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VOCATIONAL SCHOOL ENTREPRENEURSHIP COMPETENCE: DO INTELLECTUAL SKILL, SCHOOL GRADE, AND LEARNING ENVIRONMENT MATTER?

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ABSTRACT

Vocational High Schools (SMK) have an important role in preparing human resources to face the challenges of the world of work. Data in the field shows that unemployment of vocational school graduates continues to increase, so entrepreneurial competence as a solution to overcome unemployment among vocational school graduates must be considered. This research aims to examine the factors that influence entrepreneurial competence in vocational school students, namely intellectual skills, academic values, and learning environment. Data was collected through an online survey involving 250 vocational school students in Central Java Province. The research instrument was adapted from existing economic and entrepreneurship literacy tests. Data were analyzed using the Covariance-Based Structural Equation Modeling (CBSEM) method. The research results found that school rankings had a significant and positive effect on entrepreneurial competence in vocational schools and were related to the learning environment and students' intellectual abilities. This study recommends learning strategies that integrate academic values, intellectual skills, and the learning environment to produce graduates who are ready for the world of work, able to create independent business opportunities, and contribute to the local economy.
Keywords: Entrepreneurship Education, Student Competence, Learning Environment.

INTRODUCTION

The developments and changes that have hit the Indonesian nation cannot be separated from the influence of global change (Alvarez-Icaza, 2024), developments in science and technology as well as art and cultur (Alvarado, 2019). The existence of these changes has caused our national education to face several problems (Aldana-Rivera, 2019), including improving quality and results (Klemenčič, 2022), limited available funds and the fact that community funding sources have not been tapped proportionally in accordance with the principle of education as a shared responsibility between the government (M. Liu, 2023),

society and parents (Baruah, 2021). With the demands of such rapid change (Voronina, 2022), we must be ready to face and compete with changes in our educational methods (Baruah, 2019). To anticipate all these changes, we must place education as the basic capital for national development (Stenholm, 2021). Quality human resources are people who are able to live in global competition who not only have the ability to master physical technology but also have advantages in digital technology (Soltanifar, 2022).

Vocational high school education and training is a type of formal education that can handle employment problems (Ovcharuk, 2020). Vocational education is basically aimed at helping prospective workers acquire the skills (Ramirez-Montoya, 2020), abilities, work habits, attitudes and knowledge needed to meet and develop work skills (Porkodi, 2023b). They also want to be productive and useful workers (Morselli, 2024). Education in Vocational High Schools (SMK) is a process of education and guidance carried out in schools as well as a process of job training in the real business world (Kim, 2019). In schools, the main goal of learning is to help students develop their personality (Romero-Rodríguez, 2023), academic potential, and strong and correct foundations of skills (Paiva, 2024). This is achieved through flexible, adaptive, and productive learning programs (Susnea, 2024). The goal of the normative program is to shape the character and personality of students as Indonesian citizens and to enable them to develop themselves sustainably (Oliver, 2022). On the other hand, the work training process in the business world aims to equip students with the ability to master standardized productive expertise (Siddamal, 2021). Competencies, internalize attitudes, values, and the business world culture that is oriented towards quality standards (Whewell, 2022).

Chastanti et al., (2017) explains that there are three main advantages of vocational education: (1) for students: improving self-quality, increasing job opportunities, increasing business opportunities, increasing income, preparing themselves for additional education, preparing themselves for society, the nation, and the state, and adapting to changes and the environment. (2) for the industrial sector it can reduce operating costs, obtain high-quality workers, and help advance and develop business. (3) for society it can improve social welfare, increase national productivity, increase state income, and reduce unemployment.

The unemployment problem in Indonesia has not been completely solved, Trading Economics data shows that the open unemployment rate tends to fluctuate, this is explained in the diagram below.

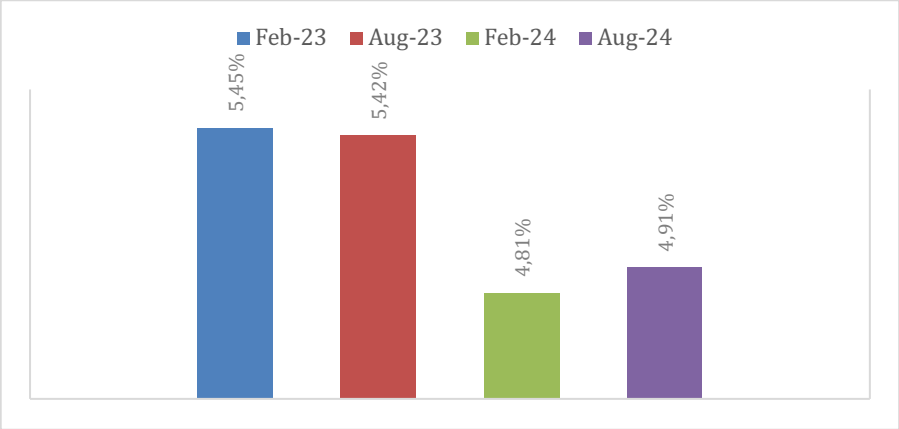

Figure 1. Open Unemployment Rate Indonesia 2023 - 2024
Source: Trading Economics (2024)

Based on the data above, the unemployment rate in Indonesia decreased to 4.82 percent in the first quarter of 2024 from 5.32 percent in the third quarter of 2023. The unemployment rate in Indonesia averaged 5.97 percent from 2023 to 2024. Entrepreneurship is an alternative in solving the problem of unemployment, the existence of companies built by entrepreneurs is a safety valve in the problem of unemployment (Støckert, 2020). To become a good entrepreneur, an entrepreneurial attitude is needed. An entrepreneurial attitude consists of: (1) working hard; (2) strong belief in personal strength; (3) honesty and responsibility; physical and mental endurance; (4) perseverance and tenacity to work hard; (5) constructive and creative thinking (Nagai, 2019).

Entrepreneurship education in Vocational High Schools (SMK) is very relevant in facing the challenges of globalization and rapid technological development (Nevalainen, 2021). With the high unemployment rate that continues to increase, especially among high school graduates (Knox, 2022), empowering students to become independent and creative entrepreneurs is one of the solutions that is expected (Mariyono, 2024). Entrepreneurship education in vocational schools is not only aimed at preparing graduates who are ready to enter the world of work (Muñoz, 2020), but also to create a generation that has the ability to open up employment opportunities through their own businesses (Suharnomo, 2021). Therefore, it is important for vocational education in vocational schools to integrate entrepreneurial competencies into their curriculum (Kiri, 2024). These competencies include knowledge of business fundamentals (Alqahtani, 2023), skills in business planning and management (Ndejjo, 2022), and interpersonal skills that support success in the business world (Akhmetshin, 2019). In addition, factors such as intellectual skills, academic achievement during high school (Brakaj, 2024) and a conducive learning environment greatly influence the development of students' entrepreneurial competencies (Kusdiyanti, 2020).

The changes that occur in the world of education are expected to adapt to market needs and developments in the times, the quality of education in vocational schools must continue to be improved (Petegem, 2020). This includes improving facilities and programs that encourage students' creativity and innovation in the

field of entrepreneurship (Porkodi, 2023a). In addition, the role of teachers as facilitators and mentors in directing and motivating students to develop entrepreneurial attitudes is very important for the success of this program (Arshad et al., 2025). Effective entrepreneurship education is expected to produce graduates who are not only ready to work (García-Hurtado et al., 2024), but also have the potential to create their own businesses, make positive contributions to the local economy, and reduce unemployment rates (Chauhan et al., 2024). Therefore, the role of families, communities, and governments in supporting entrepreneurship education is very necessary so that the goal of economic development through empowering human resources can be achieved optimally (Juárez-Varón & Monreal, 2025).

Research conducted by Zuazua Ruiz et al., (2023) states, intellectual skills include critical thinking skills, creativity, and innovation. Research shows that developing these skills through relevant curriculum can improve students' ability to start a business. The learning environment, including support from schools, teachers, and the business world, is essential in creating an ecosystem that supports entrepreneurial skills. For example, business participation and industry-based training strengthen the link between theory and real-world practice. While Satar et al., (2025) stated teacher competence plays an important role in delivering entrepreneurship education. Competence teachers are able to use innovative methods such as project-based learning, business simulations, and practice-based teaching to help students develop entrepreneurial skills (Guerola-Navarro et al., 2023). This is reinforced by the finding that collaborative learning and integration of local resources can strengthen students' interest and ability to become entrepreneurs.

This research is expected to provide insights and recommendations that can be applied in the development of entrepreneurship education curriculum and policies in Indonesia (Bouncken et al., 2022). Research related to entrepreneurial competency in Vocational High Schools has been widely conducted, but most of it focuses on technical and practical factors in entrepreneurship education, such as technical skills or practical business experience (Lazarte-Aguirre, 2024). Several studies also highlight the influence of the learning environment, but not many have combined factors of intellectual skills, previous academic achievement (vocational high school grades), and the learning environment comprehensively in the context of Vocational High Schools (Nobanee et al., 2024). Most of the existing research is still focused on practical business skills and soft skill development related to entrepreneurship, while the influence of intellectual and academic variables and the interaction of the three on entrepreneurial competence in vocational schools has not been widely studied (Zaleskiene & Zadiekaite, 2020). This study aims to fill this gap by investigating the relationship between intellectual skills, academic values from vocational schools, and learning environments in forming entrepreneurial competencies in vocational schools, as well as the interaction between the three (Fredholm et al., 2020).

Most existing research on entrepreneurial competence in Vocational High Schools (SMK) focuses predominantly on practical and technical aspects of

entrepreneurship education, such as technical skills and hands-on business experiences. Although studies have highlighted the importance of the learning environment, there has been limited exploration of how intellectual skills, prior academic performance, and the learning environment interact comprehensively to influence entrepreneurial competence in vocational education. Furthermore, the role of school ranking and its impact on entrepreneurial education outcomes remains under-researched (Turner, 2022). This study aims to address this gap by examining the interplay between intellectual skills, academic achievements, and the learning environment, with an emphasis on how these variables collectively contribute to the development of entrepreneurial competencies in SMK. By introducing the new independent variables of school ranking, learning skills, and the vocational learning environment, this research seeks to provide a deeper understanding of the factors that shape entrepreneurial readiness among SMK students (Mas, 2024).

RESEARCH METHOD

This study applies Covariance-Based Structural Equation Modeling (CB-SEM) to confirm the hypothesis formulated based on existing theories. The variables tested are latent variables whose indicators are reflective. CB-SEM analysis was carried out using R-Studio-R-V4.4.1 software. This study uses primary data obtained directly from schools through surveys. The survey in the form of a questionnaire will be sent and filled out online by students at vocational high schools in Central Java Province. Sampling uses a simple random sampling technique and uses the Isaac and Michael formula sample size so that a sample size of 250 respondents was obtained (Chang, 2023).

The behavioral economic research instrument was developed by adopting Jervan et al., (2021) and adoption of informal economic education (Maidment, 2023). The instrument for measuring Vocational School Entrepreneurship Competence has been adapted from the Economic Literacy Test developed by the Council for Economic (Heriyati et al., 2023), while the entrepreneurial literacy instrument was adapted. The Intellectual Skill, High School Grades, and Learning Environment Test was developed by the Council for Economic Education (CEE). The adaptation was carried out by adding question points related to the entrepreneurial aspects developed by Dandridge & Flynn, (2022) following the Indonesian context. Furthermore, a trial was conducted on 250 respondents using Pearson Product Moment correlation with the criteria. Namely, the instrument is declared valid if the calculated r coefficient> r table (df = n – 2 = 250 – 2 = 248) with a significance of 0.05. The results of the validity test in table one explain, the economy of the Intellectual Skill, High School Grades, and Learning Environment instruments.

Table 1. Intellectual Skills, High School Grades, and Learning Environment Validity Test Results

Item	r Count	r Table (df = 248, = 0.05 α=0.05)	Validity
HSG	0.6207	0.123	Valid
IS	0.6753	0.123	Valid
LE	0.6354	0.123	Valid

Source: processed data (2024)

Information:
HSG : High School Grades
IS : Intellectual Skills
LE : Learning Environment

Since the r table value for df=248df = 248df=248 and α=0.05\alpha = 0.05α=0.05 is approximately 0.123, we can compare the calculated r value with the r table to determine whether the items are valid. All calculated r values for HSG, IS, and LE are greater than r table = 0.123, so all the items are valid based on the Pearson validity test criteria with a significance level of 0.05. Based on the results of the Pearson validity test, all items (HSG, IS, and LE) can be considered valid, because r count > r table.

Table 2. Intellectual Skills, High School Grades, and Learning Environment **Reability Test Result**

Reliability Statistics		
Item	**Cronbach's Alpha**	**N of Items**
HSG	0.775	200
IS	0.756	200
LE	0.771	200

Source: processed data (2024)

The item-total Cronbach's Alpha results displayed provide more detailed information about the reliability of each item in the instrument. HSG (High School Grades): Cronbach's Alpha = 0.775. IS (Intellectual Skills): Cronbach's Alpha = 0.756. LE (Learning Environment): Cronbach's Alpha = 0.771. Cronbach's Alpha values above 0.7 for all items indicate that each item in your instrument has good internal consistency (Martí et al., 2021). These values indicate that HSG, IS, and LE are all reliable in their respective measurements. Good reliability: With Cronbach's Alpha for each item around 0.75, your instrument is reliable in measuring the intended concept with a good level of internal consistency (Yoon, 2022). Good correlation between items: All items (HSG, IS, LE) contribute positively to the total score of the instrument and have a fairly good correlation with the concept being measured.

RESULTS AND DISCUSSION

The data collection conducted in February - June 2024 met the minimum number of samples, namely 200 samples, while the data that was successfully collected and met the criteria was 200. Based on the data that had been collected, tabulation was carried out to determine the characteristics of the respondents. The results of the analysis of respondent characteristics are presented in table 3 below:

Table 3. Demographic Profile of Respondents

Category	Percentage
Gender	
Man	57%
Woman	43%
Age	
18	100%
Recent Education	
Hotel Department	20%
Engineering Department	7%
Electrical Department	13%
Makeup Major	15%
Catering Department	45%
Regional Origin	
Semarang	34.8%
Solo	10.6%
Tegal	10.13%
Others	44.47%
Have a Business	
Yes	38.2%
No	61.8%
High School Grades	
High	53.7%
Low	46.3%
Intellectual Skill	
critical thinking	22.3%
Normal	28.7%
not critical	50%

Source: processed data (2024)

Measurement Model

The results of the second level CFA analysis have met the criteria, Test Statistic (Model Test User Model): A value of 0.000 for the test statistic indicates that your model fits the data very well, as the proposed model and the data match perfectly. However, this could indicate a very simple or possibly overly specific model. Comparative Fit Index (CFI): A value of 1.000 indicates a perfect fit. The CFI measures how well your model compares to a simpler reference model. A value of 1.000 indicates that the proposed model fits the data very well. Tucker-Lewis

Index (TLI): A value of 1.000 also indicates a perfect fit. The TLI also measures model fit and corrects for model complexity. Root Mean Square Error of Approximation (RMSEA): A value of 0.000 is an excellent value, as an RMSEA lower than 0.05 indicates a very good model fit. However, this value could also be an indication of a very overfitted or overly simple model (Alvarez-Icaza, 2024).

Standardized Root Mean Square Residual (SRMR): A value of 0.000 also indicates a perfect model fit. An SRMR lower than 0.08 indicates that the model fits the data very well. The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are measures used to select the best model, with lower values indicating a better model (Dias et al., 2024). A value of 1091.060 for the AIC and 1104.634 for the BIC suggest that the model is quite good, although you may want to compare it to alternative models. The sample-size adjusted Bayesian Information Criterion (SABIC) is a better measure when the sample size is very large. A value of 1091.958 indicates similar results to the AIC and BIC (Van Ewijk, 2024).

CR (Composite Reliability): The CR value for all variables is greater than the cut-off value (0.7), indicating that the indicators have good internal consistency. VE (Variance Extracted): The VE value is also greater than the cut-off value (0.7), indicating that each construct is able to capture more variance from its indicators compared to the error variance. Results: All variables are declared valid and reliable so that they are worthy of use in further analysis and interpretation (Brandshaug, 2024).

Table 4. Construct Reliability and Variance Extracted Test Results

Variable	CR	Cut Off Value	VE	Cut Off Value	Results
HSG	0.967	>0.7	0.967	>0.7	Valid & Reliable
IS	0.880	>0.7	0.880	>0.7	Valid & Reliable
Le	0.893	>0.7	0.893	>0.7	Valid & Reliable

Source: processed data (2024)

Based on the analysis results in Table 4 above, all research variables have CR values > 0.7 and VE > 0.7. These results indicate that all indicators are reliable and can be used in this study.

Model Accuracy Test

The model accuracy test evaluates the model's suitability to the Goodness of Fit Index (GoFI). The results of the Goodness of Fit (GoF) test are presented in Table 5 below:

Table 5. GoF Analysis

The goodness of the fitindex	Cut Of Value	Results	Criteria
Absolute Fit Measures			
Chi-square (X2) (0.95)	< 341,395	391,157	Marginal Fit

Significant probability	≥ 0.05	0.000	Not Fit
RMSEA	≤ 0.08	0.000	Not Fit
CMIN/DF	≤ 2.0	0	Good Fit
GFI	≥ 0.90	0.933	Good Fit
RMR	≤ 0.05	0.000	Not Fit
ECVI	Approaching ECVIsaturated values(1,693)	1,020	Marginal Fit
Incremental Fit Measures			
TLI	≥ 0.90	1,000	Good Fit
NFI	≥ 0.90	0.952	Good Fit
AGFI	≥ 0.90	0.905	Good Fit
RFI	≥ 0.90	0.932	Good Fit
IFI	≥ 0.90	0.903	Good Fit
CFI	≥ 0.95	1,000	Good Fit
Parsimony Fit Measures			
PGFI	> 0.50	0.712	Good Fit
Normed Chi-Squared (X2/pdf)	1.0 – 2.0	1,585	Good Fit
PNFI	> 0.50	0.796	Good Fit

Source: processed data (2024)

The results of the Goodness of Fit (GoF) analysis show that the model has several indicators of good fit, but there are also indicators that need attention. Based on Absolute Fit Measures, the Chi-Square value (391.157) is greater than the cut-off value (341.395), which indicates Marginal Fit, while the significant probability (0.000) is below the threshold (≥ 0.05), so the model is not significant. RMSEA (0.000) although small, indicates Not Fit, and RMR (0.000) also indicates similar results. However, CMIN/DF of 0 indicates Good Fit, as does GFI (0.933) which is above the cut-off value (≥ 0.90). ECVI of 1.020 is close to the saturated value (1.693), which indicates Marginal Fit (Gangadhara & Kumar, 2024).

In Incremental Fit Measures, the model shows good results with TLI (1,000), NFI (0.952), AGFI (0.905), RFI (0.932), IFI (0.903), and CFI (1.000) values, all above the threshold (≥ 0.90), so the model can be considered to have Good Fit in this category. Meanwhile, in Parsimony Fit Measures, the PGFI (0.712) and PNFI (0.796) values are above the cut-off value (> 0.50), with Normed Chi-Squared (1.585) in the ideal range (1.0–2.0), which also indicates Good Fit.

Overall, the model has many indicators that show Good Fit, especially in Incremental and Parsimony Fit Measures (Zinecker et al., 2024). However, the inconsistency in several Absolute Fit Measures indicators, such as Chi-Square, RMSEA, and RMR, indicates that the model requires further improvement. Steps that can be taken are to re-evaluate variables or indicators that may be less appropriate, adjust the relationships in the model based on theory, or ensure the quality of the data used, such as avoiding multicollinearity and missing values (Henry et al., 2024).

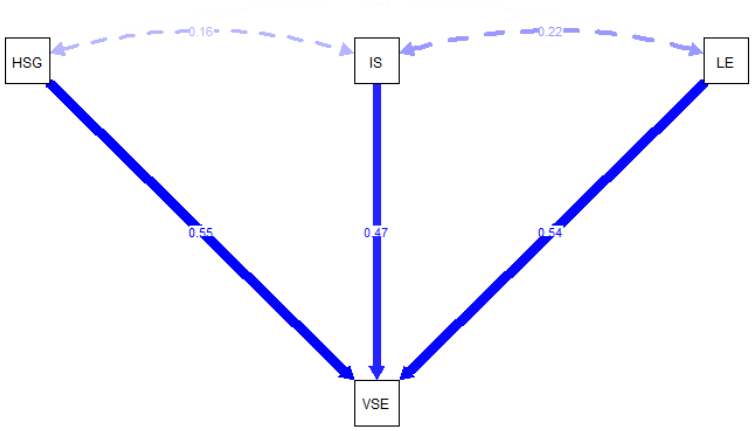

Figure 2. Structural Equation Model
Source: processed data (2024)

Structural Model

Structural models link latent variables through simultaneous equations (Sapna et al., 2023). This structural model test examines the influence of exogenous variables on endogenous variables.

Hypothesis Testing

The direct effect hypothesis test is conducted to see the effect of exogenous variables on endogenous variables. The hypothesis is tested by analyzing the estimated amount of influence between variables in the model. The Maximum Likelihood Value of Regression Weight tests the direct effect between the two variables. An estimated value is considered significant if the significance level is ≤ 5%, the p-value is ≤ 0.05, or the Critical Ratio (CR) value is ≥ 1.967. Table 6 below shows the results of the regression weight test in this study:

Table 6. Regression Weights Test Results

Hypothesis	Path	B	SE	CR	P	Conclusion
H1	HSG → VSEC	0.550	0.058	4,580	0.005	Positive, significant
H2	IS→VSEC	0.472	0.056	4.296	0.005	Positive, significant
H3	LE → VSEC	0.535	0.083	2,793	0.005	Positive, significant
H4	HSG, IS, LE → VSEC	0.000	0.013	2.298	0.001	Positive, significant

Source: processed data (2024)

The first hypothesis (H1) tests the effect of academic grades in high school (HSG) on students' entrepreneurial competence in vocational high schools (VSEC) which has a positive and significant relationship. This is indicated by the path

coefficient (β) of 0.550 with a standard error (SE) of 0.058. The Critical Ratio (CR) value of 4.580 which is far above the critical value of ±1.96 and the level of significance (P) of 0.005 (p <0.001) indicates a significant relationship. Thus, it can be concluded that academic grades in vocational high school make a strong contribution to increasing students' entrepreneurial competence in vocational high schools (López Requena, 2023). These results confirm the importance of previous academic achievement in forming the basis of students' entrepreneurial skills (Adamec & Marinič, 2024).

The second hypothesis (H2) tests the effect of intellectual skills (IS) on students' entrepreneurial competence in vocational high schools (VSEC). The results of the analysis show that this relationship is positive and significant, with a path coefficient (β) of 0.472 and a standard error (SE) of 0.056. The Critical Ratio (CR) value of 4.296 is far above the critical limit of ±1.96, and the level of significance (P) is 0.005 (p <0.001). These results indicate that intellectual skills contribute significantly to the development of students' entrepreneurial competence in vocational high schools (Neergård & Roald, 2025). This means that students' intellectual abilities, such as critical and analytical thinking skills, greatly influence their success in building entrepreneurial potential (Otiniano León et al., 2024).

The third hypothesis (H3) tests the influence of the learning environment (LE) on students' entrepreneurial competence in vocational high schools (VSEC). The results show a positive and significant relationship with a path coefficient (β) of 0.535 and a standard error (SE) of 0.083. The Critical Ratio (CR) value of 2.793 exceeds the critical value of ±1.96, and the level of significance (P) is 0.005 (p <0.001). These results confirm that a supportive learning environment, both in terms of facilities, teacher support, and interaction with peers, has an important influence in improving students' entrepreneurial competence in vocational high schools (Glasserman-Morales et al., 2024).

The fourth hypothesis (H4) tests the combined effect of academic grades in high school (HSG), intellectual skills (IS), and learning environment (LE) on students' entrepreneurial competence in vocational high schools (VSEC). The results of the analysis show a positive and significant relationship with a path coefficient (β) value of 0.000, a standard error (SE) of 0.013, and a Critical Ratio (CR) value of 2.298. The significance level (P) of 0.01 indicates that the combination of these three variables makes a significant contribution to increasing students' entrepreneurial competence. These results strengthen the understanding that the influence of the three variables simultaneously is more effective in building students' entrepreneurial competence than if only one factor is considered (Ahmed et al., 2025).

Coefficient of determination test

The coefficient of determination (R2) determines the magnitude of the variability of economic and behavioral variables compared to exogenous variables explaining (Gil-Doménech et al., 2024). Based on the Squared Multiple Correlations value, it is known that the magnitude of the R2 coefficient of Economic Behavior is 0.594. This coefficient means that the informal economic education

variable can explain the economic behavioral variable by 59.4%. R2 of 0.394 is included in the moderate category (Romero-García & Suárez-Ortega, 2024).

Cárdenas-Gutiérrez et al., (2023) The results of this study indicate a positive and significant relationship between each independent variable on students' entrepreneurial competence, as well as the combined influence of the three variables, looking at table 7 above there are several things that are of concern in the future to foster entrepreneurial competence in vocational high schools (SMK) (Hammoda, 2025).

The results of the Hypothesis Test and Determination Coefficient show the influence of High School Academic Values (HSG). The first hypothesis (H1) shows that students' academic values in high school contribute significantly to the development of entrepreneurial competencies in vocational high schools. The path coefficient of 0.550 indicates that students' previous academic success provides a strong foundation in understanding entrepreneurial concepts and skills. This finding is consistent with previous research showing that good academic achievement builds self-confidence and critical thinking skills, which are important in entrepreneurship (Feijóo-Quintas et al., 2024). It also shows that students who have a strong academic foundation are more prepared to receive vocational education oriented towards entrepreneurship.

The Influence of Intellectual Skills (IS). The second hypothesis (H2) reveals that intellectual skills have a significant effect on entrepreneurial competence with a path coefficient of 0.472. Intellectual skills, such as analytical skills, problem solving, and critical thinking, enable students to explore opportunities and create innovative solutions in a business context. This finding reinforces the view that students' intellectual abilities are an important element in forming an entrepreneurial mindset that is adaptive to challenges and opportunities in the business world (Villena-Martínez et al., 2024).

Influence of Learning Environment (LE) The learning environment is also proven to play an important role, as stated in the third hypothesis (H3). With a path coefficient of 0.535, these results indicate that a supportive learning environment, both in terms of physical, social, and emotional aspects, greatly influences the development of students' entrepreneurial competencies (Quintano-Méndez et al., 2025). Support from teachers, availability of facilities, and a collaborative culture in schools create a conducive atmosphere for students to learn and develop entrepreneurial skills. This is in line with the literature that emphasizes the importance of an adaptive and innovative learning environment in supporting the success of entrepreneurship education (Monteagudo et al., 2025).

Combined Effect (H4). The fourth hypothesis (H4) shows that the combination of academic values, intellectual skills, and learning environment has a significant effect on students' entrepreneurial competence. This result emphasizes that the combination of these three factors has a greater impact than each factor individually (Lechuga-Jimenez et al., 2024). This indicates that a holistic approach involving the development of academic abilities, the enhancement of intellectual skills, and the creation of a supportive learning environment is very important to

improve the entrepreneurial competence of vocational high school students (Ignacio et al., 2024).

Overall, this study provides a significant contribution in understanding the factors that support the success of entrepreneurship education at the vocational high school level. These findings also provide practical implications for education managers to integrate learning strategies that focus on these three aspects into the vocational education curriculum. Coefficient of Determination (R^2) and Interpretation of Variability (Moscoso & Guerra, 2024). The coefficient of determination (R^2) produced in this study shows that the informal economic education variable can explain around 59.4% of the variability of students' economic behavior, which is categorized as moderate according to (Dilova et al., 2024). This figure shows that although informal economic education makes a significant contribution to entrepreneurial behavior, there are still other factors that can influence students' entrepreneurial competence (Çelik & Taşpınar, 2024). Thus, informal economic education can be an important factor, but it needs to be complemented by approaches and support from various other aspects, such as formal education, practical experience, and a supportive social environment (García-Tudela et al., 2024).

CONCLUSION

Based on the results of this study, it can be concluded that academic grades in high school, intellectual skills, and learning environment have a positive and significant influence on students' entrepreneurial competence in Vocational High Schools (SMK). Specifically, students' academic achievement in high school provides a strong foundation for developing entrepreneurial skills, intellectual skills such as critical and analytical thinking play an important role in students' ability to create innovative solutions in business, and a supportive learning environment, both physically and socially, plays a major role in facilitating the development of entrepreneurial competence (L. Liu & Kang, 2024).

The results of this study also show that the combination of the three factors academic grades, intellectual skills, and learning environment has a greater impact on students' entrepreneurial competence than if only one factor is considered separately. Therefore, a holistic approach to entrepreneurship education, which includes strengthening these three factors, is very important to prepare vocational high school students to have optimal entrepreneurial competence (Kakouris et al., 2024). In addition, the results show that informal economic education can explain a large part of the variability in students' entrepreneurial behavior, but there are still other factors that need to be considered. Therefore, although informal economic education has a significant contribution, support from various other aspects is needed, including formal education and practical experience, to improve students' entrepreneurial competence as a whole.

Practically, the results of this study can be applied through several strategic steps. First, curriculum design needs to be enhanced by integrating project-based learning, business simulations, and real-world case studies that foster critical and

analytical thinking skills. Second, collaborative learning can be strengthened through partnerships with local businesses and industries to provide practical experience and mentoring opportunities for a students (Álvarez-Álvarez, 2024). Third, a conducive learning environment should be created by improving school facilities, including access to digital technology and entrepreneurial resources that encourage student creativity and innovation. Fourth, academic support programs should be implemented to assist students with lower academic achievements so they can still benefit from entrepreneurship education. Fifth, teacher training is essential to improve their competence in using innovative teaching methods and acting as entrepreneurship mentors. However, this study also raises critical reflections that need to be considered. For instance, to what extent do external factors, such as government policies and economic conditions, influence the entrepreneurial readiness of vocational high school students? Additionally, how can vocational high schools systematically evaluate and adapt their learning environments to better meet the needs of an ever-evolving job market? With the increasing importance of digital skills, further research is needed to explore how digital literacy can complement traditional entrepreneurial competencies in vocational education.

In conclusion, entrepreneurship education in vocational high schools must go beyond conventional teaching methods by adopting innovative, inclusive, and collaborative approaches. By addressing the internal and external factors shaping entrepreneurial competence, vocational high schools can better prepare their students to face the challenges of a competitive global economy and make significant contributions to local and national development (Thaanyane & Jita, 2024).

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