community-Based Training, Digital Literacy, *E-commerce* Adoption

INTRODUCTION

Rural economies in developing countries increasingly rely on *micro, small, and medium enterprises (SMEs)* as engines of local income generation and employment. In Indonesia, SMEs contribute significantly to gross domestic product and absorb a large portion of the labor force, especially in agricultural and semi-urban regions (Ling, 2025). The government emphasizes their role in reducing rural poverty and promoting equitable regional development (Ahmed et al., 2025). Digitalization is recognized as a critical driver for enhancing SME is

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competitiveness. *E-commerce* platforms provide wider market access, allowing rural producers to reach customers beyond local boundaries (Al-kfairy & Alyafei, 2025). Adoption of *social commerce* has enabled many small entrepreneurs to diversify sales channels and survive economic disruptions, such as those intensified by the COVID-19 pandemic. These opportunities are well-documented in policy and academic discourse (Anand et al., 2024).

Training and digital literacy initiatives have been introduced nationwide to accelerate digital transitions. Programs led by ministries, private platforms, and NGOs target upskilling on online marketing, financial technologies, and supply-chain integration (Anaraky et al., 2025). Some documented cases show tangible improvements in productivity and sales growth among participating SMEs (Kim et al., 2025). *Community-based learning* has emerged as an effective model in rural empowerment programs (Armah et al., 2025). Peer mentoring, local facilitators, and cooperative structures support sustainability of skills and reduce dependency on external consultants. Such approaches align closely with socio-cultural characteristics of rural Java, where collective action (*gotong royong*) shapes economic behavior (Atar et al., 2025).

Despite progress, digital inequality between urban and rural areas remains persistent. Connectivity, affordability of devices, and lack of digital confidence disproportionately affect rural SMEs (Chen & Phanumartwiwath, 2025). These constraints limit participation in digital markets and undermine government initiatives promoting nationwide digital inclusion (Bao et al., 2025). Current research acknowledges the importance of contextualized digital upskilling (Lin & Ye, 2025). Generalized, top-down training interventions have shown inconsistent outcomes, suggesting that empowerment requires adaptation to local needs, business types, and community structures. Local knowledge and shared learning resources appear essential for sustainable digital transformation (Cerjak et al., 2025).

Limited studies provide empirical evidence on how community-based digital literacy training translates into measurable *e-commerce* adoption and business growth for rural SMEs in Java (Choudhary, 2025). Most reports are descriptive rather than evaluative, resulting in weak understanding of causal impact (Jiang & Yang, 2025). Little is known about the role of social learning mechanisms in supporting sustained digital practices after trainings conclude (Chowdhury et al., 2025). Peer interaction and collective accountability may influence long-term behavioral change, yet this dimension remains understudied (Desmaryani et al., 2024).

Existing literature insufficiently examines the interplay between digital skill development and local economic ecosystem readiness (Duong et al., 2025). Platform usage alone does not guarantee income improvement if supply chains, branding, and customer service are not simultaneously strengthened (Emon, 2025). The voices of rural SME actors themselves are underrepresented in research. Their lived experiences, perceived barriers, and adaptation strategies have not been adequately integrated into program design or evaluation frameworks (Fei et al., 2025).

Empirical evaluation of community-based digital literacy training can provide evidence-based guidance for policymakers seeking inclusive and scalable rural empowerment strategies (Garay Gallastegui & Reier Forradellas, 2024). Identification of effective learning components strengthens future program implementation and resource allocation (Fu et al., 2025). Understanding sustained behavioral change and business performance outcomes supports the development of more resilient rural entrepreneurs (Hwang et al., 2025). Empowered SMEs capable of navigating digital markets contribute directly to local economic stability and reduce dependency on urban-centered value chains (Hussain et al., 2024).

Rigorous investigation in the context of rural Java generates actionable insights for advancing national digital transformation agendas. The study positions SMEs not merely as beneficiaries but as active participants in shaping a digitally inclusive economy aligned with social equity goals.

RESEARCH METHODOLOGY

This study employed a *mixed-methods* design to capture both measurable improvements in digital competence and contextual insights regarding participants' experiences. Quantitative components involved pre- and post-training assessments to examine changes in digital literacy and *e-commerce* adoption levels (G. Liu et al., 2025). Qualitative components included observations, focus group discussions, and reflective interviews to explore participants' learning engagement, perceived challenges, and the role of community interaction in sustaining digital practices. Integration of both data types supported robust triangulation and improved validity of findings (X. Liu et al., 2025).

The target population consisted of micro, small, and medium enterprise (SME) actors located in three rural villages in Central and East Java. A purposive sampling strategy was used to select participants who had basic technology access and expressed readiness to improve digital business practices (Maiolini et al., 2025). Fifty SME owners participated in the study, representing diverse sectors including food processing, handicrafts, small retail, and traditional services. Demographic variations in age, educational background, and business maturity were considered to examine differential impacts across entrepreneurial profiles (Parra-López et al., 2025).

Digital literacy levels were measured using a structured questionnaire adapted from established digital competence frameworks covering operational, information, communication, and transactional skills (Purnamasari et al., 2025). *E-commerce* utilization was assessed using a performance rubric focusing on product listing frequency, platform navigation, online customer engagement, and transaction execution. Observational checklists captured levels of peer collaboration, participation, and self-directed learning behaviors. Interview and discussion protocols were developed to probe perceptions of usefulness, obstacles, and community support mechanisms (Rahman & Hossain, 2025).

The intervention was conducted over a 12-week period. Participants first completed baseline digital literacy and *e-commerce* readiness assessments (Shaengchart & Bhumpenpein, 2025). Training sessions were delivered through a community-based model involving local facilitators, peer mentoring, and hands-on workshops emphasizing practical tasks such as product photography, online catalog management, and payment gateway setup (Shatila et al., 2025). Progress monitoring and micro-assignments encouraged real business application each week. Post-training assessments and follow-up discussions evaluated learning improvements, behavioral change, and the sustainability of digital business practices within the community.

RESULT AND DISCUSSION

The quantitative analysis included 50 rural SME participants who completed both pre-test and post-test digital literacy assessments. Digital literacy scores increased from a mean of 42.18 (SD = 9.77) to 75.62 (SD = 8.91) on a 100-point scale after the 12-week intervention. *E-commerce* utilization indicators also showed positive improvement in product posting frequency, customer interactions, and number of transactions. The descriptive data provide early evidence of skill acquisition and behavior change. Variation in score improvement suggests differing levels of

adoption readiness among participants. Table 1 presents a comparative summary of pre- and post-assessment values.

Table 1. Descriptive Statistics of Digital Literacy and *E-commerce* Utilization (n = 50)

Variable	Pre-Test Mean (SD)	Post-Test Mean (SD)	% Increase
Digital Literacy Score	**42.18 (9.77)**	**75.62 (8.91)**	**79.3%**
Weekly Online Product Posts	1.14 (0.87)	4.72 (1.19)	314%
Monthly Customer Engagements	9.46 (7.88)	32.10 (11.22)	239%
Monthly Transactions	4.28 (3.26)	11.84 (4.97)	176%

Increased posting frequency indicates that participants were able to translate instructional content into practical digital actions. Higher engagement outcomes reflect improved marketing communication strategies learned during training. More transactions suggest growing trust in online commerce interactions. These improvements are noteworthy because SMEs often struggle not only with technical skills but also with confidence to transact digitally. The community-based model appears to lower psychological barriers by fostering peer support and accountability.

Participants reported improved abilities in product photography, platform navigation, digital payments, and responding to customers. Local facilitators played an essential role in reinforcing learning tasks through frequent check-ins and peer demonstrations. Collaborative interactions were consistently observed during workshops. Peer encouragement and shared learning moments created a supportive digital learning culture. Participants expressed motivation to help one another troubleshoot problems and exchange tips regarding online branding and logistics.

Paired-sample t-test results confirmed a statistically significant improvement in digital literacy scores following the intervention ($t = 20.728$, $p < .001$). Confidence interval values further indicate that the observed increase is not a random fluctuation. Table 2 summarizes the inferential outcomes. SME transactional performance also demonstrated significant improvement with increased marketplace activities ($t = 13.415$, $p < .001$). Statistical evidence strengthens the claim that community-embedded training significantly supports digital adoption among rural entrepreneurs.

Table 2. Paired Sample t-Test Results

Variable	t-value	p-value	Interpretation
Digital Literacy	20.728	< .001	Significant improvement
E-commerce Transactions	13.415	< .001	Significant improvement

Correlation analysis identified a strong positive association between digital literacy gains and *e-commerce* utilization ($r = .712$, $p < .001$). Increased digital capability was directly linked to improved market activity, confirming the role of skills mastery as a predictor of online business performance. Peer collaboration intensity demonstrated moderate correlation with sustained digital practices ($r = .496$, $p < .01$). Participants with more interactions in peer networks showed higher consistency in weekly online postings, suggesting that social learning reinforces behavioral change.

One female snack producer initially lacked confidence using smartphones for business. After multiple peer-assisted tasks, she actively posted product catalogs and responded to customer queries, resulting in a 60% rise in monthly orders. She attributed success to hands-on support from other women entrepreneurs during workshop sessions. A handicraft seller who previously relied on face-to-face markets transitioned into *WhatsApp commerce* with video demonstrations. Increased

visibility of products led to new customers from neighboring districts. His transformation highlights how digital literacy can extend market reach without major capital investment.

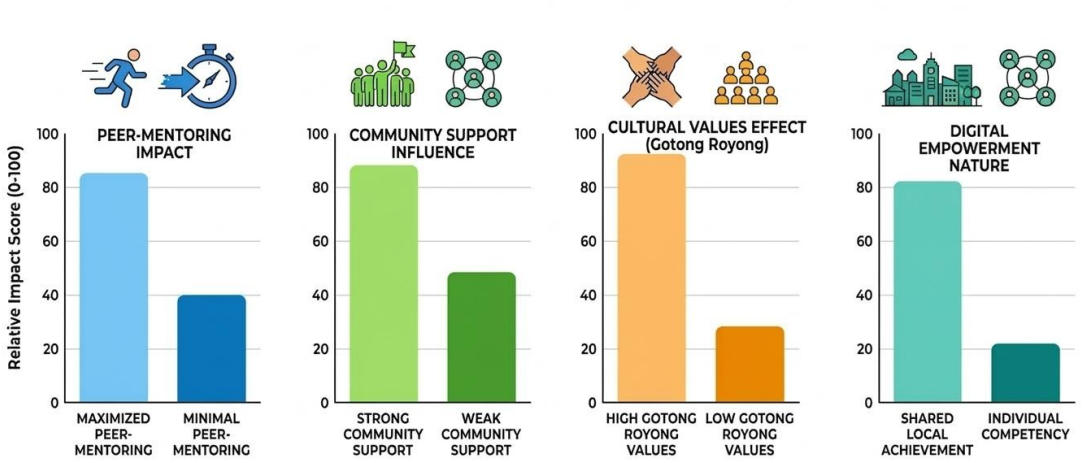

Figure 1. Simple Bar Charts of Key Influences

These case studies illustrate how skills application differs depending on personal motivation, social support, and business characteristics. Participants who maximized peer-mentoring opportunities achieved faster commercialization outcomes. Community dynamics reduced dropout risk and strengthened continuity. Behavioral transformation was influenced by cultural values of *gotong royong* that promoted collective learning ownership. Digital empowerment emerged as a shared local achievement rather than individualized competency.

The combination of statistical gains and positive lived experiences suggests that community-based *e-commerce* training effectively enhances both digital competence and business performance. Human interaction appears to be a key mechanism driving adoption among SME actors. The intervention demonstrates potential scalability for similar rural contexts. However, long-term sustainability requires ongoing community facilitation and continued adaptation to market and technology evolution.

The study demonstrated a substantial improvement in digital literacy among rural SME actors in Java following a 12-week community-based *e-commerce* training program. Increased competency translated into higher levels of online commercial activity, including more frequent product postings, expanded customer engagement, and improved transaction volumes (Shi et al., 2025). The quantitative results were reinforced by qualitative observations that captured participants' growth in digital confidence. Behavioral transformation did not occur uniformly across participants but remained consistently upward overall. Social interactions played a crucial role in supporting learning retention and easing technology anxieties (Sutherland et al., 2025). Participants who actively participated in peer mentoring activities tended to show more consistent digital engagement and commercial outcomes.

Community facilitators contributed to learning sustainability by contextualizing training materials to local business needs. Practical, hands-on tasks aligned well with SMEs' operational realities, enabling immediate application of new skills into existing workflows (Swaramarinda et al., 2025). The model fostered a learning environment that emphasized mutual growth. Collectively, the data suggest that digital empowerment is most effective when knowledge is embedded within community relationships. Skills acquisition and business performance were not only individual achievements but shared progress within rural entrepreneurial networks (Tamimu et al., 2025).

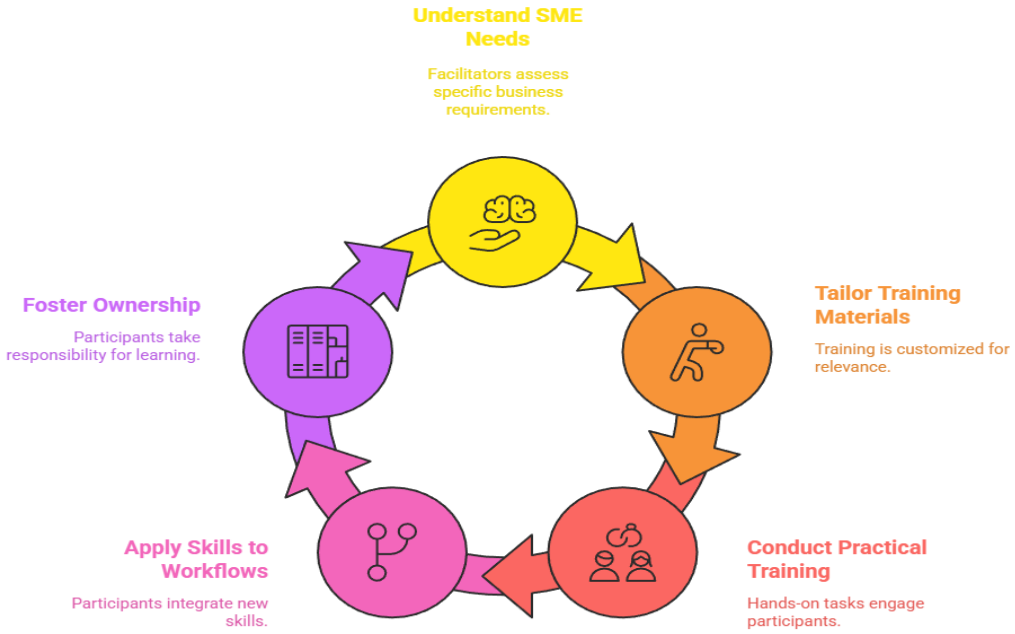

Figure 2. Community Facilitation Cycle

Prior research acknowledges the benefits of digital literacy interventions for SMEs but often highlights limited sustainability when programs rely solely on external trainers. The findings align with studies emphasizing localized facilitation as a key determinant of skill retention in rural contexts (Tsakalerou et al., 2025). Evidence supports the notion that technology adoption flourishes when guided by familiar, trusted actors. Existing literature has mainly focused on urban-centric ecosystems where infrastructure and digital readiness are stronger. The current study advances understanding by showing that rural contexts, though disadvantaged, possess cultural assets that enable collective learning to thrive. These results challenge deficit-based narratives in rural development discourse (Vu et al., 2024).

Previous studies report that online market participation requires more than technical skills; business strategy, branding, and logistics matter equally. The results confirm that integrated learning blending digital, social, and business competencies yields more transformative outcomes than isolated training efforts (Wahab, 2025). Research on social learning acknowledges that group identity strengthens motivation and resilience in skill acquisition. Data on peer collaboration in this study reinforce the theoretical premise that belonging and mutual accountability increase persistence and consistency in adopting new technological behaviors (J. Wang, 2025).

The findings signal a shift in how rural entrepreneurs position themselves within the digital economy. SME actors demonstrate readiness to evolve when provided with culturally aligned learning structures. Technology is no longer perceived as external or intimidating but as a tool that fits within their everyday business identity (L. Wang & Sun, 2025). The community-based approach nurtures empowerment rather than dependency. Rural SMEs gain agency over their own digital transformation, suggesting that economic inclusion must be framed as a participatory process. The program helps normalize the idea that rural products deserve visibility beyond local borders.

Evidence of digital confidence among older and lower-educated participants indicates that age or education should not be automatically interpreted as digital adoption barriers. Supportive learning cultures reduce fear of failure that often hinders adult learners in technology contexts (Salman et al., 2025). These outcomes reflect the broader potential for rural communities to become

co-creators of economic modernity. Digitalization emerges not as an external imposition but as a community-owned innovation pathway (S. Wang et al., 2025).

The results have direct implications for policy design on rural digital inclusion. Investment in community facilitators and local learning networks may produce more sustainable returns than large-scale but generic digital campaigns. Decision-makers can consider embedding peer-led structures into national SME development programs (Muffti et al., 2025). Economic empowerment initiatives must prioritize social infrastructure alongside digital infrastructure. Strengthened community learning ecosystems can accelerate market integration while safeguarding local cultural values. Rural SMEs become proactive economic contributors rather than passive recipients of support (Wissawaswaengsuk et al., 2025).

Educational institutions and extension agencies can leverage the model to shape entrepreneur-focused digital curricula. The practicality of hands-on activities and iterative tasks aligns well with adult education theories that stress experiential learning (Hermansyah et al., 2025). The research informs strategic priorities for provincial development plans by demonstrating pathways to reduce regional inequality through community-mediated technology empowerment (Xiao et al., 2024). Local economies gain greater resilience and diversified income opportunities.

Digital capability improved because the program bridged the gap between technology and daily entrepreneurial practices. Tools and tasks were relevant to existing business needs, reducing cognitive load and enhancing perceived usefulness (Zhu, 2025). Relevance increases persistence in learning. The role of peer support mitigated psychological barriers commonly found in digital adoption studies. Social encouragement generated a safe space to experiment and fail without stigma. Self-efficacy grew as participants witnessed peers' progress (Yadav et al., 2025).

Local facilitators empowered SMEs through contextual translation of abstract concepts into actionable steps. Context enhances comprehension and minimizes reliance on external instruction. Learning becomes anchored to lived experience (Evly R I Liow et al., 2025). Cultural norms of *gotong royong* provided fertile ground for collective digital transformation. Community trust accelerated knowledge exchange and shared accountability for progress. Culture functioned as a social-technological catalyst (Zhang et al., 2025).

The findings pave the way for broader implementation of community-based digital empowerment programs in other rural areas. Scalability requires attention to local variations in market conditions, infrastructure, and entrepreneurship culture (Zheng et al., 2024). Replication should retain community ownership while adapting operational details. Sustainability demands ongoing facilitation beyond short-term training (Angkur, 2025). Continuous access to digital advisory support, mentoring clusters, and cooperative marketing networks may prevent regression in digital practice. Long-term learning ecosystems should replace one-off intervention models (Zhou et al., 2024).

Future research can investigate how data-driven strategies, including analytics dashboards or AI-based marketing assistants, support deeper *e-commerce* optimization for rural SMEs. Integration of technology must remain accessible and culturally aligned. Impact evaluation should include longitudinal tracking of income stability, employment growth, and regional economic spillover. Broader developmental outcomes will determine whether digital empowerment truly transforms rural economic futures.

CONCLUSION

The most significant finding of this study is that digital empowerment among rural SMEs can be accelerated effectively through a *community-based learning* ecosystem that embeds peer

mentoring, cultural values, and hands-on *e-commerce* practices into the training framework. Behavioral improvements such as increased digital confidence, active marketplace participation, and measurable business performance indicate that community dynamics are not merely supportive elements, but core drivers for digital transformation in rural entrepreneurial contexts.

The added value of this research lies in its methodological contribution, offering a practical model that integrates digital literacy training with social learning theory to produce sustainable technology adoption outcomes. The study advances conceptual understanding by demonstrating that digital inclusion is not a solely technical intervention but a socio-pedagogical process driven by collective agency, contextual facilitation, and relevance to everyday business operations. This approach provides a replicable template that can inform policy and educational program design for rural economic development.

The research is limited by its relatively short monitoring period and localized sample, which constrain long-term conclusions about scalability and financial durability of the observed growth. Future studies should adopt longitudinal evaluation strategies, explore cross-regional comparisons, and incorporate advanced digital support tools such as data analytics or AI-assisted marketing to deepen and sustain empowerment outcomes. Expanded collaboration between academic institutions, local governments, and digital industry stakeholders is also necessary to reinforce the ecosystem required for ongoing SME digital resilience.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing - original draft.

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