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Principal Transformational Leadership as a Strategic Mechanism for Developing Vocational Students' Entrepreneurial Competency

Finorina Finorina[1*], Saifur Rahman[2], A.A. Iskandar[3], Andala Rama Putra Barusman[4], Habiburrahman Habiburrahman[5]
Universitas Bandar Lampung, Bandar Lampung, Indonesia[1,2,3,4,5]
finorinaroli@gmail.com[1*], iskandar@ubl.ac.id[3], andala@ubl.ac.id[4], habiburahman@ubl.ac.id[5]

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Abstract

Purpose: This study examines the effects of four transformational leadership dimensions on students' entrepreneurial competency in Indonesian public vocational high schools (SMK Negeri) and identifies the most influential dimension.

Research Methodology: A sequential explanatory mixed-methods design was employed. Quantitative data were collected from 90 vocational high school students using a structured Likert-scale questionnaire and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). Semi-structured interviews were subsequently conducted to explain and validate the quantitative findings through methodological triangulation

Results: All four transformational leadership dimensions significantly and positively influenced students' entrepreneurial competency, explaining 71% of its variance ($R^2 = 0.710$). Idealized influence was the strongest predictor, followed by individualized consideration, intellectual stimulation, and inspirational motivation. Qualitative findings reinforced the importance of exemplary leadership, personalized support, innovation, and inspirational vision.

Conclusions: Principals' transformational leadership, particularly idealized influence, plays a strategic role in strengthening entrepreneurial competency among vocational students.

Limitations: The study is limited by its cross-sectional design, relatively small sample, and focus on Indonesian public vocational high schools.

Contributions: This study extends Transformational Leadership Theory and Social Cognitive Theory by highlighting the role of leadership dimensions in developing students' entrepreneurial competencies in vocational education.

Keywords: *Entrepreneurial Competence, PLS-SEM, Transformational Leadership, Vocational Education, Vocational High Schools*

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1. Introduction

State Vocational High Schools (SMKs) are vocational education institutions mandated to prepare graduates who are not only job-ready but also capable of creating employment through entrepreneurial competence. Despite this mission, vocational school graduates continue to contribute disproportionately to Indonesia unemployment rate compared with graduates from other educational levels. This condition indicates that developing students' entrepreneurial competence remains a critical indicator of the effectiveness of vocational education. Entrepreneurial competence is not developed in isolation; rather, it is shaped by the overall school ecosystem, particularly the leadership exercised by school principals. Among various leadership approaches, transformational leadership has been widely recognized as a strategic mechanism that inspires organizational members, encourages innovation, and creates a supportive learning environment conducive to competency development (Ayu, Citra, Agung, Arun, Arianty, & Susanti, 2024). Likewise, transformational leadership has increasingly been recognized as a strategic organizational capability that promotes innovation, adaptability, and sustainable competency development across educational settings (Firmansyah, Chen, Junaedi, Arwani, & Kistyanto, 2022).

Previous studies have consistently highlighted the importance of entrepreneurial competence and educational leadership in improving school outcomes. Latifah, Mahbub, and Ismaili (2022) found that principals' entrepreneurial competence, together with teachers' pedagogical competence, significantly improved students' academic achievement in Indonesian vocational schools. Abubakar, Rifandi, Rahmawati, and Fatimah (2023) demonstrated through Structural Equation Modeling (SEM) that entrepreneurial leadership positively influenced organizational effectiveness and teacher efficacy, while Miço (2023) reported comparable findings in English language training institutions. Within entrepreneurship education, Subhaktiyasa (2024) emphasized that educators must first possess entrepreneurial competence before effectively transferring entrepreneurial knowledge to students. Sasqia, Wahira, and Habibah (2022) further revealed that vocational students already possessed basic digital entrepreneurship knowledge; however, its implementation remained constrained by insufficient institutional support. Meanwhile, Jinke (2024) confirmed that structured entrepreneurial training programs implemented by schools significantly improved vocational students' entrepreneurial skills.

Although these studies provide valuable insights, several important research gaps remain. First, an empirical gap exists because previous studies have predominantly examined the influence of school leadership on teacher performance, teacher efficacy, organizational effectiveness, or school management outcomes, whereas students' entrepreneurial competence has rarely been investigated as the primary endogenous variable (Jinke, Azni, Aziz, & Kadir, 2022). Second, a contextual gap is evident because most international studies were conducted in different educational and sociocultural environments, making their findings difficult to generalize to Indonesian State Vocational High Schools, where entrepreneurship development is a national educational priority (Abubakar et al., 2023; Miço, 2023). Third, a methodological gap remains because many previous studies have relied on descriptive or conventional regression analyses and seldom employed comprehensive structural models capable of simultaneously examining multiple dimensions of transformational leadership and their direct effects on entrepreneurial competence (Firmansyah et al., 2022). Furthermore, although entrepreneurial competence has been widely investigated, the emphasis has primarily been placed on principals or teachers as research subjects rather than students as the ultimate beneficiaries of vocational education (Wahyuni, 2022). Consequently, there is still no comprehensive empirical model explaining how the four dimensions of transformational leadership directly contribute to the development of entrepreneurial competence among vocational students in Indonesia. This unresolved gap forms the principal justification for this study.

The novelty of this study lies in three significant contributions. First, unlike previous studies that primarily focused on teachers or organizational outcomes, this research positions students' entrepreneurial competence as the principal endogenous construct, thereby extending transformational leadership theory into the domain of student competency development. Second, this study simultaneously investigates the effects of the four dimensions of transformational leadership idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration within a

single integrated structural model, providing a more comprehensive understanding of how each leadership dimension contributes to entrepreneurial competence. Third, this research applies Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine measurement validity, construct reliability, and structural relationships simultaneously, offering more robust empirical evidence than the descriptive and regression-based approaches commonly employed in previous vocational education studies (Firmansyah et al., 2022). Collectively, these contributions advance both transformational leadership theory and entrepreneurship education by providing a comprehensive leadership model specifically designed for the Indonesian vocational education context.

Based on these considerations, this study seeks to answer the following research questions: (1) To what extent do the four dimensions of transformational leadership idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration individually and collectively influence students' entrepreneurial competence in State Vocational High Schools? (2) Which transformational leadership dimension contributes most significantly to entrepreneurial competence? Accordingly, this study aims to empirically examine the influence of transformational leadership dimensions on entrepreneurial competence and identify the most influential leadership dimension in fostering entrepreneurial knowledge, skills, and attitudes among vocational students.

The findings of this study are expected to contribute to the literature both theoretically and practically. Theoretically, this study extends transformational leadership theory by demonstrating its direct role in developing students' entrepreneurial competence, thereby enriching the literature on educational leadership and vocational education. Practically, the findings are expected to provide evidence-based recommendations for school principals, educational policymakers, and local education authorities in designing leadership development programs that strengthen entrepreneurial culture and improve vocational graduates' competitiveness in the labor market as well as their capacity for self-employment

2. Literature Review and Hypotheses Development

2.1 Theoretical Foundations of Transformational Leadership

Transformational leadership is a leadership approach that emphasizes a leader's ability to inspire, motivate, and empower followers to achieve organizational goals beyond their personal interests. Unlike transactional leadership, which primarily focuses on the exchange of rewards and performance, transformational leadership encourages employees to develop higher levels of commitment, creativity, and organizational citizenship behaviors through value-based leadership and a shared organizational vision (Bass & Avolio, 1994). According to Bass and Avolio (1994), transformational leadership consists of four fundamental dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. These dimensions enable leaders to establish trust, encourage innovative thinking, foster employees' professional growth, and create a collaborative organizational climate. Consequently, transformational leaders are more likely to improve employees' motivation, organizational commitment, and long-term organizational effectiveness.

The effectiveness of transformational leadership has consistently been supported by empirical evidence. A comprehensive meta-analysis conducted by Judge and Piccolo (2004) demonstrated that transformational leadership exhibits stronger positive relationships with leadership effectiveness, employee satisfaction, motivation, and job performance than does transactional leadership. Their findings confirmed transformational leadership as one of the strongest predictors of individual and organizational performance in diverse organizational settings. Recent evidence further reinforces the relevance of transformational leadership in contemporary organizations. Deng, Gulseren, Isola, Grocutt, and Turner (2023) argued that transformational leadership remains one of the most empirically supported leadership theories because it consistently enhances employee engagement, innovative work behavior, organizational learning and adaptability in increasingly dynamic environments. Their review also concluded that although newer leadership approaches, such as authentic, ethical, and servant leadership, have attracted considerable scholarly attention,

transformational leadership continues to demonstrate superior explanatory power regarding employee and organizational outcomes.

Within educational organizations, transformational leadership plays a critical role in promoting teachers' professional development, fostering collaborative learning cultures, and improving institutional performance. In vocational schools, principals who demonstrate transformational leadership encourage teachers to continuously improve their competencies, participate in professional learning activities, and embrace innovation, ultimately contributing to improved school effectiveness and educational quality (Firmansyah, Chen, Junaedi, Arwani, & Kistyanto, 2022; Özdemir, Eriçok, Topaloğlu, & Tuti, 2024). Furthermore, transformational leaders facilitate organizational change by creating a supportive environment in which teachers feel psychologically empowered to experiment with new teaching strategies and continuously develop their professional capabilities. Such leadership practices are particularly important in vocational education, where rapid technological advancements and changing labor market demands require schools to remain adaptive and innovative (Haryaka, Dwiyono, Rachmawaty, Liana, & Sjamsir, 2026). Taken together, previous studies consistently indicate that transformational leadership positively influences organizational performance through its ability to enhance employee competence, stimulate innovation, strengthen organizational commitment, and improve institutional effectiveness. Therefore, transformational leadership provides an appropriate theoretical foundation for examining how school principals influence teacher competence and school performance in vocational schools.

2.2 Transformational Leadership in the Context of Vocational Education

Vocational high schools are designed to prepare graduates for employment and entrepreneurship, requiring school leaders to adopt adaptive leadership approaches that respond effectively to rapid industrial and technological changes. In this context, transformational leadership has been recognized as one of the most appropriate leadership models because it promotes innovation, organizational learning, and continuous competency development. Özdemir, Eriçok, Topaloğlu, and Tuti (2024) found that transformational leadership significantly improves teachers' job satisfaction through the mediating roles of professional learning and teacher self-efficacy, indicating that the influence of school leadership extends beyond administrative functions to psychological and professional development issues. Mariatie, Edy, and Rezeki (2022) reported that transformational leadership, combined with teachers' academic qualifications, positively influences teachers' work ethic and overall performance in secondary schools. These findings suggest that transformational leadership operates across multiple organizational levels, beginning with individual teachers and gradually shaping the overall school culture, which ultimately affects students as the primary beneficiaries of the educational process.

Furthermore, transformational leadership is recognized as a strategic organizational capability that strengthens innovation, organizational adaptability, and sustainable institutional performance across diverse organizational settings. The consistent implementation of transformational leadership also contributes to creating a school climate characterized by openness, collaboration, and continuous improvement. Such an environment provides an essential foundation for nurturing creativity, initiative, and entrepreneurial values among students. Albaqiatussalihat, Sabandi, Jasrial, and Ermita (2022) confirmed that principals' transformational leadership is consistently associated with a more innovative school climate, thereby supporting the development of new competencies, including entrepreneurial competence among vocational students.

2.3 Student Entrepreneurial Competence as an Endogenous Construct

Student entrepreneurial competence is a multidimensional construct encompassing opportunity recognition, creativity, innovation, calculated risk-taking, problem-solving ability, resilience, and confidence required to initiate and sustain entrepreneurial activities. Rather than being developed solely through formal entrepreneurship curricula, entrepreneurial competence is strongly influenced by the educational environment and leadership practices in schools. Recent evidence from higher education demonstrates that the transformational leadership exhibited by entrepreneurship mentors positively affects students' entrepreneurial intentions, with entrepreneurial attitudes serving as a

mediating mechanism, while perceived creativity and economic confidence strengthen these relationships through moderating effects (Tang & Cui, 2026). Although conducted in higher education, these findings are highly relevant to vocational secondary education because both educational contexts share the objective of preparing graduates with entrepreneurial skills. Consequently, vocational school principals can be viewed as transformational leaders who shape entrepreneurial attitudes and competencies by creating supportive learning environments and encouraging innovative thinking among their students.

2.4 Relationship between Transformational Leadership and Student Entrepreneurial Competence

The relationship between transformational leadership and students' entrepreneurial competence can be theoretically explained through social learning, value internalization, and the development of self-efficacy. Principals who consistently demonstrate innovative thinking, visionary leadership, and calculated risk-taking become influential role models whose behaviors are internalized by students as desirable entrepreneurial traits. Through this process, leadership values are gradually transformed into entrepreneurial mindsets and competency. Indrawati et al. (2025) reported that transformational leadership enhances organizational performance through increased work motivation, suggesting that visionary leadership effectively translates organizational goals into individual motivations. This mechanism is similarly applicable to vocational education because principals who effectively communicate entrepreneurial visions can inspire students to perceive entrepreneurship as a meaningful and achievable career pathway.

Moreover, Sánchez-García et al. (2024) found that teachers' involvement in transformational leadership practices significantly enhances students' self-efficacy and engagement intentions, indicating that support from influential authority figures encourages young people to initiate new ideas and embrace innovative behaviors. These findings reinforce the proposition that entrepreneurial competence is not merely the outcome of entrepreneurship courses but rather the cumulative result of sustained transformational leadership practices embedded within the school environment. Therefore, transformational leadership can be conceptualized as a strategic mechanism that directly facilitates the development of entrepreneurial competence among students of vocational high schools.

2.5 Hypothesis Development

Dimensions Idealized Influence reflects the extent to which the principal is an exemplary figure who is trusted and respected by the school community. Teacher leadership styles, through the classroom climate that is formed as a consequence, are strongly correlated with students' academic motivation, with students' self-efficacy also strengthening this relationship, a pattern that confirms that the role models of authority figures have a direct influence on students' attitudes and learning orientations (Wang, Lee, & Hoque, 2023). Based on this description, we formulate the following hypothesis:

> *H_1:* Idealized influence, the principal has a positive and significant effect on the entrepreneurial competence of SMK Negeri students

Dimensions inspirational motivation related to the ability of the principal to communicate an attractive vision and arouse the optimism of school residents for the future. The ability to convey a vision convincingly is believed to be an important element that bridges leadership with improved performance and work motivation in the school environment, as outlined in the previous section (Indrawati, Wiyono, & Romlah, 2025).

> *H_2:* Inspirational motivation, the principal has a positive and significant effect on the entrepreneurial competence of SMK Negeri students

Dimensions of Intellectual stimulation demand that school principals encourage school residents to think critically, creatively, and dare to question old ways of solving problems. This kind of stimulation has been shown to be closely related to increased self-efficacy and active involvement of students in various school activities, which indicates that the critical thinking impulse of authority figures fosters

the confidence to take new initiatives (Sánchez-García, Reigal, Hernández-Martos, Hernández-Mendo, & Morales-Sánchez, 2024).

H₃: Intellectual stimulation, the principal has a positive and significant effect on the entrepreneurial competence of SMK Negeri students

Dimensions of individualized consideration Focus on the personal attention of the principal to the needs, potential, and development of each individual school resident. The relationship between a supportive school climate and the growth of student confidence in facing entrepreneurial challenges has been confirmed in various educational contexts at both the secondary and vocational higher education levels (Albaqiatussalihat, Sabandi, Jasrial, & Ermita, 2022; Tang, & Cui, 2026).

H₄: Individualized consideration, the principal has a positive and significant effect on the entrepreneurial competence of SMK Negeri students

2.6 Conceptual Frameworks and Simultaneous Hypotheses

Referring to the four arguments that have been outlined, the four dimensions of transformational leadership are believed to work synergistically and reinforce each other, rather than standing alone, in shaping students' entrepreneurial competencies. The example shown through idealized influence provides a foundation of trust, vision communicated through inspirational motivation provides direction, cognitive stimulation through intellectual stimulation gives courage to innovate, and personal attention through individualized consideration provides confidence, strengthening students at the individual level. The combination of these four mechanisms is theoretically projected to explain the proportion of variations in student entrepreneurial competence more comprehensively than if the four dimensions were tested separately. Thus, the simultaneous hypothesis of this study is formulated as follows:

H₅: Idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration, simultaneously have a positive and significant effect on the entrepreneurial competence of SMK Negeri students

3. Research Methodology

This research was designed using the mixed method with model Sequential Explanatory Design, which is a combination research design that integrates the quantitative stage in the initial phase and the qualitative stage in the next phase to deepen and strengthen the interpretation of the statistical findings obtained. The selection of this design is based on the consideration that numerical data alone is not enough to explain how the transformational leadership process of school principals really takes place and is felt by students in the field; therefore, it is necessary to explore the meaning narratively after the patterns of relationships between variables are identified numerically. This kind of approach is in line with the practice applied to other educational research, where the quantitative survey stage is used to map general patterns, then deepened through interviews so that the context and experience of the research subject can be revealed more fully, as shown in a study on English learning practices at the secondary level that also combines the two methods sequentially (Creswell & Creswell, 2018). At the quantitative stage, this study uses an explanatory research approach that aims to examine the causal relationship between latent variables, namely, the four dimensions of the principal's transformational leadership as an exogenous variable and students' entrepreneurial competence as an endogenous variable.

Primary data were collected through a Likert-scale questionnaire distributed to respondents in the state vocational school, and the data were processed using the Partial Least Square Structural Equation Modeling (PLS-SEM) technique with the help of SmartPLS software. The analysis was carried out through two main stages: the evaluation of the outer model or measurement model to test the validity of the convergence, the validity of the discriminant, and the reliability of the construct through the value of outer loading, Average Variance Extracted (AVE), and composite reliability, and the evaluation of the inner model or structural model to test the significance of the inter-construct path

through the value of the path coefficient and R-square. This stage of evaluation of measurement models and structural models is a standard procedure in the application of PLS-SEM in educational research, both for reflective and formative models with first-order and second-order approaches, as systematically explained in the practical guide to the use of SmartPLS for educational research. Hypothesis testing was then carried out through a bootstrapping procedure to obtain t-statistics and p-values that determine the significance of each influence path in the model, as is commonly applied to studies that place PLS-SEM as a predictive model test tool with flexible sample sizes, as seen in studies that analyze factors that inhibit the completion of student studies through the stages of testing the outer model and inner model are sequential. Recent educational management studies have also employed PLS-SEM because of its robustness in analyzing complex causal relationships with relatively small samples (Subhaktiyasa, 2024; Abubakar, Rifandi, Rahmawati, & Fatimah, 2023).

After the quantitative results were obtained and the most dominant leadership dimension was identified, the research proceeded to the qualitative stage through semi-structured interviews with a number of key informants, including school principals, entrepreneurship teachers, and purposively selected student representatives based on the results of the first stage. This interview was intended to explore more deeply how transformational leadership practices are applied in school daily life, the obstacles faced, and the strategies that are considered the most effective in fostering students' entrepreneurial competence. The collected qualitative data were then analyzed using thematic analysis techniques to identify patterns, categories, and meanings that are relevant to previous quantitative findings. The integration between quantitative and qualitative results was carried out at the final stage through the method triangulation technique, so that the final interpretation of the research is not only based on statistical figures, but also enriched by the context and real experience of the actors in the field, so that the resulting model has a more comprehensive and applicable explanatory power for the development of leadership policies in the State Vocational School.

4. Results and Discussions

This section presents the research findings obtained through two stages of analysis, as described in the method section: the quantitative stage using Partial Least Square Structural Equation Modeling (PLS-SEM) with SmartPLS software, and the qualitative stage through semi-structured interviews with key informants. The presentation of results was compiled based on the formulation of the problems and research objectives stated in the introductory section: to examine the partial and simultaneous influence of the four dimensions of transformational leadership of school principals on students' entrepreneurial competence, identify the most dominant dimensions, and deepen these findings through a qualitative exploration of leadership practices in the field. These findings also support the view that organizational capability and strategic management practices significantly influence organizational outcomes and sustainable competitiveness.

4.1 Characteristics of Research Respondents

This study involved 90 respondents of State Vocational High School students who were selected using the sampling technique described in the method section. The number of respondents refers to the Sum of Square Observation (SSO) of 1800 in the Entrepreneurial Competency construct, which has 20 indicators; thus, when divided by the number of indicators, the number of respondents is obtained as 90 people, a sample size that statistically meets the minimum requirements for PLS-SEM analysis, as affirmed in the study of the application of PLS-SEM in educational research (Firmansyah et al., 2022). The respondents were spread across several expertise programs within State Vocational Schools, with relatively homogeneous characteristics in terms of education level but varied in terms of expertise programs, gender, and length of exposure to school entrepreneurship programs. The diversity of these characteristics is important to observe because, as found by Kadek Arief Jayadie Putra and his colleagues, the context of the expertise program and the school environment also shape the way students and educators interpret the entrepreneurial competencies taught in the vocational environment. The demographic data of the respondents were then the basis for testing the measurement and structural models presented in the following section.

4.2 Evaluation Results of Measurement Model (Outer Model)

Evaluation of the measurement model was carried out to ensure that the indicators used were truly valid and reliable in measuring their respective latent constructs before the data were used to test the structural relationships between the variables.

4.2.1 Convergent Validity

The convergent validity test was conducted using two criteria, namely, *t*he outer loading value and Average Variance Extracted (AVE). The results of data processing showed that all indicators in the five research constructs had an outer loading value above the required threshold of 0.70. A summary of the results is presented in Table 1.

Table 1. Convergent Validity Test Results (Outer Loading and AVE)

Construct	Outer Loading Range	AVE
Idealized Influence	0.858–0.917	0.768
Inspirational Motivation	0.870–0.909	0.780
Intellectual Stimulation	0.842–0.847	0.712
Individualized Consideration	0.826–0.897	0.740
Entrepreneurial Competencies	0.815–0.900	0.729

Value Outer Loading, which is all well above 0.70, indicates that each statement item adequately reflects the latent construct it is measuring, in line with the criteria put forward by Hair et al. as referenced in the PLS-SEM standard procedure for educational research (Arief, Putra, Triyono, & Daryono, 2022). AVE values ranging from 0.712 to 0.780 also exceed the minimum threshold of 0.50, which means that each construct is able to explain more than half of the variance of its indicators. These findings reinforce the argument that research instruments, particularly those that measure the dimensions of Idealized Influence, inspirational motivation, Intellectual stimulation, and individualized consideration, have a solid psychometric foundation for use in the context of vocational education in Indonesia, a context that Algusri Virnindo et al. say is still rarely rigorously tested quantitatively due to the dominance of qualitative case study approaches on similar topics.

4.2.2 Discriminatory Validity

The validity of the discriminant was tested using three approaches: the Fornell-Larcker method, the Heterotrait Monotrait Ratio (HTMT), and cross loading. Table 2 summarizes the results of the Fornell-Larcker and HTMT methods.

Table 2. Results of the Discriminant Validity Test (Fornell-Larcker and HTMT)

Construct	AVE Roots (Fornell-Larcker)	HTMT Highest against Other Constructs
Idealized Influence	0.877	0.667 (against Entrepreneurial Competence)
Inspirational Motivation	0.883	0.518 (against Entrepreneurial Competence)
Intellectual Stimulation	0.844	0.581 (against Entrepreneurial Competence)
Individualized Consideration	0.860	0.453 (against Entrepreneurial Competence)
Entrepreneurial Competencies	0.854	–

The square root value of AVE in each construct was found to be greater than the highest correlation of that construct with other constructs; thus, the Fornell-Larcker criterion was consistently met. Similarly, all HTMT scores were below the 0.90 threshold, with the highest score of 0.667 for the relationship between idealized influence and entrepreneurial competence. Cross-loading examination also showed a consistent pattern, namely, each indicator had the highest charge value in its own parent construct compared to other constructs. These three criteria confirm that the four dimensions of

transformational leadership tested, despite coming from the same conceptual umbrella, are completely empirically separate and do not overlap, a condition that is an important prerequisite before all four are tested simultaneously against the student's entrepreneurial competence.

4.2.3 Model Fit (Model Fit)

Model suitability testing was conducted using the Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI) indicators. The processing results showed an SRMR value of 0.064, both in the saturated model and the estimation model, which was below the maximum threshold of 0.08, indicating that the model was deemed suitable. The NFI value of 0.436 is moderate, a condition commonly found in models with a large number of reflective indicators, especially in the Entrepreneurial Competency construct, which has 20 items. Overall, the combination of SRMR values that meet the criteria and the structure of the model that has passed the validity and reliability tests provides confidence that this measurement model is feasible for use in the next stage of analysis.

4.2.4 Construct Reliability

Table 3 presents the reliability assessment results of the measurement model using Cronbach's alpha and composite reliability (rho_c) to evaluate the internal consistency of each construct.

Table 3. Construct Reliability Test Results

Construct	Cronbach Alpha	Composite Reliability (rho_c)
Idealized Influence	0.925	0.943
Inspirational Motivation	0.929	0.946
Intellectual Stimulation	0.899	0.925
Individualized Consideration	0.912	0.934
Entrepreneurial Competencies	0.980	0.982

As shown in Table 3, all Cronbach's alpha and composite reliability values were well above the recommended threshold of 0.70, with most values approaching or exceeding 0.90, indicating excellent internal consistency across all measurement constructs. The Entrepreneurial Competency construct demonstrated the highest reliability, with a Cronbach's alpha value of 0.980 and a composite reliability value of 0.982. These findings are consistent with previous studies, which reported that leadership and competency constructs in vocational education can achieve high measurement consistency when the instruments are carefully designed and validated (Kasim, 2022).

4.3 Measurement Model Path Diagram (Outer Model/PLS-SEM Algorithm Result)

The measurement model path diagram based on the PLS-SEM algorithm results is presented in Figure 1 , which illustrates the relationships between the latent constructs and their respective indicators used in this study.



Figure 1. Measurement Model Path Diagram (PLS-SEM Algorithm Result)

4.4 Structural Model Evaluation

After the measurement model was declared valid and reliable, the analysis was continued to evaluate the structural model to answer the formulation of research problems regarding the partial and simultaneous influence of the four dimensions of transformational leadership on students' entrepreneurial competence.

4.4.1 Coefficient of Determination (R-Square)

The R-square value in the Entrepreneurship Competency construct was 0.710, with an adjusted R-square value of 0.696. This value is relatively strong according to the criteria of Hair et al., who set the thresholds of 0.75, 0.50, and 0.25 for strong, moderate, and weak categories, respectively. This means that 71% of the variation in the entrepreneurial competencies of SMK Negeri students can be explained by the four dimensions of transformational leadership of the principal, while the remaining 29% is explained by other factors outside the model, such as family environmental factors, individual interests, or exposure to entrepreneurial experiences outside school. This finding strengthens the leadership position of the principal not only as an administrative factor but also as a strategic mechanism that directly and substantially shapes student competence, in line with the conclusion of Usfandi Haryaka et al. that the principal's leadership style has a strong direct influence on the performance achievement of school elements, not only on the elements of teachers and administrative staff.

4.4.2 Hypothesis Testing (Path Coefficient)

Hypothesis testing was performed using the bootstrapping procedure to estimate the path coefficients, t-statistics and p-values for each hypothesized relationship. The results of the structural model evaluation are shown in Table 4.

Table 4. Path Coefficient Test Results and Hypothesis Testing

Influence Path	Path Coefficient (β)	T-Statistics	P-Values	Remarks
Idealized Influence → Entrepreneurial Competency	0.464	7.365	0.000	Supported
Inspirational Motivation → Entrepreneurial Competency	0.240	3.696	0.000	Supported

Influence Path	Path Coefficient (β)	T-Statistics	P-Values	Remarks
Intellectual Stimulation → Entrepreneurial Competency	0.289	4.124	0.000	Supported
Individualized Consideration → Entrepreneurial Competency	0.310	5.002	0.000	Supported

As shown in Table 4, all hypothesized relationships were positive and statistically significant, with t-statistics exceeding the recommended threshold of 1.96 and p-values below 0.001. These results indicate that each dimension of transformational leadership significantly influences students' entrepreneurial competency, thereby supporting all the proposed hypotheses. Among the four dimensions, idealized influence demonstrated the strongest effect (β = 0.464; t = 7.365), followed by individualized consideration (β = 0.310), intellectual stimulation (β = 0.289), and inspirational motivation (β = 0.240). These findings suggest that principals who serve as exemplary role models exert the greatest influence on the development of entrepreneurial competencies among vocational school students.

4.4.3 F-Square and Q-Square

To provide a more comprehensive evaluation of the structural model, effect size (f^2), and predictive relevance (Q^2) were assessed. Table 5 summarizes the effect sizes of each exogenous construct and the predictive relevance of the endogenous construct.

Table 5. Effect Size (f^2) and Predictive Relevance (Q^2) Results

Construct	F-Square on Entrepreneurial Competence	Categories Effects	Q-Square (Cross-Validated Communality)
Idealized Influence	0.658	Large	0.640
Inspirational Motivation	0.165	Medium	0.654
Intellectual Stimulation	0.233	Medium	0.556
Individualized Consideration	0.315	Medium	0.603
Entrepreneurial Competencies	–	–	0.695 (Communality); 0.506 (Redundancy)

As presented in Table 5, idealized influence exhibited a large effect on entrepreneurial competency (f^2 = 0.658), indicating that it was the most influential dimension in the structural model. In contrast, inspirational motivation (f^2 = 0.165), intellectual stimulation (f^2 = 0.233), and individualized consideration (f^2 = 0.315) demonstrated medium effect sizes, suggesting that these dimensions also contribute meaningfully to students' entrepreneurial competency. Furthermore, the Q^2 values indicate a strong predictive relevance for the proposed model. The cross-validated redundancy value for entrepreneurial competency (Q^2 = 0.506) exceeded the recommended threshold of 0.35, demonstrating high predictive accuracy according to the guidelines of Hair et al. These findings confirm that the structural model not only explains the relationships among the constructs but also possesses substantial predictive capability for students' entrepreneurial competency based on principals' TL.

4.5 Results of Structural Model Evaluation (Inner Model)

The structural model evaluation results are presented in Figure 2, which illustrates the hypothesized relationships among the latent variables and the estimated path coefficients obtained from the PLS-SEM analysis.

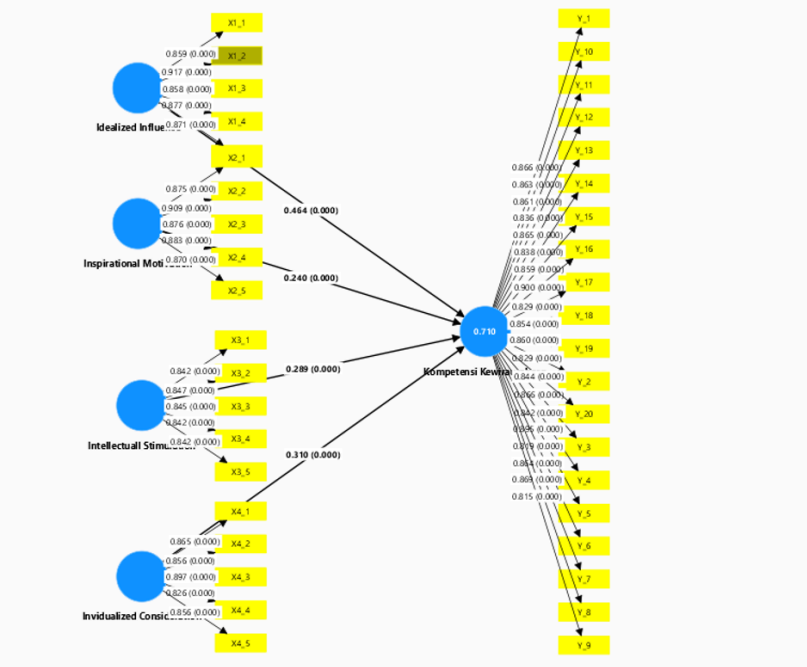


Figure 2. Structural Model (Inner Model) Results

4.6 The Influence of Idealized Influence of School Principals on Students' Entrepreneurial Competence

Idealized influence emerged as the strongest predictor of entrepreneurial competency (β = 0.464), indicating that principals' exemplary behavior plays a central role in shaping students' entrepreneurial attitudes. These findings support social learning theory, which suggests that students internalize entrepreneurial values by observing credible role models. The result is consistent with Bass and Riggio (2006), Hoch, Bommer, Dulebohn, and Wu (2018), and Wang, Lee, and Hoque (2023), who argued that idealized influence strengthens innovation capability and competency development.

4.7 The Influence of Principal's Inspirational Motivation on Students' Entrepreneurial Competence

The results of the second hypothesis test showed that inspirational motivation had a positive and significant effect on students' entrepreneurial competence, with a path coefficient of 0.240 and a t-statistics value of 3.696. Although the coefficient of influence is lower than that of Idealized Influence, these findings confirm the important role of the principal's ability to communicate an attractive vision and arouse the enthusiasm of school residents to achieve common goals. Principals who are able to convincingly convey ideas about the importance of economic independence and entrepreneurial opportunities tend to encourage students to view entrepreneurship not as a secondary option, but as a career path worth fighting for after graduation. These findings reinforce the results of research by Ramadhani and his colleagues, which proves that the transformational leadership of school principals has a positive and significant effect on the effectiveness of teachers' work at SMK Negeri Banjarbaru City, with learning innovations acting as a variable to strengthen these relationships (Ramadhani & Aslamiah, 2025).

This similarity in influence patterns shows that the inspirational motivation shown by the principal not only has an impact on the teacher's work performance, but also spreads to the attitude and orientation of students towards entrepreneurship, a chain of influence that confirms the central role of the principal as the driving force of the school culture as a whole. In addition, the findings of Muin (2026) and her colleagues, who observed the implementation of The Four I's in two different institutions, are also relevant to explain this result, where progressively applied inspirational motivational mechanisms tend to create an innovation-oriented work culture, while more persuasive and administrative implementation can only guarantee compliance without encouraging deeper transformation. The difference in the pattern of application indicates that the amount of influence of

Inspirational Motivation on students' entrepreneurial competence depends on how the principal operates the motivation in daily practice, not just on the existence or absence of this dimension normatively. This finding is supported by recent evidence showing that inspirational motivation strengthens individuals' career aspirations, entrepreneurial intentions, and organizational engagement by communicating a compelling vision and fostering collective optimism toward future goals (Nguyen, & Vu, 2023; Li, Cao, & Salarzadeh, 2023).

4.8 The Influence of Principal Intellectual Stimulation on Students' Entrepreneurial Competency

The results of the third hypothesis test prove that intellectual stimulation has a positive and significant effect on students' entrepreneurial competence, with a path coefficient of 0.289 and a t-statistics value of 4.124. This dimension reflects the extent to which school principals encourage school citizens, including students, to think critically, creatively, and question old ways of solving problems. In the context of the formation of entrepreneurial competence, intellectual stimulation plays an important role because entrepreneurship requires the ability to recognize opportunities, solve problems innovatively, and manage uncertainty, skills that cannot grow in a rigid school environment and minimal experimental space. These findings are in line with the results of research by Firmansyah, Chen, Junaedi, Arwani, and Kistyanto (2022) who found that the application of transformational leadership is shared knowledge management and learning organization has a positive effect on the organizational performance of vocational schools in the digital era, with an open organizational learning process becoming an important mediator in this relationship (Faridah & Ansar, 2022).

This similarity of logic shows that the intellectual stimulation applied by the principal does not stand alone but rather works through the creation of a learning ecosystem that encourages the exchange of knowledge and the courage to try new approaches, both among teachers and students. The value of the F-square effect of 0.233, which is classified as moderate in this dimension, also confirms that although the effect is statistically real, the contribution is not as large as the Idealized Influence dimension, a condition that indicates that the direct exemplification aspect still affects vocational students more strongly than the cognitive stimulation aspect alone, possibly due to the characteristics of vocational students who learn more through observation and direct practice than intellectual discourse abstract. The present findings are also aligned with studies demonstrating that intellectual stimulation enhances creativity, problem-solving capability, and knowledge sharing, all of which are fundamental antecedents of entrepreneurial competence in educational organizations (Le, & Lei, 2019; Pham, Nguyen, Nguyen, & Ahmed, 2024).

4.9 The Influence of Principal's Individualized Consideration on Students' Entrepreneurial Competence

The results of the fourth hypothesis test showed that individualized consideration had a positive and significant effect on students' entrepreneurial competence, with a path coefficient of 0.310 and a t-statistics value of 5.002, making it the dimension with the second largest influence after Idealized Influence. This dimension reflects the principal's attention to the individual needs, potential, and development of school residents personally, not just uniform treatment. In the context of the formation of entrepreneurial competence, this individual attention is important because each student has different interests, talents, and psychological readiness for the business world; therefore, a personal approach tends to be more effective in fostering confidence and mental readiness for entrepreneurship than a mass approach. These findings reinforce the research results of Usfandi Haryaka and his colleagues, who proved that the principal's leadership style, professional development, and work environment directly affect the performance of school elements, with an emphasis that personal attention to individual development is one of the key aspects in creating a productive work environment (Marfuah & Sururi, 2024).

Further relevance is also seen in the findings of Putra, Triyono, and Daryono (2022) and his colleagues, who affirmed that the entrepreneurial competence of school principals is significantly correlated with the leadership solutions implemented, where principals with high entrepreneurial competence tend to be more sensitive to the individual needs of their subordinates in formulating solutions to the leadership challenges faced. The moderate effect value in this dimension, i.e. f-square

of 0.315, indicates that individual attention makes a substantial contribution, although not as large as the direct exemplary impact reflected in the Idealized Influence dimension. Previous Scopus-indexed studies have similarly reported that individualized consideration improves students' confidence, learning engagement, and competency development because leaders recognize individual differences and provide personalized developmental support (Li, Cao, & Salarzadeh, 2023; Kim, & Park, 2024).

4.10 Simultaneous Influence of the Four Dimensions of Transformational Leadership and the Most Dominant Dimension

The results of the simultaneous test through an R-square value of 0.710 proved that the four dimensions of transformational leadership, namely, Idealized Influence, Inspirational Motivation, Intellectual Stimulation, and Individualized Consideration, together had a significant effect on the entrepreneurial competence of SMK Negeri students, with the ability to explain the endogenous construct of 71 percent. This value is relatively strong and confirms that the conceptual model proposed in this study has high clarity on the phenomenon of forming student entrepreneurial competencies. Based on the comparison of the path coefficient and f-square value in the four dimensions, it can be concluded that Idealized Influence is the most dominant dimension in shaping students' entrepreneurial competence, followed in order by Individualized Consideration, Intellectual Stimulation, and Inspirational Motivation. This sequence of dominance has important practical implications, namely that the program to strengthen the leadership capacity of SMK Negeri principals should prioritize strengthening the exemplary aspects and building trust first, before strengthening aspects of vision communication, intellectual stimulation, and individual attention.

The findings on the dominance of exemplary-based leadership are in line with the results of Norhisham Mohd Kasim's research, which found that entrepreneurial leadership has a significant influence on the success of high-performing school principals, with empowerment as a mechanism that mediates the relationship, confirming that the personal aspects of leadership that inspire subordinate self-confidence tend to have a stronger impact than the administrative aspect alone (Nisa, Rochman, & Edy, 2021). Thus, the simultaneous hypothesis of this research is empirically accepted, and the Idealized Influence dimension is confirmed as the most important strategic path in the formation of entrepreneurial competencies of SMK Negeri students. The findings on the simultaneous influence and dominance of Idealized Influence also provide a theoretical contribution that directly answers the gap in the literature that has been described in the introduction, namely the lack of an empirical model that makes students the main unit of analysis in the study of vocational education leadership. Most previous research has tended to stop at the relationship between principals' leadership and organizational effectiveness or teacher efficacy, as Li and colleagues found through the Structural equation modeling in China, which proves that entrepreneurial leadership principals contribute significantly to organizational effectiveness and teacher efficacy but have not touched student achievement directly (Virnindo & Giatman, 2025).

This research expands this scope by emphasizing that transformational leadership mechanisms, especially through direct example, have an influence path that can be measured empirically down to the individual level of students, without having to go through the intermediary of teacher performance or organizational effectiveness alone. This contribution is important because it shows that the impact of the principal's leadership is multilevel, which can be directly felt by students as the final beneficiaries of the educational process, as well as enriching the framework of transformational leadership theory, which has been more directed at institutional performance than the formation of students' character directly. Thus, the results of this study not only confirm the theory of transformational leadership in general, but also expand the domain of its application in the realm of the formation of student entrepreneurial competence as a bound variable that has not received adequate empirical attention so far. These findings are consistent with contemporary strategic management literature, which argues that transformational leadership creates organizational value by strengthening innovation capability and competency development.

The substantial explanatory power ($R^2 = 0.710$) indicates that transformational leadership is an important organizational resource for developing entrepreneurial competence. This result is consistent

with the Resource-Based View (RBV) and Dynamic Capability (DC) perspectives, which argue that strategic leadership creates competitive advantages by developing valuable organizational competencies and adaptive capabilities (Teece, 2018; Munir, Hussain, Farooq, Habib, & Shahzad, 2023).

4.11 Qualitative Findings: In-Depth Interview Results

To deepen the interpretation of the quantitative findings, a qualitative stage was carried out through semi-structured interviews with three categories of key informants, namely school principals, entrepreneurship teachers, and student representatives, who were selected purposively based on the results of the first stage. To enrich the interpretation of the quantitative findings, semi-structured interviews were conducted with the school principals, entrepreneurship teachers, and vocational students. The interview data were analyzed thematically and integrated with quantitative results through methodological triangulation. The principal interviewed revealed that strengthening students' entrepreneurial competence cannot be done only through formal policies but must start from the attitudes and behaviors shown by school leaders on a daily basis. One of the informants said,

> "*I always try to go directly to the school's production unit, not just give instructions from the principal's room, because students will trust them more if they see for themselves how I dare to try new things and take risks*."

This statement strengthens the quantitative finding that Idealized Influence is the most dominant dimension because concrete examples that are directly felt by students have a stronger psychological impact than written policies alone.

The entrepreneurship teachers who became informants also emphasized a similar pattern. One of the teachers said,

> "*Our principal often invites open discussions about new business ideas for school business units, and even students are also involved in providing input, so that they feel valued for their opinions and become more courageous to innovate*."

This narrative is relevant to the dimension of Intellectual Stimulation and confirms the findings of Arif Firmansyah and colleagues that open discussion and knowledge exchange are important mechanisms that bridge transformational leadership with vocational school performance achievements (Ramadhani & Aslamiah, 2025). Another teacher added that the principal's personal attention was also significant, revealing,

> "*The principal always takes the time to ask questions personally to students who look less confident, and usually after that the student becomes more active in entrepreneurial practice activities*," a vivid description of the Individualized Consideration mechanism that works at the individual level of the student.

The student representatives interviewed provided perspectives that complemented the findings of the two previous informant groups. One of the students stated,

> "*I became more confident to try a small business because I saw that the principal himself was also directly involved in developing the school's production unit, not just telling us without setting an example*."

This statement directly describes the mechanism of identification and behavioral modeling that is at the core of the Idealized Influence dimension. Other students also expressed their views on the dimension of inspirational motivation, saying,

> "*Every ceremony, the principal always conveys stories about alumni who have successfully opened a business, it makes me feel that entrepreneurial opportunities are really real and achievable*," which emphasized the important role of vision communication in arousing

students' optimism for their entrepreneurial future.

This pattern of qualitative findings is generally consistent with the results of Faridah and Ansar's research, which found that the perception of school principals regarding entrepreneurial competence greatly determines the direction of the development of production units and entrepreneurship curriculum in the vocational school environment, with a greater focus on the development of production units than a formal curricular approach alone (Faridah & Ansar, 2022). The interview findings corroborate previous qualitative studies that emphasize that students develop entrepreneurial confidence primarily through observing authentic leadership practices rather than merely receiving entrepreneurship instruction in classrooms (Ratten, 2023).

4.12 Integrated Discussion: Triangulation of Quantitative and Qualitative Findings

The integration of quantitative and qualitative findings through the triangulation technique of the method results in mutually reinforcing interpretations of each dimension of transformational leadership tested. Statistical findings show that Idealized Influence has the greatest influence on students' entrepreneurial competence, and these findings are corqualitatively reinforced through the narratives of principals, teachers, and students that consistently highlight the importance of direct role models in school entrepreneurship practices. Similarly, the dimension of Inspirational Motivation, which quantitatively has the lowest path coefficient, when explored qualitatively, still makes a meaningful contribution through the mechanism of conveying motivational stories and communicating visions, although the impact is not as large as that of the direct example dimension. This integration pattern confirms the argument of Nisa, Rochman, and Edy (2021) and her colleagues that transformational leadership does not work alone but rather through intermediate variables such as commitment and competency support of teachers, which in turn affects the quality of learning and overall student achievement. In the context of this study, this commitment is manifested in the form of students' trust in the principal as an exemplary figure, which then encourages the internalization of entrepreneurial values more deeply than fulfilling curricular targets.

Data triangulation also reveals that the effectiveness of the four dimensions of transformational leadership is highly dependent on the consistency of its application in the daily life of schools, not just its normative presence in policy documents. This condition is in line with the findings of Muin (2026) and her colleagues, who found that the transformational leadership mechanism does not run uniformly in each institution, but is adapted according to the characteristics and work culture of each school, so that schools with progressive and consistent implementation tend to produce a stronger culture of innovation than schools with purely administrative implementations (Ramadhani & Aslamiah, 2025). The implication of these integrated findings is that improving the entrepreneurial competence of SMK Negeri students is not enough by formulating conceptually ideal leadership policies, but requires a real commitment from the principal to translate the four dimensions of transformational leadership into daily practices that are directly felt by students, ranging from personal examples, inspiring vision communication, openness to new ideas, to attention to the individual needs of each student. Thus, this research succeeded in answering all the formulations of the problems and objectives proposed, as well as providing a new empirical contribution in the form of transformational leadership models that are directly and simultaneously proven to shape students' entrepreneurial competencies at the vocational education level in Indonesia.

Overall, the present findings reinforce contemporary transformational leadership theory by demonstrating that school leadership influences not only teachers and organizational performance but also students' entrepreneurial competence directly. This finding extends previous international studies that predominantly examined teacher outcomes, organizational commitment, and school effectiveness (Hallinger, 2020; Fayolle, & Gailly, 2015). Furthermore, the results support recent entrepreneurship education literature, which argues that entrepreneurial competence is developed through leadership, organizational culture, experiential learning, and innovation ecosystems rather than entrepreneurship courses alone (Fayolle and Gailly, 2015; Ratten, 2023). Therefore, the present study contributes theoretically by positioning transformational leadership as a strategic capability that directly shapes vocational students' entrepreneurial competence within the Indonesian vocational education context.

Although this research model shows sufficient statistical strength, some methodological notes still need to be presented honestly in order to strengthen the credibility of the interpretation of the results. The normed fit index value of 0.436, which is classified as moderate, indicates that even though the estimation model met the SRMR criteria, there is still room for improvement in model specifications in follow-up research, for example, through the addition of control variables such as students' socioeconomic background or length of exposure to school entrepreneurship programs. The cross-sectional design of the study also limits the ability to definitively conclude causal relationships, a limitation that is also recognized in similar studies that use correlational approaches and path analysis, as seen in the study by Ramadhani et al., who also suggested a longitudinal approach to capture the dynamics of leadership relationships and school achievement more fully. The evaluation procedure of the measurement model and structural model applied in this study still refers to the standard stages of PLS-SEM as systematically explained in the practical guide to the use of SmartPLS for educational research, so that the procedural validity of this research can be accounted for methodologically. Taking into account these limitations, the interpretation of the results of this study should be understood as a description of structural relationships at a specific point in time, not as an absolute generalization that applies to all contexts of State Vocational Schools in Indonesia without considering the variation in local conditions of each school.

5. Conclusions

5.1 Conclusion

This study succeeded in answering all the formulations of the problem by proving that the four dimensions of transformational leadership of principals–idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration–make a positive and significant contribution to the entrepreneurial competence of State Vocational High School students, both partially and simultaneously, with the clear power of the model reaching 71% of the variation of the endogenous construct. Among the four, idealized influence appears as the most decisive path of influence, emphasizing that the real example and consistency of school leaders' attitudes are the main drivers of the growth of student entrepreneurial spirit, beyond the role of delivering vision, critical thinking, and personal attention alone. The reinforcement of the interview data also confirmed this pattern and showed that the success of the implementation of transformational leadership is highly dependent on the consistency of the practice in the daily life of the school. Thus, this research closes the gap in the literature by presenting an empirical model that makes students who are not teachers or school organizations the main unit of analysis in the study of vocational education leadership in Indonesia.

5.2 Research Limitations

The moderate value of the Normed Fit Index indicates the need to improve the model specifications, for example, by adding control variables such as students' socioeconomic conditions. The cross-sectional design used also limits the ability to conclude causal relationships with certainty; therefore, the results of this study should be interpreted as a portrait of structural relationships in a given period, not an absolute generalization for all State Vocational Schools in Indonesia.

5.3 Suggestions and Directions for Future Research

School principals are advised to prioritize strengthening personal examples, for example, through direct involvement in the school's production unit. The education office is advised to design leadership training based on field case studies so that the internalization of values occurs more deeply. Researchers are further advised to expand the scope of the sample to more diverse regions and levels, test mediation variables such as student self-efficacy or school climate, and apply a *longitudinal design* to capture the dynamics of changes in entrepreneurial competencies more completely.

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Author Contributions

FF conceptualized the study, designed the research methodology, conducted the data collection and analysis, interpreted the findings, and prepared the original manuscript. SR contributed to the research design, data validation, interpretation of the results, manuscript review, and editing. IAA contributed to the research methodology, supervised the data analysis and critically reviewed the manuscript. ARPB provided academic supervision, contributed to the conceptual framework, and reviewed the manuscript for its important intellectual content. HH contributed to the interpretation of the findings, manuscript revision, and overall supervision of the study. All authors discussed the results, approved the final version of the manuscript, and agreed to be accountable for all aspects of the study..

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