

Regional Potential-Based Strategies to Enhance Vocational Education Effectiveness in Smk Development on the East Coast of Aceh

Syukurdi M¹, Badaruddin², Suwardi Lubis³, Charloq⁴

Abstract

Vocational high schools (SMKs) are essential in enhancing human resource quality by aligning education with regional potential. However, on the East Coast of Aceh, graduates frequently face long waiting periods for employment due to local industries' preference for external recruits. This study examines the potential for SMK development based on regional potential and identifies priority strategies to improve their effectiveness. Simple linear regression was used to evaluate the relationship between SMK graduate outcomes and competency alignment with market demands, while the Analytical Hierarchy Process (AHP) determined key priorities, focusing on leadership (weight: 0.421) and school governance improvement (weight: 0.397). The findings reveal that 81% and 82% of graduates work within their expertise locally and outside Aceh, respectively, while 87.3% and 88.85% work outside their fields in Aceh and beyond. Moreover, 85.4% pursue higher education or formal service, 32% engage in entrepreneurship, and 45.1% remain unemployed. These outcomes indicate a need for improved alignment between education and local industry demands. Recommended strategies include curriculum adjustments to incorporate local economic sectors such as agribusiness, fisheries, and tourism, strengthening collaborations between SMKs and industries, and enhancing local government support. This study underscores the importance of sustainable, regionally relevant SMK development to improve graduate employability and competitiveness in both local and national labor markets.

Keywords: *Vocational Education, Regional Potential, East Coast of Aceh, Vocational High Schools.*

Introduction

Vocational education plays a critical role in developing high-quality, competitive human resources, particularly in developing countries like Indonesia. One of its primary objectives is to produce workforce-ready graduates capable of meeting labor market demands and supporting national economic growth (Sumantri et al., 2019; Indriaturrahmi, 2016). In this context, vocational high schools (SMKs) serve as strategic institutions that not only prepare students for employment but also enhance skillsets aligned with industry needs and regional potential (Rizkiyah, 2015; Maharani et al., 2021).

However, significant challenges exist in aligning vocational education with labor market demands in Indonesia. The gap between graduates' competencies and the requirements of local industries remains a major issue, contributing to high unemployment rates and job mismatches (Nugroho et al., 2021; Mukhadis et al., 2018). In the East Coast of Aceh region—encompassing East Aceh Regency, Aceh Tamiang Regency, and Langsa City—this issue is particularly pronounced, despite the region's abundant potential in agriculture, fisheries, and energy, which remains underutilized in the vocational education system (Nurlina et al., 2019; BPS Aceh Timur, 2023).

As an area rich in economic potential, the East Coast of Aceh presents significant opportunities to leverage vocational education as a strategic tool for regional development. According to the Central Bureau of Statistics (2023), the agriculture and fisheries sectors contribute 42.78% of East Aceh Regency's Gross Regional Domestic Product (GRDP) and 38.22% of Aceh Tamiang Regency's GRDP. However, this contribution is not supported by skilled local workers from SMKs, leading to a reliance on external labor (Wicaksana et al., 2013; Teja, 2015).

¹ Rural Area and Development Program, Universitas Sumatera Utara, Medan, Indonesia

² Rural Area and Development Program, Universitas Sumatera Utara, Medan, Indonesia, Email: badaruddin@usu.ac.id, (Corresponding Author)

³ Rural Area and Development Program, Universitas Sumatera Utara, Medan, Indonesia.

⁴ Rural Area and Development Program, Universitas Sumatera Utara, Medan, Indonesia

This skills gap can be explained through the Skill Gap Theory, which highlights the misalignment between vocational curricula and labor market needs as a primary cause of job mismatch (Suryani, 2015; Kilpatrick, 2004). The high percentage of SMK graduates working outside their fields, both within and outside Aceh, underscores the imbalance between the education system and labor market dynamics (Nurtanto & Ramdani, 2016; Nugroho et al., 2021). This situation calls for an urgent curriculum reform to make SMK programs more responsive to regional needs and potentials.

To address these challenges, local potential-based education planning emerges as a recommended solution. The Human Capital Theory posits that investment in education tailored to local potential results in competent workers who contribute to economic growth (Becker, 1994; Babatunde & Adefabi, 2005). On the East Coast of Aceh, this approach can be operationalized by integrating key sectors such as fisheries, agriculture, and tourism into SMK programs (Mukhadis et al., 2018; Nurlina et al., 2019).

The development of SMKs based on local potential aligns with Dewey's concept of vocational education, which emphasizes contextual and experiential learning (Dewey, 1938; Indriaturrahmi, 2016). Implementing this approach requires not only curriculum adjustments to meet industrial needs but also close collaboration between local governments, businesses, and educational institutions (Jemorang et al., 2021; Electiana et al., 2016).

Furthermore, developing SMKs on the East Coast of Aceh must incorporate sustainability principles, as advocated by the Sustainable Development Theory. By focusing on sustainable resource management, vocational education can support regional economic resilience while preserving the environment (Popescu & Diaconu, 2009; UNESCO, 2016). This ensures that SMK graduates are not only job-ready but also capable of contributing to an inclusive and sustainable economic ecosystem.

Given these challenges and opportunities, this study aims to analyze the development of SMK institutions based on local potential in the East Coast of Aceh. It also seeks to formulate priority strategies to enhance the relevance and effectiveness of vocational education in the region. Through a comprehensive approach, the findings of this research are expected to contribute significantly to education development, unemployment reduction, and local economic strengthening (Teja, 2015; Irwanto, 2022).

By providing strategic recommendations, this study seeks to advance the development of local potential-based SMKs in the East Coast of Aceh. These recommendations aim not only to improve the quality of vocational education but also to promote inclusive and sustainable regional economic growth. Ultimately, this research aspires to serve as a reference for policymakers, educational institutions, and stakeholders in designing relevant and adaptive educational models for local needs (Rajab & Rusli, 2019; Wagiran, 2010).

Research Method

Research Methodology

Type of Research

This study employs a quantitative approach using descriptive and analytical methods to examine the relationship between local potential-based vocational high schools (SMKs) and graduate outcomes in the East Coast of Aceh. Quantitative data are analyzed through inferential statistics, while qualitative data, converted into numerical forms (scoring), support the quantitative interpretation. This approach is deemed suitable for measuring inter-variable relationships and identifying priority strategies for developing SMKs based on regional potential (Creswell, 2014; Moleong, 2010).

Research Location and Period

The research was conducted in the East Coast of Aceh, covering East Aceh Regency, Aceh Tamiang Regency, and Langsa City. This area was purposively selected due to its significant economic potential in sectors such as fisheries, agriculture, and tourism, which are relevant for developing SMKs tailored to local

potential. Data collection took place throughout 2023, utilizing both primary and secondary data from various relevant sources (BPS Aceh, 2023; Irwanto, 2022).

Population and Sample

The research population includes school principals, teachers, SMK students, business and industrial sectors (DuDi), and relevant policymakers in the East Coast of Aceh. The total identified population is 9,124 individuals. The sample size was determined using Slovin's formula with a 95% confidence level and a 5% margin of error, resulting in 422 respondents. Sample distribution was proportional to the population in each unit (Supranto, 2000; Hendryadi & Suryani, 2015).

Research Instruments

The instruments used include structured questionnaires and in-depth interviews. The questionnaires were designed to measure respondents' perceptions of local potential-based SMK development and graduate distribution outcomes (Y1 to Y7). In-depth interviews were conducted to explore challenges and opportunities in SMK development within the region. Supporting data were obtained from documents and tracer study reports (Moleong, 2010; Creswell, 2014).

Data Collection Techniques

- **Primary Data**

Primary data were collected through questionnaires and direct interviews with respondents, including school principals, teachers, SMK students, DuDi representatives, and policymakers. These data reflect perceptions and experiences regarding local potential-based SMK development.

- **Secondary Data**

Secondary data included SMK tracer study reports, statistical data from BPS Aceh, and education planning and policy documents from the East Coast of Aceh. These data provided contextual support for the main analysis.

Data Analysis

- **Simple Linear Regression**

Simple linear regression was used to examine the relationship between the number of SMK graduates (independent variable, X) and graduate outcomes (dependent variables, Y1 to Y7). This analysis aimed to determine the extent to which local potential-based SMK development influences graduate placement according to their competencies (Gujarati, 2012).

- $Y_{ij} = \beta_0 + \beta_1 X_i + \epsilon_{ij}$

- **Chi-Square Test**

This test examined relationships between nominal variables, such as graduate outcome categories and graduate distribution in the research area. It helped identify significant associations between vocational education and career paths (Hussain et al., 2015).

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

- **Analytic Hierarchy Process (AHP)**

AHP was employed to prioritize strategies for improving SMK management effectiveness. Data were gathered through Focus Group Discussions (FGDs) involving education experts, policymakers, and DuDi practitioners. Pairwise comparisons were used to assign relative weights to each criterion and alternative (Saaty, 1980; Hussain et al., 2015).

Research Variables

- **Independent Variable (X):** Number of SMK graduates in the East Coast of Aceh.
- **Dependent Variables (Y):** Categories of graduate outcomes:

Y1: Employed in Aceh in their field of expertise.

Y2: Employed outside Aceh in their field of expertise.

Y3: Employed in Aceh outside their field of expertise.

Y4: Employed outside Aceh outside their field of expertise.

Y5: Pursuing higher education or civil service institutions.

Y6: Self-employed.

Y7: Unemployed.

Validity and Reliability

Instrument validity was assessed using construct validity, while reliability was measured through Cronbach's Alpha coefficient. Instruments with Cronbach's Alpha ≥ 0.7 were considered reliable for this study (Hair et al., 2010).

Research Ethics

This study adhered to research ethics principles, including respondent consent, data confidentiality, and the use of data strictly for academic purposes. All respondents were informed of the study's objectives before data collection commenced.

With this structured methodology, the study aims to produce valid, reliable, and relevant findings to support the development of local potential-based SMKs in the East Coast of Aceh.

Results and Discussion

Research Location

The East Coast of Aceh, encompassing East Aceh Regency, Aceh Tamiang Regency, and Langsa City, was selected as the study location for its strategic relevance and significant economic potential. Key sectors such as agriculture, fisheries, and light industries contribute substantially to the regional economy, aligning with the goals of vocational high schools (SMKs) to produce graduates with skills tailored to labor market demands.



Figure 1. Research Location

The region's high demand for skilled labor, particularly in its dominant sectors, presents an opportunity for SMK graduates to fill local and regional needs, thereby reducing unemployment rates. Integrating local economic potential—agribusiness, fisheries processing, and tourism—into SMK curricula could enable graduates to transition directly into the workforce.

The East Coast of Aceh also provides a promising environment for developing vocational education based on local potential. With supportive government policies and adequate infrastructure, SMKs in this area can enhance curriculum relevance and graduate competencies. Tracer study data indicate that many SMK graduates in the region work in local sectors or pursue higher education, making this area ideal for analyzing the relationship between vocational education and graduate employability. Insights from this study are expected to offer a model for vocational education development in other regions with similar characteristics.

Regression Analysis Between Variables

Relationship Between X and Y1 (Employed in Aceh Within Expertise)

Regression Equation

$$\hat{Y} = 6,17 + 0,20X$$

- *Coefficient of Determination (R^2): 81.0%*

The results indicate that vocational education in SMKs on the East Coast of Aceh is effective in preparing graduates to work within their fields of expertise locally. Relevant skills in sectors like agribusiness, fisheries, and services contribute significantly to high employment rates. Initiatives such as BLUDs (Regional Public Service Agencies) integrating skill-based business units act as catalysts for job creation aligned with graduate competencies.

Despite the strong relationship, 19% of the variability remains unexplained, likely due to limited formal job opportunities, student preferences for non-field-related work, or disparities in education quality among SMKs. Adapting school management strategies and curricula to align with market needs, including emerging sectors like renewable energy and tourism, could improve outcomes.

*Relationship Between X and Y2 (Employed Outside Aceh Within Expertise)**Regression Equation*

$$\hat{Y}_2 = 1,39 + 0,17X$$

- *Coefficient of Determination R²: 82,2%*

The high percentage of graduates employed in their fields outside Aceh reflects the competitiveness of SMK graduates nationally. Fields like mechanical engineering, IT, and healthcare are particularly sought after in cities such as Medan, Jakarta, and Surabaya.

However, this trend also indicates a labor outflow that could impede Aceh's economic growth. Strengthening ties with local industries and fostering locally-based entrepreneurship could mitigate reliance on external employment. Additionally, incorporating cross-cultural communication and self-management programs in SMKs could better prepare graduates for the challenges of working outside their home region.

*Relationship Between X and Y3 (Employed in Aceh Outside Expertise)**Regression Equation:*

$$\hat{Y}_3 = -2,01 + 0,17X$$

- *Coefficient of Determination R²: 87,3%*

This relationship suggests that many graduates take jobs unrelated to their expertise due to limited local opportunities in their fields. The mismatch between graduate skills and local market needs underscores the necessity of dynamic curriculum adjustments.

The high proportion of graduates working outside their field of expertise in Aceh highlights a mismatch between the skills of SMK graduates and the demands of the local labor market. This phenomenon is often attributed to limited job opportunities relevant to the graduates' areas of expertise. Many graduates, despite holding certifications in specific fields, are compelled to take jobs in the informal sector or unrelated industries to meet economic needs.

This mismatch is further exacerbated by the lack of curriculum adaptation in SMKs to address the dynamic demands of the local job market. For instance, the agribusiness sector may require modern technological management skills, which are not adequately covered in the current curriculum.

To address this issue, strategies should include strengthening collaborations with local businesses and industries (DU/DI) in Aceh, adjusting SMK curricula to align with regional potential, and developing more targeted internship programs. Additionally, enhanced career guidance at the school level is essential to help students better understand available career pathways that align with their expertise. These efforts can bridge the gap between education and the local labor market, improving job alignment and graduate employability.

*Relationship Between X and Y4 (Employed Outside Aceh Outside Expertise)**Regression Equation:*

$$\hat{Y}_4 = -4,91 + 0,16X$$

- *Coefficient of Determination R^2 : 88,5%*
- While graduates finding work outside Aceh may benefit from broader job markets, many work in fields unrelated to their training. This mismatch highlights challenges in aligning SMK curricula with national market demands.

Improving curriculum flexibility and fostering partnerships with industries outside Aceh could help bridge this gap. Training programs focused on adaptable, in-demand skills—such as IT and digitalization—can enhance graduate employability in diverse sectors.

Relationship Between X and Y5 (Pursuing Higher Education or Formal Institutions)

Regression Equation:

$$\hat{Y}_5 = -3,49 + 0,15X$$

- *Coefficient of Determination R^2 : 85,4%*

A significant portion of graduates opts for higher education, indicating awareness of the value of advanced qualifications. This trend aligns with the Human Capital Theory, which emphasizes the importance of education in enhancing competitiveness.

Collaborations between SMKs and higher education institutions, along with scholarship programs, can further support this pathway. Career counseling should also guide students toward suitable educational opportunities aligned with their interests and skills.

Relationship Between X and Y6 (Entrepreneurship)

Regression Equation:

$$\hat{Y}_6 = 2,66 + 0,03X$$

- *Coefficient of Determination R^2 : 32.0%*

Only a small fraction of graduates pursue entrepreneurship. Challenges such as limited access to capital, managerial training, and confidence hinder entrepreneurial ventures.

These figures indicate that only a small proportion of vocational high school (SMK) graduates from the East Coast of Aceh choose entrepreneurship as their primary career path. Although the percentage is relatively low compared to other outcomes, entrepreneurship remains an important option, particularly for individuals with technical skills that can be directly applied in the local market. Skills such as culinary arts, electronics repair, or fashion design offer opportunities for establishing independent businesses.

However, the low percentage also reflects challenges in creating a supportive entrepreneurial ecosystem for SMK graduates. Limited access to business capital, managerial guidance, and entrepreneurship training are key barriers. Additionally, many graduates may lack the confidence to start their own businesses due to insufficient experience or market networks.

To improve these outcomes, integrating entrepreneurship training into SMK education is essential. SMKs can serve as business incubators by providing production facilities, marketing support, and mentorship. Local governments can also facilitate access to capital through microcredit programs or entrepreneurship grants for SMK graduates.

*Relationship Between X and Y7 (Unemployment)**Regression Equation:*

$$\hat{Y} = 0,20 + 0,09X$$

- *Coefficient of Determination R^2 : 45,1%*

Despite the vocational focus of SMKs, unemployment remains a concern, reflecting a skills mismatch with labor market demands. Local industries' limited capacity to absorb skilled workers exacerbates this issue.

These findings suggest that, despite SMKs being designed to prepare students for the workforce, a significant proportion of graduates remain unemployed. The high unemployment rate among SMK graduates highlights a mismatch between the skills taught in SMKs and the demands of both local and national labor markets. It also reflects the limited capacity of the formal sector to absorb skilled labor from SMKs.

This phenomenon aligns with the Mismatch Theory, which identifies skill misalignment between graduates and labor market needs as a primary cause of unemployment. Additionally, the local industrial sector's limited capacity to employ skilled labor further contributes to this issue.

To address this challenge, steps such as aligning curricula with labor market demands, strengthening partnerships with industries, and developing industry-focused internship programs are crucial. Furthermore, reskilling programs for graduates who have not been absorbed into the workforce can help reduce unemployment rates.

Regression results reveal a significant relationship between the number of SMK graduates on the East Coast of Aceh (X) and employment and education outcomes (Y). Each outcome presents unique characteristics and challenges, reflecting the dynamics of local and national labor markets as well as the relevance of SMK curricula. Developing SMKs based on local potential through industry collaboration, curriculum adjustments, and entrepreneurship enhancement is critical to improving the alignment of vocational education with labor market needs.

Summary of Regression and Chi-Square Analysis

Regression and chi-square tests reveal significant relationships between SMK graduate outcomes and regional/local contexts. The findings underscore the importance of aligning SMK development strategies with local and national market demands to enhance the relevance and effectiveness of vocational education.

Table 1. Correlation Coefficient, Significance Level, and Interpretation of Relationships Between Variables

| Variable | Correlation Coefficient (r) | Significance Level (p) | Interpretation |
|----------|-----------------------------|------------------------|----------------|
| Y1 | 0.9 | 0 | Near Perfect |
| Y2 | 0.907 | 0 | Near Perfect |
| Y3 | 0.934 | 0 | Near Perfect |
| Y4 | 0.941 | 0 | Near Perfect |
| Y5 | 0.924 | 0 | Near Perfect |
| Y6 | 0.566 | 0 | Strong |
| Y7 | 0.672 | 0 | Strong |

These findings reinforce the need for targeted policy interventions and enhanced collaboration between SMKs and industries to optimize graduate outcomes.

*Analytical Hierarchy Process (AHP) Analysis**AHP Objectives and Approach*

The AHP analysis was utilized to prioritize strategies for improving the management effectiveness of vocational high schools (SMKs) in the East Coast of Aceh. The process involved evaluations by experts, including school principals, SMK administrators, industry practitioners, and education-focused NGOs. The AHP approach followed these steps:

- **Problem Definition:** Establishing the analysis objective, i.e., strategies for enhancing SMK management effectiveness.
- **Hierarchy of Criteria:** Identifying key criteria and relevant attributes.
- **Comparison Matrix:** Pairwise comparison of criteria elements to derive priority weights.
- **Alternative Evaluation:** Determining the best alternative based on the weighted criteria and attributes.

Hierarchical Structure

The hierarchical structure for strategies to enhance SMK management effectiveness on the East Coast of Aceh includes three levels:

- **Goal:** Improve SMK management effectiveness.
- **Criteria:**
 - Man (Human Resources)
 - Money (Finance)
 - Method (Approach)
 - Material (Learning Materials)
- **Alternatives:**
 - Enhancing School Governance
 - Improving Quality Management
 - Integrating Governance and Quality Management

Priority Results and Criteria Weights

The table below displays the weightings and rankings of each criterion:

Table 2. Weight and Ranking of Criteria for Improving SMK Management Effectiveness

| Criteria | Weight | Rank |
|-----------------------|--------|------|
| Man (Human Resources) | 0.421 | 1 |
| Money | 0.390 | 2 |
| Method | 0.265 | 3 |
| Material | 0.193 | 4 |

The highest weight assigned to "Man" (Human Resources) (0.421) highlights the pivotal role of leadership and educator quality in effective SMK management. Financial management ("Money") ranks second (0.390), emphasizing the need for efficient budget allocation. While "Method" (0.265) and "Material" (0.193) have lower weights, they remain essential for supporting the learning process.

Priority Results and Attribute Weights

The following table outlines the attribute priorities under each criterion:

Table 3. Weights and Rankings of Attributes Under Each Criterion

| Criteria | Attribute | Weight | Rank |
|----------|---------------------|--------|------|
| Man | Leadership | 0.623 | 1 |
| | Student Achievement | 0.499 | 2 |
| Money | Budget Management | 0.508 | 1 |

Leadership in the "Man" category received the highest weight (0.623), emphasizing the importance of school principals in driving changes at SMKs. Student achievement (0.499) reflects the effectiveness of human resource management. For "Money," budget management (0.508) is the primary attribute ensuring program sustainability.

Alternative Priorities and Weights

The table below shows the priority weights for each strategic alternative:

Table 4. Weights and Rankings of Strategic Alternatives for SMK Development

| Strategy | Weight | Rank |
|---|--------|------|
| Enhancing School Governance | 0.397 | 1 |
| Improving Governance and Quality Management | 0.354 | 2 |
| Improving Quality Management | 0.289 | 3 |

"Enhancing School Governance" ranks as the top priority (0.397), reflecting the need to improve transparency, accountability, and management efficiency. "Improving Governance and Quality Management" (0.354) highlights the importance of combining good governance with improved teaching quality.

Attribute-Based Weighting for Alternatives

The table below provides weights for each alternative based on attributes:

Table 5. Weights of Strategic Alternatives Based on Key Attributes

| Attribute | Governance | Quality Management | Governance & Quality Management |
|-------------------|------------|--------------------|---------------------------------|
| Leadership | 0.488 | 0.370 | 0.346 |
| Budget Management | 0.627 | 0.236 | 0.311 |
| School Climate | 0.416 | 0.337 | 0.473 |

Leadership dominates the "Governance" strategy (0.488), underscoring the critical role of school principals in ensuring successful governance. Budget management also plays a vital role in governance (0.627), reflecting the importance of sound financial systems. "Governance & Quality Management" has the highest potential for improving the school climate (0.473), demonstrating the synergy between governance and quality in fostering a conducive learning environment.

Recommended Strategies

Based on the AHP analysis, the following strategies are prioritized for improving SMK management effectiveness in the East Coast of Aceh:

- **Enhancing School Governance:** Focus on improving transparency, accountability, and financial management.
- **Improving Governance and Quality Management:** Combine good governance practices with enhanced teaching quality.
- **Improving Quality Management:** Emphasize teaching and curriculum quality.

These strategies should be implemented incrementally, with emphasis on leadership development, financial management, and fostering a supportive school climate. This approach is expected to strengthen the relevance of vocational education to local and national labor market needs.

Conclusion and Recommendations

The study conducted in the East Coast of Aceh—encompassing East Aceh Regency, Aceh Tamiang Regency, and Langsa City—yielded significant findings regarding the effectiveness of vocational high schools (SMKs) based on local potential. Regression analysis showed that the number of SMK graduates has a significant relationship with various employment and educational outcomes. Most graduates work in their field of expertise in Aceh (81%) and outside Aceh (82%), although a significant proportion work outside their field both in Aceh (87.3%) and outside Aceh (88.5%). The high interest in higher education, civil service, or military careers (85.4%) reflects awareness of the importance of further education. However, the 45.1% unemployment rate among SMK graduates poses a challenge.

The AHP analysis emphasized leadership as a key attribute (priority weight: 0.623) in improving SMK management effectiveness. Enhancing school governance emerged as the top strategic priority (weight: 0.397), followed by a combination of governance and quality management. Aligning SMK curricula with regional economic sectors, such as agribusiness, fisheries, and tourism, provides significant opportunities to enhance graduate competitiveness alongside entrepreneurial programs.

The mismatch between graduate skills and labor market needs underscores the urgency of curriculum reform. SMKs must integrate local potential into their curricula, focusing on skills in agribusiness, fisheries, and tourism aligned with local market needs. This approach will increase the relevance of SMK graduates while expanding their employment opportunities.

Leadership and school governance improvements are critical. Local governments and SMK administrators should strengthen principals' capacities through intensive training while ensuring transparency and accountability. Entrepreneurial programs should be bolstered by offering training, mentorship, and access to capital to encourage graduates to create their own jobs, thus reducing unemployment.

Close collaboration between SMKs and industries is key to bridging the gap between graduate skills and labor market requirements. Partnerships can be facilitated through internships and market-driven training programs, equipping graduates with relevant skills.

To support graduates pursuing higher education, SMKs must collaborate with universities and civil service institutions. Comprehensive career guidance programs are also essential to help students plan their futures. Periodic monitoring and evaluation by local governments will ensure that SMK development programs remain aligned with labor market dynamics.

Through these efforts, SMKs on the East Coast of Aceh are expected to improve their management effectiveness, producing competent, relevant, and competitive graduates for both local and national labor markets.

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