

ENTREPRENEURIAL FORMATION IN TVET: A SEM ANALYSIS OF KNOWLEDGE, FAMILY ENVIRONMENT, AND SPIRIT ON SELF-EFFICACY AND INTEREST AMONG COMPUTER AND NETWORK ENGINEERING STUDENTS

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ABSTRACT

Unemployment is a serious problem, especially for young people graduating from vocational schools. Vocational education and training (TVET) is a strategic solution to prepare young people to become job seekers and creators. However, the number of vocational school graduates who become entrepreneurs is still low. This indicates a gap between the school entrepreneurship education and students' motivation to become entrepreneurs. This study aims to analyze the influence of entrepreneurship knowledge, family environment, and entrepreneurial spirit on entrepreneurial interest, with self-efficacy as a mediating variable, among students of the Computer and Network Engineering Vocational High School in Makassar. This study uses a quantitative approach with an ex post facto method on 178 respondents, and the data is analyzed using SEM-PLS. The study results show interesting findings: entrepreneurial knowledge does not significantly affect entrepreneurial interest, while family environment and entrepreneurial spirit have a positive and significant effect. Self-efficacy was proven to strongly mediate between psychological factors (entrepreneurial spirit) and social factors (family environment) to entrepreneurial motivation. Theoretically, this study provides evidence that with these research results, Bandura's self-efficacy theory in vocational education can confirm that self-efficacy is the key to shaping students' entrepreneurial behavior. Practically, the results of this study emphasize the importance of project-based and real-life entrepreneurial learning that builds students' confidence in entrepreneurship, as well as the important role of the family in supporting students to become entrepreneurs. These findings provide important insights for educators and policymakers in strengthening entrepreneurial education in vocational high schools.

Keywords: *Self-Efficacy, Entrepreneurial Spirit, Family Environment, Interest in Entrepreneurship, Entrepreneurial Knowledge.*

INTRODUCTION

Vocational education is one of the keys to overcoming global unemployment, because through vocational education, students will be equipped with the skills to compete in the industrial world. In vocational high schools, technical skills are taught, as well as skills related to entrepreneurship. With this, vocational high school students are not only job seekers but are also expected to be able to create jobs themselves (OECD, 2020). Entrepreneurship education must be taught early on in school because it is one way to overcome the problem of unemployment (Elshaiekh et al., 2023). Entrepreneurship plays a very important role in driving economic growth. It has been proven through various studies that entrepreneurship can have a positive impact on economic growth, especially in developing countries where job opportunities are still limited (Liguori & Winkler, 2020).

The concepts of Vocational High School and Vocational Education and Training (TVET) are the same, namely playing an important role throughout the world in equipping students with skills and readiness for the world of work in the future, and making graduates who can create jobs. However, global challenges are inevitable. According to a report from the International Labor Organization (ILO, 2024), the global youth unemployment rate is around 16%, indicating that the success of vocational education programs is an issue that needs attention. In addition, an OECD, (2023) reveals that vocational education outcomes vary significantly between countries due to differences in program quality and relevance to industry. In some countries, vocational education outcomes differ because entrepreneurship education is not yet optimal in schools, and the technical skills taught in schools are not yet in line with industry needs. The mismatch of skills and the low effectiveness of entrepreneurship are major obstacles to the success of TVET graduates in various countries.

The global phenomenon above is highly relevant to what is currently happening in Indonesia. Based on data from the Central Statistics Agency (Direktorat Statistik Kependudukan dan Ketenagakerjaan, 2025), vocational high schools have the highest open unemployment rate at 8.00%. This result is higher than senior high school graduates (6.35%) and college graduates (6.23%). In 2024, the unemployment rate of vocational high school graduates reached 9.01%. Furthermore, the 15–24 age group contributes the most to unemployment in Indonesia, with a percentage of 16.16%. An interesting point here is that Computer Engineering and Informatics is one of the majors contributing to the highest unemployment rate, indicating that the skills taught in school are insufficient to meet industry needs (Mukhlason et al., 2020). However, the Directorate General of Vocational Education data shows that vocational high school graduates generally find jobs relatively quickly, with an average time of 0 to 2 months. It indicates that entrepreneurship development in the 15-24 age group has great potential (Swasty, 2024).

Various international studies have been conducted on entrepreneurial intent, showing that vocational school graduates/vocational education graduates in various countries have low entrepreneurial intent. Several comparative studies conducted in Europe and Asia reveal that, although vocational schools always encourage the improvement of technical skills, graduates of vocational schools do not always have

a high level of confidence or an entrepreneurial mindset (Che Embi et al., 2019; Edelman et al., 2016; García-Rodríguez et al., 2015). In Indonesia, this problem is also evident among vocational high school graduates, whose unemployment rate is higher than that of senior high school graduates (Direktorat Statistik Kependudukan dan Ketenagakerjaan, 2025). Although entrepreneurship has been included in the vocational high school curriculum, the number of graduates who become entrepreneurs remains low. These findings are in line with international research, which reveals that entrepreneurship education in schools is not relevant to market needs, so the number of graduates who decide to start a business is still relatively small (Indriyani & Subowo, 2019; Nowiński et al., 2017).

Based on previous research, the results show that the success of entrepreneurship education among vocational high school students/vocational education students can be influenced by entrepreneurial knowledge and other factors such as family support and self-confidence (Gao & Lu, 2024). In addition to the above factors, many studies have revealed that an entrepreneurial mindset can encourage interest in entrepreneurship (Hanandeh et al., 2021; Yan et al., 2023). Research results in various countries show conflicting findings. Some studies found that entrepreneurial knowledge positively and significantly influenced entrepreneurial interest (Indriyani & Subowo, 2019), while other studies reported a weak or even insignificant influence (Hussain et al., 2014; Montes et al., 2023). Other studies mention that although entrepreneurship education can increase entrepreneurial intention, it must be mediated by factors such as personality and family economic status (Liu et al., 2022).

Self-efficacy is one of the psychological factors that can mediate the relationship between variables, such as the relationship between entrepreneurial knowledge and entrepreneurial interest. Therefore, the role of self-efficacy as a mediating variable in the relationship between knowledge, family environment, and entrepreneurial interest still needs further research, especially in the field of vocational education related to technology. Research conducted in various countries has also found that although vocational students have good technical skills, students from vocational schools often lack confidence and do not have a mindset that reflects an entrepreneurial spirit (Juhari et al., 2023; Rodriguez & Lieber, 2020). This raises the question of how knowledge, social support, and self-confidence can shape entrepreneurial interest. In the context of technical expertise, entrepreneurship education's influence has different results than in non-technical expertise. Entrepreneurship education has no significant impact on entrepreneurial interest in non-technical expertise, whereas in technical expertise, it significantly influences entrepreneurial interest (Adelaja, 2021). These differences are an interesting topic for further research.

In social cognitive theory, self-confidence is an important mediating variable in explaining the relationship between educational experiences and entrepreneurial interest (Bandura, 1997; Newman et al., 2019). However, to date, few studies have specifically examined this relationship in relation to technology-based vocational education, one of which is in the field of Computer and Network Engineering.

Research on entrepreneurial interest specializing in the field of computer and network engineering is still rarely studied. Most previous studies have focused on business or hospitality, while other fields, such as technical fields, have different characteristics. The context of computer engineering and networking expertise in

vocational schools is interesting to study because this field is one of the important aspects in the development of the current digital era, where the use of technology in entrepreneurship has become commonplace. However, there is still little research that specifically explores the factors that shape entrepreneurial interest in technology among vocational students. These differences are interesting. Previous studies have shown a difference in the effect of entrepreneurship education on entrepreneurial interest among engineering and non-engineering students, making this study enjoyable to conduct. Previous studies mostly used university students as research samples, so it is new to find out whether there is a difference in the effect of entrepreneurship education on university and high school students. This topic is a good one for further research.

This study has been developed from the following hypothesis: that the influence of entrepreneurial knowledge, family environment, and entrepreneurial spirit on the self-confidence and entrepreneurial interest of vocational school students in the field of Computer and Network Engineering can be analyzed. Furthermore, the mediating role of self-confidence in the relationship between these variables can be examined. Theoretically, this study contributes to international literature by expanding the field of entrepreneurship studies to the context of technology-based vocational education. This subject has received scant research attention, and by addressing previous inconsistent findings regarding the relationship between entrepreneurial knowledge and interest. The results of this study are expected to provide recommendations for the enhancement of TVET programs with a focus on entrepreneurship development in the era of digital transformation.

RESEARCH METHOD

Research Type and Research Design

This research is quantitative research with *ex-post facto* method. *Ex post facto* research is research conducted to examine events that have occurred to determine the factors that can cause these events. This method is done by not giving treatment to the independent variable under study because the event has already occurred (Myers et al., 2010). The number of populations in this study was 322 students and a sample of 178 students. The research variables consist of independent variables (X_1 and X_2), one dependent variable (Y) and mediating variables (Z). The first independent variable X_1 is entrepreneurial knowledge, X_2 is family environment, X_3 is entrepreneurial spirit Z is self-efficacy, while the dependent variable Y is entrepreneurial interest. The design in this study can be described as follows.

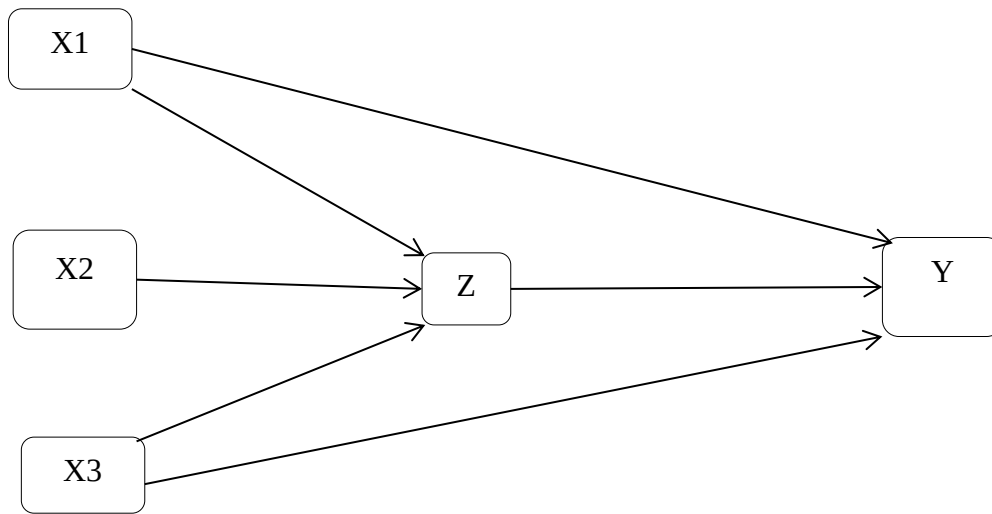


Figure 1. Research design

The following is a more complete description of the variables and indicators used in the study:

Table 1. Indicator descriptions of each research variable

Table 1: Indicator descriptions of each research variable			
Variables		Indicator	Scale
X1 = Entrepreneurship Knowledge	X1.1,	Knowledge about business opportunities	Guttman (0 = False and 1 = True)
	X1.2,		
	X1.3		
	X1.4,	Basic knowledge of entrepreneurship	
	X1.5,		
	X1.6		
	X1.7,	Knowledge of business management	
	X1.8,		
	X1.9		
	X1.10,	Knowledge of entrepreneurial attitudes and behaviors	
	X1.11,		
	X1.12		
	X1.13,	Knowledge of the business to be started (business aspects)	
	X1.14,		
	X1.15		
X2 = Family Environment	X2.1,	Parental support, attitude and treatment	Likert 1-5 Strongly Agree (SS), Agree (S), Undecided (R), Disagree (TS) and Strongly Disagree (STS).
	X2.2,		
	X2.3		
	X2.4	Parents' occupation	
	X2.5,	Economic status and circumstances of parents and other family members	
	X2.6		
	X2.7,	Parental education	
	X2.8	Parental support, attitude, and treatment (Negative Question)	
	X2.9		

Variables	Indicator	Scale
X3 = Entrepreneurial spirit	X2.10, X2.11	Relationship between family members
	X3.1	Optimism
	X3.2	Task- and result-oriented
	X3.3	Discipline
	X3.4	Dare to take risks
	X3.5	Having a sense of leadership
	X3.6	Future-oriented
	X3.7	Being motivated
	X3.8	Originality (Creative and Innovative)
	X3.9	Likes challenges
	X3.10	Honesty and responsibility
	X3.11	Human relationship
	X3.12	Able to see opportunities
	X3.13	Can make changes.
Z = Self-efficacy	X3.14	
	Z1, Z2, Z3	Magnitude
	Z4, Z5, Z6, Z7	Generality
	Z8, Z9, Z10	Strength
Y= Interest in Entrepreneurship	Y1, Y2, Y3	Being motivated and driving in entrepreneurship
	Y4, Y5,	A feeling of interest in entrepreneurship
	Y6, Y7,	Happy when doing entrepreneurial activities
	Y8, Y9, Y10	Have a desire/hope in entrepreneurship
	Y11,	Expressing interest in entrepreneurship both verbally and in action.
	Y12,	
	Y13	

Source: elaborated by the authors.

Data Analysis Technique

The data analysis technique used is inferential statistics by using the *Structural Equation Modeling* (SEM) method. Inferential analysis techniques with SEM use the SEM-PLS type (*Structural Equation Modeling - Partial Least Square*). SEM PLS analysis will be carried out using the help of SmartPLS 3.0 software.

Measurement Test (Outer Model)

Measurement model testing (*outer model*) is used to determine the specification of the relationship between latent variables and their indicators, this

test includes *convergent validity*, *discriminant validity*, and reliability (Ali & Nurji, 2021).

Convergent Validity

Convergent validity is used to see the validity of the instrument. The results of this convergent validity can be seen from the *loading factor* value. *Convergent validity* aims to determine the validity of each relationship between indicators and their latent variables. An indicator is said to be valid, if the loading factor value is > 0.7 (Hair et al., 2021). Another way to measure Convergent validity is to look at the *square root* value of the *average variance extracted* (AVE). The recommended value is above 0.5 for a good model, so the AVE value must be greater than > 0.5 (Ali & Nurji, 2021).

Discriminant Validity

Discriminant Validity is a test to see the validity of the instrument. The discriminant validity test uses the cross-loading value. An indicator is declared to meet discriminant validity if the indicator's cross-loading value on its variable is the largest compared to other variables (Agustin & Trisnawati, 2021).

Composite Reliability

Composite Reliability is a test used to see the reliability of an instrument. Reliability testing is done by looking at the composite reliability and Cronbach's alpha values. It is said to be reliable if the composite reliability value and Cronbach's alpha > 0.7 . This means that the construct has good reliability, or the questionnaire used as a tool in this study is declared reliable or consistent. Composite reliability shows how well the construct is measured by predetermined indicators (Himawan & Aima, 2022).

Structure Test (Inner Model)

After testing the measurement model (*outer model*), the next step is to test the structural model (*inner model*) to see how much influence each variable has, the level of goodness of the model, and conduct hypothesis testing both direct influence and indirect influence (Agustin & Trisnawati, 2021).

Coefficient of Determination (R^2)

The calculation of the coefficient of determination in this study is used to determine the magnitude of the influence of exogenous constructs (independent variables) on endogenous constructs (dependent variables) (Agustin & Trisnawati, 2021).

F^2 Test (Effect Size)

Used to determine the proportion of variance of exogenous variables on endogenous variables. Furthermore, this test is conducted to determine whether the predictor of endogenous variables has a small, medium, and large influence at the structural level. The value of F^2 ranges from 0 to 1 with the interpretation of the value being 0.02 (the influence of exogenous variables is small), 0.15 (the influence of exogenous variables is moderate), and 0.35 (the influence of exogenous variables is large) (Himawan & Aima, 2022).

Stone Goisser (Q^2)

According to (Handayati et al., 2020) *stone goisser* (Q^2) is used to test the predictive power of the Model. The Q^2 score > 0 (zero) indicates that the Model has a good predictive relevance value, while the formula for calculating the Q^2 value can be used as follows:

$$Q^2 = 1 - (1 - R^2) \quad (1)$$

Model Fit (Goodness of Fit (GoF))

The Goodness of Fit test assesses the overall fit of the model using various criteria. Goodness of Fit (GoF) measures the extent to which observational or actual inputs match the predictions of the proposed model. In short, this test is used to see the level of goodness of the Model based on the NFI value (Hair Jr et al., 2021).

Hypothesis Test with Direct Effect

To conclude whether the hypothesis is accepted or rejected, the p-value at significance $\alpha = 5\%$ or 0.05 and the T-statistic value (t-test) are used. If the p-value < 0.05 and the T-statistic value (t-test) > 1.96 then H_0 is rejected, in other words, there is a significant influence between these variables. However, if the p-value > 0.05 then H_0 is accepted, meaning that there is no significant influence between these variables or constructs (Hair Jr et al., 2021). This test answers the following hypotheses:

H₁: There is a positive influence of Entrepreneurship Knowledge on the Entrepreneurial Interest of Computer and Network Engineering Expertise Vocational Students in Makassar City.

H₂: There is a positive influence of family environment on the entrepreneurial interest of vocational students in Computer and Network Engineering Expertise Competency in Makassar City.

H₃: There is a positive influence of entrepreneurial spirit on the entrepreneurial interest of vocational students in computer and network engineering expertise in Makassar city.

H₄: There is a positive influence of Self-Efficacy on the Entrepreneurial Interest of Computer and Network Engineering Expertise Vocational Students in Makassar City.

Hypothesis Test of Indirect Influence

The Specific indirect effects value is used to test hypotheses that use intermediate or intervening variables. This process is done by comparing the data from the path coefficient with the specific indirect effects. So that Specific Indirect Effects need to be displayed (Hair et al., 2019). So that by displaying the value of Specific Indirect Effects will answer the following hypotheses:

H₅: There is a positive influence of Entrepreneurship Knowledge through Self-Efficacy on the Entrepreneurial Interest of Computer and Network Engineering Expertise Vocational Students in Makassar City.

H₆: There is a positive influence of family environment through self-efficacy on the entrepreneurial interest of Computer and Network Engineering Expertise Vocational Students in Makassar City.

H7: There is a positive influence of entrepreneurial spirit through self-efficacy on the entrepreneurial interest of computer and network engineering vocational students in Makassar City.

The *total effect* value of the independent variable on the dependent variable is obtained through the summation of the *direct effect* and *indirect effect* (Avkiran et al., 2018).

RESULTS AND DISCUSSION

RESULTS

Outer Model Test

Convergent validity

Based on the results of the data analysis, the indicators were found to be valid. As for indicators that are declared invalid, these indicators must be removed from the model. The following is a description of the indicators that are declared valid based on the results of *Convergent validity*.

Table 2. Convergent validity test results

Variables	Indicator	Loading Factor (>0.7)	AVE (>0.5)	Information
X1 (Entrepreneurship Knowledge)	X1.1	0.726	0.653	Valid
	X1.10	0.812		
	X1.11	0.792		
	X1.12	0.817		
	X1.14	0.816		
	X1.3	0.836		
	X1.6	0.850		
X2 (Family Environment)	X2.1	0.814	0.655	Valid
	X2.11	0.783		
	X2.2	0.811		
	X2.3	0.847		
	X2.7	0.790		
X3 (Entrepreneurial Spirit)	X3.11	0.846	0.651	Valid
	X3.12	0.769		
	X3.13	0.778		
	X3.2	0.775		
	X3.3	0.836		
	X3.9	0.833		
Z (Self-efficacy)	Z1	0.846	0.661	Valid
	Z2	0.842		
	Z3	0.845		
	Z4	0.806		
	Z5	0.717		
	Z6	0.713		
Y (Entrepreneurial Interest)	Y1	0.846	0.610	Valid
	Y11	0.784		
	Y13	0.735		
	Y2	0.732		
	Y3	0.828		
	Y6	0.713		
	Y7	0.777		
	Y8	0.839		
	Y9	0.766		

Discriminant Validity

Table 3. Cross Loading Value

	X1	X2	X3	Y	Z	Information
X1.1	0.726	-0.009	0.193	0.035	0.061	Valid
X1.10	0.812	-0.024	0.202	-0.026	0.079	Valid
X1.11	0.792	0.029	0.155	-0.014	0.088	Valid
X1.12	0.817	-0.074	0.106	-0.137	-0.009	Valid
X1.14	0.816	-0.071	0.093	-0.051	0.001	Valid
X1.3	0.836	-0.061	0.169	-0.077	0.069	Valid
X1.6	0.850	-0.030	0.173	-0.017	0.070	Valid
X2.1	-0.016	0.814	0.493	0.608	0.573	Valid
X2.11	-0.037	0.783	0.444	0.633	0.512	Valid
X2.2	-0.106	0.811	0.444	0.629	0.574	Valid
X2.3	-0.065	0.847	0.530	0.743	0.604	Valid
X2.7	0.042	0.790	0.462	0.584	0.538	Valid
X3.11	0.213	0.469	0.846	0.529	0.643	Valid
X3.12	0.149	0.398	0.769	0.433	0.547	Valid
X3.13	0.106	0.476	0.778	0.490	0.608	Valid
X3.2	0.125	0.509	0.775	0.624	0.691	Valid
X3.3	0.181	0.463	0.836	0.469	0.694	Valid
X3.9	0.136	0.513	0.833	0.600	0.641	Valid
Z1	0.046	0.656	0.683	0.660	0.846	Valid
Z2	0.051	0.517	0.616	0.577	0.842	Valid
Z4	0.022	0.600	0.665	0.636	0.845	Valid
Z7	0.054	0.554	0.668	0.624	0.806	Valid
Z9	0.093	0.470	0.591	0.415	0.717	Valid
Y1	-0.109	0.664	0.505	0.846	0.597	Valid
Y11	-0.050	0.661	0.475	0.784	0.495	Valid
Y13	-0.120	0.596	0.414	0.735	0.481	Valid
Y2	-0.009	0.567	0.513	0.732	0.541	Valid
Y3	-0.039	0.715	0.492	0.828	0.564	Valid
Y6	-0.030	0.509	0.512	0.713	0.554	Valid
Y7	0.031	0.564	0.597	0.777	0.637	Valid
Y8	-0.167	0.659	0.468	0.839	0.544	Valid
Y9	0.003	0.622	0.633	0.766	0.674	Valid

Source: elaborated by the authors.

Based on the *cross-loading* value in *Discriminant Validity* testing, the results show that all indicators can be said to be valid because the relationship between variables and their indicators is the largest when compared to other variable indicators. Likewise with the AVE-Fornell-Larcker *criterion* value seen in table 4.

Table 4. AVE- Fornell-Larcker criterion

	X1	X2	X3	Y	Z
X1	0.808				
X2	-0.047	0.809			
X3	0.188	0.588	0.807		
Y	-0.070	0.793	0.656	0.781	

	X1	X2	X3	Y	Z
Z	0.062	0.693	0.794	0.725	0.813

Source: elaborated by the authors.

Based on the Fornell-Larcker criterion value, each indicator on each variable can be said to be valid, the AVE value of each variable is higher than the correlation with other variables contained in the model.

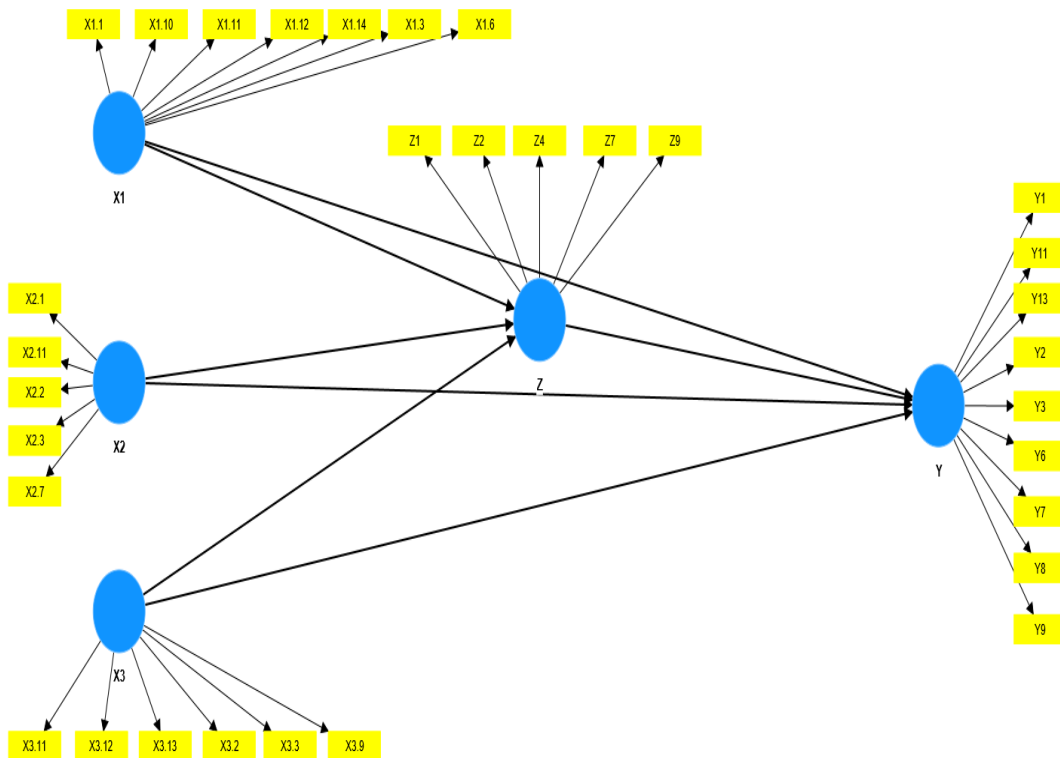


Figure 2. Structural Equation Model

Source: elaborated by the authors.

Structure Test (Inner Model)

Table 5. R^2 Q^2 and NFI values

	R^2	Q^2	NFI (Model Fit)
Structural Test Results	0.70	0.420	0.777

Source: elaborated by the authors.

The coefficient of determination can be seen in Table 5, the effect of exogenous variables in this case is Entrepreneurial Knowledge (X1), Family Environment (X2), and Entrepreneurial Spirit (X3) on endogenous variables in this case is Entrepreneurial Interest (Y) which is 0.700 or 70.0%. This *R-square* value is included in the moderate criterion. With this it can be interpreted that interest in entrepreneurship is influenced by entrepreneurial knowledge, family environment, entrepreneurial spirit and self-efficacy by 70%, and 30% is influenced by other variables not mentioned in the study.

Based on the *Effect Size* (F^2) value, it can be seen that the independent variable Entrepreneurship Knowledge (X1) has a small effect of 0.029 on the dependent variable, namely Entrepreneurial Interest (Y). The independent variable Family Environment (X2) has a large effect of 0.481 on the dependent variable, namely Entrepreneurial Interest. The independent variable Entrepreneurial Spirit (X3) has a small effect of 0.047 on the dependent variable, namely Entrepreneurial Interest (Y). The intervening variable self-efficacy (Z) has a small effect of 0.042 on the dependent variable, namely Entrepreneurial Interest (Y).

Based on the above value of Q^2 obtained by Y is 0.420, where this value is > 0 so it can be concluded that the model has a good predictive relevance value Based on Table 4.31, the NFI value is 0.777 where this value is close to 1 and the value of SRMR is 0.077 where this value is smaller than 0.10. So, it can be concluded that the structural equation model formed can be said to be good or has met the criteria for model fit.

Hypothesis Test direct effect (Direct Effect)

Table 6. Results of direct effect hypothesis testing

Relationship	F^2	Infor.	Mean	SD	T-stat. > 1.96	Path Coefficient	P values (<0,05)	Hypothesis Result
X1 Y (H1)	0.029	Small	-0.202	0.141	1.787	-0.234	0.074	Rejected
X2 Y (H2)	0.481	Great	0.611	0.070	8.570	0.529	0.000	Accepted
X3 Y (H3)	0.047	Small	0.306	0.084	3.839	0.199	0.000	Accepted
Z Y (H4)	0.042	Small	0.201	0.083	2.472	0.206	0.013	Accepted

Source: elaborated by the authors.

First Hypothesis Test (H1) Effect of Entrepreneurial Knowledge on Entrepreneurial Interest (X1 → Y).

Based on the results of hypothesis testing conducted on variable X1 on Y using the *bootstrapping* method, it can be seen in Table 6, that the *p-value* is 0.074 and the T-statistic value (t-test) is 1.787. So based on the *p-value* < 0.05 and the T-statistic value (t-test) > 1.96 as a reference, then H_a is rejected and H_0 is accepted so that it can be concluded that there is no positive and significant effect of Entrepreneurial Knowledge on Entrepreneurial Interest of Vocational Students in Computer and Network Engineering Expertise Competency in Makassar City.

The direct effect of entrepreneurial knowledge (X1) on entrepreneurial interest (Y) can be seen in Table 6. In the table, it can be seen that the direct effect of entrepreneurial knowledge on interest in entrepreneurship amounted to -0.234. The negative value of the number means that there is a negative influence between entrepreneurial knowledge on entrepreneurial interest. So, this can be interpreted as if there is an increase in entrepreneurial knowledge by one unit, there will be a decrease in entrepreneurial interest by 0.234 or 23.4%. The probability value seen from the *p-values* of 0.074, it is interpreted that there is no significant influence between entrepreneurial knowledge and entrepreneurial interest. This is because the probability value obtained is greater than 0.05.

Second Hypothesis Test (H2) Effect of Family Environment on Entrepreneurial Interest ($X_2 \rightarrow Y$)

Based on the hypothesis test conducted on variable X_2 on Y with the *bootstrapping* method, a *p-value* of 0.000 and a T-statistic value (t-test) of 2.472 are obtained which can be seen in Table 8. So based on the *p-value* <0.05 and the T-statistic value (t-test) > 1.96 as a reference, H_a is accepted and H_0 is rejected so that it can be concluded that there is a positive and significant effect of the Family Environment on Entrepreneurial Interest of Vocational Students in Computer and Network Engineering Expertise Competency in Makassar City.

The direct effect of family environment (X_2) on entrepreneurial interest (Y) obtained a coefficient of 0.529 which can be seen in Table 6. The coefficient value of X_2 on Y is positive, so it means that there is a positive and significant influence between the family environment on entrepreneurial interest of 0.529. This means that if there is an increase in the family environment variable by one unit, there is an increase in the interest in entrepreneurship variable by 0.529 or 52.9%. The probability value seen from the *p-values* of 0.000, it is interpreted that there is a significant influence between entrepreneurial knowledge with entrepreneurial interest. This is because the probability obtained is smaller than 0.05.

Third Hypothesis Test (H3) Effect of Entrepreneurial Spirit on Entrepreneurial Interest ($X_3 \rightarrow Y$)

Based on the hypothesis test conducted on variable X_3 on Y with the *bootstrapping* method, the *p-value* is 0.000 and the T-statistic value (t-test) is 3.839. So based on the *p-value* <0.05 and the value of the T-statistic (t-test) > 1.96 as a reference, H_a is accepted and H_0 is rejected so that it can be concluded that there is a positive and significant effect of entrepreneurial spirit on the entrepreneurial interest of vocational students in computer and network engineering competency in Makassar city.

The magnitude of the direct effect of the entrepreneurial spirit (X_3) on interest in entrepreneurship (Y) can be seen in Table 6. In the table, it can be seen that the direct effect of entrepreneurial spirit on entrepreneurial interest amounted to 0.199. The positive coefficient value on this figure means that there is a positive and significant influence between entrepreneurial knowledge on entrepreneurial interest. So, this can be interpreted if there is an increase in the entrepreneurial spirit by one unit, there will be an increase in entrepreneurial interest of 0.199 or 19.9%. The probability value seen from the *p-values* of 0.000, is interpreted that there is a significant influence between entrepreneurial knowledge and interest in entrepreneurship. This is because the probability obtained is smaller than 0.05.

Fourth Hypothesis Test (H4) Effect of Self-efficacy on Entrepreneurial Interest ($Z \rightarrow Y$)

Based on the hypothesis test conducted on variable Z on Y using the *bootstrapping* method, the *p-value* is 0.013 and the T-statistic value (t-test) is 8.570. So based on the *p-value* <0.05 and the T-statistic value (t-test) > 1.96 as a reference H_a is declared accepted and H_0 is declared rejected so that it can be concluded that there is a positive and significant effect of self-efficacy on the entrepreneurial interest of vocational students of computer and network engineering expertise in Makassar City.

The magnitude of the direct effect of self-efficacy (Z) on entrepreneurial interest (Y) can be seen in Table 8. In the table, it can be seen that the direct effect of self-efficacy on interest in entrepreneurship amounted to 0.206. The positive coefficient value on this figure means that there is a positive and significant influence between entrepreneurial knowledge on entrepreneurial interest. So this can be interpreted if there is an increase in self-efficacy by one unit, there will be an increase in entrepreneurial interest by 20.6 or 20.6%. The probability value seen from the *p-values* of 0.013, it is interpreted that there is a significant influence between entrepreneurial knowledge and entrepreneurial interest. This is because the probability obtained is smaller than 0.05.

Hypothesis Test indirect effect

Table 7. Hypothesis testing results of indirect effects

Relationshi p	Path Coefficient	T statistics (> 1.96)	P values (<0,05)	Hypothesis Result	Explanation
X1 -> Z -> Y (H5)	-0.018	0.658	0.510	Rejected	No Mediation
X2 -> Z -> Y (H6)	0.069	2.316	0.021	Accepted	Partial Mediation
X3 -> Z -> Y (H7)	0.124	2.335	0.020	Accepted	Partial Mediation

Source: elaborated by the authors.

Fifth Hypothesis Test (H5) Effect of Entrepreneurial Knowledge on Entrepreneurial Interest through Self-Efficacy ($X1 \rightarrow Z \rightarrow Y$)

Based on the hypothesis test conducted on variable X1 on Y through Z with the *bootstrapping* method, the *p-value* is 0.510 and the T-statistic value (t-test) is 0.658. So based on the *p-value* <0.05 and the T-statistic value (t-test) > 1.96 as a reference, H_a is rejected, and H_0 is accepted so that it can be concluded that there is no positive and significant effect of Entrepreneurship Knowledge on Entrepreneurial Interest through Self-efficacy of Computer and Network Engineering Expertise Vocational Students in Makassar City.

The indirect effect of entrepreneurial knowledge (X1) through self-efficacy (Z) on entrepreneurial interest (Y) obtained is -0.018. The negative value in the indirect effect value means that there is a negative influence between entrepreneurial knowledge on entrepreneurial interest through self-efficacy. This can be interpreted if the higher the value of entrepreneurial knowledge (X1), the interest in entrepreneurship (Y) through self-efficacy (Z) will decrease. An increase of one unit of X_1 can reduce Y through Z by 1.8%. So, it can be concluded that self-efficacy can reduce the effect of entrepreneurial knowledge on entrepreneurial interest by 1.8%. With this, it can be considered that self-efficacy is not able to mediate the relationship between entrepreneurial knowledge variables on entrepreneurial interest. The probability value seen from the *p-values* of 0.510, is interpreted as that there is no significant influence between entrepreneurial knowledge and entrepreneurial interest through self-efficacy. This is because the probability value obtained is greater than 0.05.

Sixth Hypothesis Test (H6) Effect of Family Environment on Entrepreneurial Interest through Self-Efficacy ($X_2 \rightarrow Z \rightarrow Y$)

Based on hypothesis testing conducted on the family environment variable (X_2) on entrepreneurial interest (Y) through self-efficacy (Z) as a mediating variable with the bootstrapping method, the p -value is 0.021 and the T-statistic value (t-test) is 2.335. So based on the p -value < 0.05 and the T-statistic value (t-test) > 1.96 as a reference, H_a is accepted and H_0 is rejected so that it can be concluded that there is a positive and significant effect of the Family Environment on Entrepreneurial Interest through Self-efficacy of Computer and Network Engineering Expertise Vocational Students in Makassar City.

The indirect effect of family environment (X_2) through self-efficacy (Z) on entrepreneurial interest (Y) obtained an indirect effect coefficient of 0.069. Based on the positive indirect effect value, it can be interpreted that there is a positive influence of the family environment on entrepreneurial interest through self-efficacy. It can be interpreted that if the higher value of the family environment (X_2), then the interest in entrepreneurship (Y) through self-efficacy (Z) can also increase. If there is a one-unit increase in X_2 , then Y will also increase through Z by 6.9%. So, it can be concluded that self-efficacy can increase the influence of the family environment on interest in entrepreneurship by 6.9%. So, the *total effect* of the family environment on interest in entrepreneurship is 59.8% this value is obtained based on the sum of the direct effect (direct effect) and indirect effect (indirect effect). The probability value seen from the p -values of 0.020 it is interpreted that there is a significant influence between entrepreneurial knowledge and entrepreneurial interest through self-efficacy. This is because the probability obtained is smaller than 0.05.

The direct effect of family environment on entrepreneurial interest is greater when compared to the effect of family environment on entrepreneurial interest through self-efficacy. Where the direct effect of family environment on entrepreneurial interest amounted to 52.9% while the indirect effect of family environment on entrepreneurial interest through self-efficacy amounted to 6.9%. So, it can be concluded that the mediating effect provided by self-efficacy to increase the influence of the family environment on interest in entrepreneurship falls into the category of partial mediation.

Seventh Hypothesis Test (H7) The effect of entrepreneurial spirit on entrepreneurial interest through self-efficacy ($X_3 \rightarrow Z \rightarrow Y$)

Based on the hypothesis test conducted on variable X_3 on Y with the bootstrapping method, the p -value is 0.020 and the T-statistic value (t-test) is 3.839. So based on the p -value < 0.05 and the T-statistic value (t-test) > 1.96 as a reference H_a is declared accepted and H_0 is rejected so that it can be concluded that there is a positive effect of entrepreneurial spirit on entrepreneurial interest through self-efficacy of computer and network engineering vocational students in Makassar City.

The indirect effect of entrepreneurial spirit (X_3) through self-efficacy (Z) on entrepreneurial interest (Y) obtained an indirect effect coefficient of 0.124. Based on the positive indirect effect value, it can be interpreted that there is a positive influence of entrepreneurial spirit on entrepreneurial interest through self-efficacy. It can be interpreted that the higher the value of the entrepreneurial spirit

(X3) then the interest in entrepreneurship (Y) through self-efficacy (Z) can also increase. If there is a one-unit increase in X3 then Y will also increase through Z by 12.4%. So, it can be concluded that self-efficacy can increase the effect of entrepreneurial spirit on entrepreneurial interest by 12.4%. The probability value seen from the *p-values* of 0.021, it is interpreted that there is a significant influence between entrepreneurial knowledge and entrepreneurial interest through self-efficacy. This is because the probability obtained is smaller than 0.05.

The direct effect of entrepreneurial spirit on entrepreneurial interest is greater when compared to the effect of entrepreneurial spirit on entrepreneurial interest through self-efficacy. Where the direct effect of entrepreneurial spirit on entrepreneurial interest is 19.9% while the indirect effect of entrepreneurial spirit on entrepreneurial interest through self-efficacy is 12.4%. So, it can be concluded that the mediating effect provided by self-efficacy to increase the effect of entrepreneurial spirit on entrepreneurial interest is in the category of *partial mediation*.

Discussion

Effect of Entrepreneurship Knowledge on Entrepreneurial Interest of Computer and Network Engineering Expertise Competency Students in Makassar City

The results of this study indicate that entrepreneurial knowledge has a negative effect on entrepreneurial interest. It contradicts to (Indriyani & Subowo, 2019), which states that having a high level of entrepreneurial knowledge will increase a person's interest in entrepreneurship, because the higher the knowledge of entrepreneurship, the higher a person's motivation to become an entrepreneur. The difference between the results of this study and those conducted (Suratno et al., 2024) may be due to the different types of instruments used. In that study, the instrument used was a questionnaire, while in this study, the instrument used was a test. In addition, the data analysis techniques used were also different; the study used regression analysis and path analysis techniques, while this study used SEM-PLS analysis techniques because they involved mediating variables. These differences in instruments and analysis techniques can affect the sensitivity of the results in seeing the relationship between variables. There are various ways to improve entrepreneurial knowledge, one of which is by creating entrepreneurship modules. Research shows that even though entrepreneurial knowledge has increased, the intention to become an entrepreneur has not increased significantly (Thomas, 2023). On the other hand, some have found that the effect is significant but relatively weak or small (Alakaleek et al., 2023).

Contrary to the studies conducted (Indriyani & Subowo, 2019; Suratno et al., 2024), the study conducted (Agusmiati & Wahyudin, 2019) supports the results of this study, namely that entrepreneurial knowledge does not have a positive and significant effect on students' entrepreneurial interest. This is further reinforced (Y. Liao et al., 2022; Mothibi & Malebana, 2025), which explains that entrepreneurial knowledge or entrepreneurial education is not a factor that directly influences entrepreneurial interest. Entrepreneurial knowledge or entrepreneurial education will have an impact on entrepreneurial interest when it receives a mediating effect, for example, from attitudes, self-confidence, social norms, or other psychological factors. Thus, the absence of the influence of knowledge on entrepreneurial interest

may be due to the suboptimal transformation of knowledge into practical experience, or the existence of a knowledge–practice gap, which indicates that students understand the concepts but are not yet able to apply them.

The absence of the influence of entrepreneurial knowledge on students' entrepreneurial interest raises a big question, considering that entrepreneurial education has been implemented in vocational schools and is a C3 subject, where C3 subjects are productive subjects and have a lot of learning time. However, looking back a few years, entrepreneurial learning at that time was carried out online due to the impact of the COVID-19 pandemic. The pandemic caused entrepreneurship learning, which should have been carried out at school, to be limited to theory without practical activities.

Based on the results of the study, the entrepreneurial knowledge scores of vocational high school students majoring in Computer and Network Engineering Competency Skills in theory were in the very high category. However, entrepreneurial education is not only theoretical but must be carried out directly so that students have real experience in entrepreneurship. It is evidenced by the research of (Tahirs & Rambulangi, 2020) in which direct entrepreneurial training inspired students to become entrepreneurs after the training was conducted. A few years ago, the COVID-19 pandemic caused entrepreneurship education, which should have been conducted in schools, to be conducted online. This means that entrepreneurship practices cannot be carried out optimally. Referring to the Creative Products and Entrepreneurship subject curriculum for grade XI, one of the indicators of competency achievement is presenting the design/prototype and packaging of goods/services.

This indicator cannot be optimally achieved if learning is only conducted online using lecture methods. Research (Mothibi & Malebana, 2025) in South Africa also shows that entrepreneurship education is not the main catalyst for entrepreneurial interest. Although many individuals have theoretical knowledge, they cannot often apply that knowledge in a practical context. In addition, entrepreneurship education in educational institutions is often irrelevant to society's conditions. Various international studies have suggested that entrepreneurial interest can be increased by developing entrepreneurial knowledge. However, it has also been proven that entrepreneurial interest is more strongly influenced by psychological factors such as motivation, emotions, and self-confidence (Shirokova, Bogatyreva, et al., 2016).

This is in line with (Kurniawan et al., 2017; Saoula et al., 2023), who found that in entrepreneurship learning if students only listen to information from teachers and do not really understand the material being taught. The knowledge provided is only theoretical, so students will feel bored because they consider entrepreneurship knowledge uninteresting. In fact, entrepreneurship knowledge should be more meaningful when applied in entrepreneurial practice. The effectiveness of entrepreneurship education is highly dependent on curriculum design. The impact of entrepreneurship education on student interest is a topic that has been widely explored in academic literature. (Nabi et al., 2021; Saoula et al., 2023) emphasize that a focus on theory has limited effectiveness in stimulating interest, while practical and hands-on approaches are far more impactful.

One program that schools can implement to provide students with real-world experience in entrepreneurship is the learning factory program. According to

(Hasanah & Purnamawati, 2017) the learning factory program (TEFA) is a learning program designed and implemented based on real work procedures and standards to produce products that meet market needs. However, many schools are still unable to implement this program optimally.

Furthermore, when the data is analyzed from the perspective of the average score for each entrepreneurial knowledge indicator, the questions in the indicators of business opportunity knowledge, business management knowledge, entrepreneurial attitude and behavior knowledge, and business knowledge to be implemented (business aspects) can be categorized as easy questions. On the other hand, on average, the questions in the basic entrepreneurial knowledge indicator have a moderate level of difficulty. The knowledge questions presented are at an accessible and moderate level, without any overly challenging questions. It has been proven that questions at an easy level are more dominant than questions at a moderate level. As a result, the high level of student knowledge may also be due to the presence of overly simple questions. It is recommended that the level of difficulty of the questions be varied to facilitate further research.

Entrepreneurship education in engineering majors has different characteristics compared to other majors. Engineering majors require large amounts of capital to start a business, so they need support from other factors, not just entrepreneurial knowledge. Engineering majors combine entrepreneurial knowledge with their technical competencies, so in order to become entrepreneurs, engineering students must be proficient in their field of study. To master the field of engineering, all facilities that support practical learning must be well provided, but this is difficult to fulfill for developing countries such as Indonesia. This is supported by international studies that examine the influence of entrepreneurship education on individuals with engineering majors and non-engineering majors. The results reveal that the relationship between entrepreneurship education and entrepreneurial intent for engineering majors is insignificant, while for non-engineering majors, there is a weak but positive influence (Adelaja, 2021; Bhattacharyya & Kumar, 2020).

Although this study is national in nature, the findings are supported by various international sources, including theory-based entrepreneurship education is often irrelevant to practical realities; that social environment and personal motivation have a more dominant influence on entrepreneurial interest; and that knowledge is considered only as cognitive preparation rather than a catalyst for entrepreneurial interest. Research conducted in European countries shows that entrepreneurship education has shifted from a classroom-based model to an experiential learning model. This transition signifies a paradigm shift in which students engage in experiential learning that facilitates direct practical application. The effectiveness of this model in stimulating students' interest in entrepreneurship has been proven to be superior to traditional classroom learning methods (Amjad et al., 2020; Martínez-Gregorio et al., 2021; Motta & Galina, 2023).

The findings of this study indicate that entrepreneurial knowledge does not always influence entrepreneurial interest. The findings of this study indicate that entrepreneurial learning requires a balanced approach that integrates theoretical knowledge and practical application. Increasing the amount of practical application will have a tangible impact on students. Many methods can be applied to foster

entrepreneurial interest through entrepreneurship education in vocational schools. Other methods include optimizing the process of entrepreneurship education in both theory and practice, organizing students, and holding entrepreneurship seminars to inspire students to pursue careers as entrepreneurs or business owners after graduating from vocational school.

Effect of Family Environment on Entrepreneurial Interest in Computer and Network Engineering Expertise Competency Students in Makassar City

The findings indicated a favorable impact of the family environment on the entrepreneurial interest of SMK students in Computer and Network Engineering Expertise Competency in Makassar City. The family environment exerts a significant influence on student entrepreneurial interest. It plays a significant role in fostering entrepreneurial interest, as the family environment can direct an individual towards a career in entrepreneurship (Georgescu & Herman, 2020; Rosado-Cubero et al., 2022; Mahfudzi & Fitri, 2022). The family environment also correlates with entrepreneurial attitudes, which correlate with entrepreneurial interest (Soleimanof et al., 2021).

The family environment is defined as the primary environment in life, comprising the father, mother, children, and other family members (Oktarina et al., 2019; Szabó & Aranyossy, 2024). The family constitutes the foundational unit for the growth and development of children. In this context, the initial influences on personality formation are established. Within the familial environment, one of the parents will significantly influence their children in determining their future, for example, in choosing a job. This is because families can provide moral support, encouragement, and recognition that builds confidence to try entrepreneurship (Ahmed, 2022). Students who grow up in entrepreneurial families have greater opportunities to become entrepreneurs because children who see their parents being entrepreneurs are more likely to imitate their behavior, understand the risks, and see entrepreneurship as a realistic career path (Cardella et al., 2020).

The family environment has been identified as a significant factor in developing entrepreneurial interest. The family's entrepreneurial interest is influenced by its positive or negative impact on the individual, which is a consequence of the attitudes and activities of family members, which influence each other directly and indirectly. Parents who work as entrepreneurs will also significantly impact their children's future career choices and their interest in entrepreneurship. The family environment exerts the most significant influence, a conclusion that is further substantiated by the findings concerning the impact of other exogenous variables. The family environment most significant influence on cultivating students' entrepreneurial interest (Himawan & Aima, 2022; Mahfudzi & Fitri, 2022).

An individual born into a family of entrepreneurs possesses a distinct advantage, as they will likely internalize entrepreneurial values from an early age. Consequently, it is unsurprising that an individual raised in an entrepreneurial family environment will be familiar with entrepreneurship, facilitating their transition into the field (Cardella et al., 2020). Marini & Hamidah, (2014) indicates the family is the most significant social environment for an entrepreneur, playing a substantial role in shaping an individual's character, including the entrepreneurial character of a child. This is also supported by Developmental Ecology theory,

which states that individual development is influenced by various environmental systems, ranging from the closest (microsystem) to the broadest (macrosystem). The family environment is part of the microsystem layer, which is the first environment that shapes an individual's values, attitudes, and behavior.

The present study's findings are consistent with the preliminary observations that the family environment is the primary factor influencing interest in entrepreneurship. The rationale behind this is that the operation of a commercial entity necessitates substantial financial resources. Consequently, a robust economic foundation, facilitated by familial support, is instrumental in securing the necessary capital for business operations. Furthermore, research indicates that the offspring of entrepreneurs are more likely to become entrepreneurs themselves. The rationale behind this phenomenon can be attributed to a multitude of factors, including, but not limited to, parents' requests to perpetuate the business, their interest in entrepreneurship, which has been cultivated through their engagement with entrepreneurial ventures run by their offspring, the capital and space provided by parents, and the relationships between families who are entrepreneurs. Empirical analysis found that family background, in this case economic conditions, influences students' entrepreneurial intentions (Georgescu & Herman, 2020)(Szabó & Aranyossy, 2024) .

Experience within the family is one of the factors that drives students' interest in entrepreneurship. Through families who are entrepreneurs, children can learn to manage a business directly by helping their parents with their business activities. They also regularly discuss entrepreneurship with their families (Martins et al., 2023). The family environment can also shape students' views that entrepreneurship is something important, a respected profession, and something that can be achieved (Soleimanof et al., 2021).

This finding aligns with the theory proposed (Edelman et al., 2016; Liu et al., 2022), which posits that the family environment significantly influences the cultivation of entrepreneurial interest. The family environment has the capacity to direct an individual towards the pursuit of entrepreneurship in the future. This assertion is further substantiated by the findings of (Rosado-Cubero et al., 2022), which contend that the family environment exerts the most significant influence on the attitudes of young entrepreneurs. Furthermore, as posited (Manafe et al., 2023), the family environment can foster a conducive environment for entrepreneurial search and development, thereby providing opportunities for children to direct their interests in the future. The role of the family is also very important in encouraging children's interest in entrepreneurship, including students who have started thinking or deciding to pursue a particular career as their goal.

The findings of this study demonstrate that the family environment plays a pivotal role in cultivating interest in entrepreneurship. Individuals born into entrepreneurial families are likelier to cultivate their entrepreneurial potential, ensuring entrepreneurship continuity within their family lineage. While it is impossible to compel a child to pursue a particular course of action, this is paramount when considering the continuity of a family business. For those not born into an entrepreneurial family, but who harbor an entrepreneurial spirit, it is essential to establish relationships and connections with entrepreneurs, whether as friends or colleagues. (Saoula et al., 2023; Suratno et al., 2024) obtain the greater

the intensity of individual association in an entrepreneurial environment, the more readily information, motivation, and encouragement in entrepreneurship can be obtained.

The influence of entrepreneurial spirit on entrepreneurial interest of Computer and Network Engineering Expertise Competency Students in Makassar City.

The findings indicated a positive and significant impact of entrepreneurial spirit on the entrepreneurial interest of vocational school students in Computer and Network Engineering Expertise Competency in Makassar City. This finding aligns with (Ali & Nurji, 2021; Fakhri et al., 2018), which asserts that entrepreneurial spirit significantly influences student entrepreneurial interest. Consequently, it is imperative to cultivate an entrepreneurial spirit among students, thereby inspiring their interest in becoming entrepreneurs who are willing to generate novel business opportunities. This data is pertinent to the research results, which demonstrate a positive relationship between the entrepreneurial spirit and the entrepreneurial interest of vocational students (Pratiwi, 2020).

The entrepreneurial spirit is formed based on several indicators, including self-confidence, optimism, a task- and result-oriented approach, discipline, a propensity to take risks, leadership skills, a focus on the future, motivation, originality (i.e. creativity and innovation), a penchant for challenges, honesty, responsibility, human relationships, the ability to recognize opportunities, and the capacity to implement change. The results of the descriptive analysis demonstrate that, on average, vocational students have exhibited several of the aforementioned indicators of entrepreneurial spirit, including self-confidence, a task- and result-oriented mindset, risk-taking, leadership, originality, a love of challenges, honesty and responsibility, human relationships, the ability to recognize opportunities, and the capacity to implement change (Shirokova, Osiyevskyy, et al., 2016). This finding is derived from the proportion of students who agreed with the statements presented.

The entrepreneurial spirit is of great significance, for it is the driving force behind entrepreneurial behavior, which is integral to entrepreneurship. This spirit manifests in the realization of innovative ideas in business management. Thus, vocational school Computer and Network Engineering Expertise Competency students have demonstrated an entrepreneurial spirit, albeit with room for improvement in certain areas. An entrepreneurial spirit in students is conducive to realizing innovative ideas in the realm of work. This, in turn, leads to an enhancement in the quality and standard of living of the individual's economy. the entrepreneurial spirit refers to the specific behavior exhibited by individuals with the aptitude and determination to effectively manage a business (Chong, 2022; Siburian et al., 2022).

The entrepreneurial spirit can be cultivated through training programs or workshops designed for entrepreneurship. (Karim et al., 2025) posits that the cultivation of the entrepreneurial spirit within educational institutions can be facilitated by integrating entrepreneurship education and incorporating entrepreneurial values within the classroom environment. Attention must be paid to the factors that influence the entrepreneurial spirit of students, to cultivate this spirit itself. The fulfilment of all indicators of students' entrepreneurial spirit is conducive to developing their entrepreneurial spirit, which significantly impacts their

entrepreneurial interest. Individuals will invariably aspire to establish their own commercial enterprises, driven by the conceptual frameworks within their cognitive frameworks (Ayu & Naully, 2020; Rauf et al., 2021).

The findings of this study will assist policymakers and curriculum developers at Vocational School in a more profound comprehension of how entrepreneurial spirit influences students' inclination towards entrepreneurship. The study results indicate that the curriculum could be improved to emphasize the development of the entrepreneurial spirit, for example, through project-based learning or business simulation. The present study has the potential to furnish policymakers in Vocational Schools with the necessary information to facilitate a more profound comprehension of how entrepreneurial spirit influences students' interest in entrepreneurship. These results can inform the creation of a curriculum that emphasizes the development of students' entrepreneurial spirit, such as implementing project-based learning or business simulations. The findings demonstrate that cultivating soft skills, including responsibility, discipline, honesty, risk-taking, and innovation, fosters heightened interest in entrepreneurship among students. Consequently, integrating soft skills into entrepreneurship education is a crucial endeavor.

The Effect of Self-Efficacy on Entrepreneurial Interest of Computer and Network Engineering Expertise Competency Students in Makassar City

The findings indicated a favorable impact of entrepreneurial knowledge on the entrepreneurial interest of Vocational School students in Computer and Network Engineering Expertise Competency in Makassar City. This finding aligns to (Hidayat et al., 2022; Juhari et al., 2023), which asserts that self-efficacy exerts a significant influence on student entrepreneurial interest. Specifically, it is posited that as student self-efficacy levels increase, so does their entrepreneurial interest (Roza et al., 2019) (Y. Li, 2025). There is a positive correlation between self-efficacy and the entrepreneurial interest of vocational students. (Rodriguez & Lieber, 2020) assert that elevated self-efficacy is concomitant with heightened entrepreneurial interest.

Student's interest in entrepreneurship increases when vocational students have high self-efficacy (Ahmed, 2022; Saoula et al., 2023). It can thus be posited that an increase in students' self-efficacy may be a catalyst for their interest in entrepreneurship. Self-efficacy plays a pivotal role in fostering the entrepreneurial interest of vocational student's (Karim et al., 2025). Self-efficacy contributes to an individual's confidence in their ability to execute tasks and engage in professional activities (Ramadhan et al., 2023; Schunk & DiBenedetto, 2021). The hypothesis that high self-efficacy fosters high entrepreneurial interest merits further investigation. Establishing a commercial enterprise necessitates self-confidence (self-efficacy) in one's aptitude, thereby ensuring the venture's success. Students who possess the requisite confidence to successfully overcome future difficulties and challenges and demonstrate high academic performance are a source of pride for their peers. This is because they can enhance their self-efficacy (Shirokova, Bogatyreva, et al., 2016; Tambunan et al., 2024 ; Tuenpusa et al., 2022).

The findings, based on descriptive statistical data, indicate that the self-efficacy data of vocational high school students in Makassar city have a high

tendency of 29% and a high tendency of 57%. Therefore, students who have a high level of self-efficacy. According to the definition of self-efficacy, namely the belief or trust that a person has in themselves, which is used in doing something or carrying out and completing a task so that they can overcome challenges and various kinds of situations that arise to achieve predetermined goals, it can be concluded that students who have high self-confidence are 86% of the total number of students who are respondents. The effect of self-efficacy on entrepreneurial interest is included in the small effect. Despite the negligible effect size, self-efficacy may still influence students' entrepreneurial interests.

The results of the descriptive statistical analysis of all self-efficacy indicators demonstrate that, on average, all students agree with the statement items provided, with many students also expressing a strong degree of agreement. However, many students have yet to make a definitive decision. The mean value obtained on the self-efficacy variable is directly proportional to the mean value of 40.11, which is in the high data tendency range. Thus, vocational students in Makassar City have already demonstrated a high level of confidence in their future entrepreneurial abilities. Specifically, students have expressed a strong conviction that they possess the necessary skills and competencies to complete entrepreneurial tasks and projects with high proficiency. Furthermore, students have articulated substantial self-assurance in their ability to manage and navigate various entrepreneurial endeavors. Finally, students have conveyed a profound sense of capability and readiness to undertake all the responsibilities and demands associated with entrepreneurship, underscoring their confidence in their ability to excel in this domain.

The present study provides a more profound understanding of the significance of self-efficacy in fostering entrepreneurial interest. These results can be used to encourage the establishment of self-development programs that focus on increasing students' confidence in their entrepreneurship abilities. To achieve this objective, educational institutions may consider implementing enhanced entrepreneurial practices, with a view to fostering self-assurance and trust in their capabilities. Project-based learning is a pedagogical approach that can be employed to provide students with direct entrepreneurial experience. This approach offers students a practical understanding of the entrepreneurial process, thereby facilitating knowledge acquisition and self-confidence development. This can foster students' feelings of capability regarding entrepreneurship. In education, students' motivation is critical to fostering their confidence. It is recommended that subject teachers collaborate with guidance and counselling teachers to deliver counselling to students; to avoid any misgivings they may have about entrepreneurship. Many activities have been identified as potential catalysts for personal development, including extracurricular pursuits designed to enhance self-efficacy, entrepreneurial endeavors, mentorship program and career guidance services.

Effect of Entrepreneurship Knowledge on Entrepreneurial Interest through Self-efficacy of Computer and Network Engineering Expertise Competency Students in Makassar City

The findings indicated that entrepreneurial knowledge did not positively influence entrepreneurial interest, as evidenced by the self-efficacy of Vocational School students in Computer and Network Engineering Expertise Competency in

Makassar City. These results contradict with (Hasan et al., 2020; Waldyatri et al., 2021) entrepreneurial knowledge affects entrepreneurial interest through self-efficacy. Self-efficacy, functioning as a moderating variable, obstructs the association between entrepreneurial knowledge and entrepreneurial interest.

Preliminary findings from a descriptive statistical analysis indicate that self-efficacy and entrepreneurial knowledge data are characterized by a strong tendency towards the high and high categories, respectively. Consequently, substantial knowledge and self-efficacy do not ensure a propensity for entrepreneurship. Moreover, self-efficacy and extensive entrepreneurial knowledge continue to evoke reservations among students regarding their entrepreneurial aptitude. This phenomenon can be attributed to entrepreneurship's multifaceted nature, which necessitates considering numerous factors (Burnette et al., 2020). Among these, the acquisition of capital assumes paramount importance. One potential source of capital for entrepreneurs is familial support. However, it must be acknowledged that not all parents or families possess the financial resources to provide business capital for entrepreneurial endeavors. Consequently, external factors, such as insufficient business capital, can diminish student confidence in pursuing entrepreneurship, despite their existing knowledge in this area.

A lack of confidence in implementing the knowledge acquired from running a business. A significant proportion of students also elect to seek employment with agencies or to continue their education, thus circumventing the potential risks associated with the pursuit of entrepreneurship. Furthermore, there appears to be a lack of comprehension regarding the intricacies of entrepreneurial knowledge, including fundamental principles of entrepreneurship. A proportion of entrepreneurs opt to commence operations at agencies with a view to raising capital prior to the establishment of a commercial enterprise. The decision to embark on an entrepreneurial journey is predicated on possessing initial capital (Hanandeh et al., 2021; Srianggareni et al., 2020; Waldyatri et al., 2021).

The present study demonstrates that while entrepreneurial knowledge does not influence interest in entrepreneurship, self-efficacy does mediate this relationship. At that time, entrepreneurial education was predominantly characterized by disseminating theoretical knowledge, with a paucity of practical entrepreneurial experience. This happened during the COVID-19 pandemic. This research provides compelling evidence that entrepreneurial practices within the school learning environment are important in fostering student interest in entrepreneurship. The implementation of entrepreneurial practices is conducive to the acquisition of technical expertise in the field of entrepreneurship. Consequently, this will engender an increase in students' knowledge and confidence. The practice of entrepreneurship is characterized by adjusting each student's expertise.

As indicated by the findings of numerous international studies, self-efficacy has been demonstrated to function as a mediator in the escalation of interest in entrepreneurship. However, the findings of this study indicate that self-efficacy cannot function as a mediator in increasing entrepreneurial interest. This is because cognitive knowledge does not result in a change of self-belief to action; through practical learning, such as experiential learning, that self-efficacy can be increased. This, in turn, is a strong mediator for increasing entrepreneurial interest (Motta & Galina, 2023). Consequently, to enhance interest in entrepreneurship, it is

imperative to transition from a theory-based learning model to a practice-based approach. To ensure the success of this practice-based learning, it is essential that teachers implement learning on a project basis that provides outcomes and feedback with the potential to effect changes in students' attitudes (Bernardus et al., 2024; Harianto et al., 2024).

Entrepreneurship education can be conceptualized as project-based learning, wherein students collaborate in groups to undertake an entrepreneurship project, evaluate concepts, and construct business competitions, even on a modest scale (Bernardus et al., 2024; Motta & Galina, 2023). Internships at a company can also be a viable option for acquiring this skill (Galindo-Martín et al., 2021; Martínez-Gregorio et al., 2021), as can conducting market simulations, which have been shown to teach customer validation and pivoting (Englis & Frederiks, 2024).

Effect of Family Environment on entrepreneurial interest through Self-efficacy of Computer and Network Engineering Expertise Competency Students in Makassar City

The findings indicated a favorable impact of the family environment on entrepreneurial interest, as evidenced by the enhanced self-efficacy of Vocational School students in Computer and Network Engineering Expertise Competency in Makassar City. This finding is consistent with the conclusions of a study which posits that the family environment exerts an indirect influence on entrepreneurial interest through the mechanism of self-efficacy (Saoula et al., 2023; Zhang et al., 2025). To elaborate, a favorable family environment that fosters students' entrepreneurial aspirations is hypothesized to enhance or influence their confidence in engaging in entrepreneurial activities. This finding is further corroborated by the research of (Mahfudzi & Fitri, 2022), which asserts the presence of a positive and significant indirect effect between family environment variables and entrepreneurial interest, mediated through self-efficacy. It is evident that the presence of self-confidence and self-efficacy, in conjunction with a conducive learning environment, significantly impacts the entrepreneurial inclinations of vocational school students in the domain of Computer and Network Engineering Expertise Competency.

It is evident from these results that the outcomes of the indirect effects are less substantial than those of the direct effects, yet they remain statistically significant. The lower indirect effect demonstrates the form of partial mediation, indicating that, in this study, the mediating variable (i.e. self-efficacy) cannot mediate the effect of family environment on entrepreneurial interest. This is attributable to the prevailing perception of the family environment as a pivotal and formative factor in developing entrepreneurial interest among students. A supportive family environment, which encourages engagement in entrepreneurial activities, has been demonstrated to foster an increased interest in pursuing an entrepreneurial career amongst students. This interest is not necessarily contingent upon confidence levels. In such cases, students may be less attentive to the level of trust and confidence formed within themselves, which can affect their interest in entrepreneurship (Chong, 2022; Pratiwi & Januardi, 2021).

A student can allegedly become an entrepreneur because of the influence of their social environment. The family environment itself can have positive and negative effects. Those with high self-efficacy work hard and learn new tasks

because they believe their efforts will be successful. Conversely, students with low self-efficacy may make less effort to learn and perform new, complex tasks because they do not believe their efforts will be successful. If a student's self-efficacy is low and they come from an entrepreneurial family, they may be afraid to choose entrepreneurship as a career. However, if they are in an entrepreneurial family and have high self-efficacy, they are more likely to choose entrepreneurship as a career (Burnette et al., 2020; Tambunan et al., 2024).

Students from entrepreneurial families are likely to have high self-efficacy regarding entrepreneurship. Conversely, students from non-entrepreneurial families tend to have low self-efficacy. It is because entrepreneurship involves many factors that can cause fear of failure. This fosters a lack of confidence in entrepreneurship. As with people in families where the desire to be an entrepreneur is high, but the ability is low, interest in entrepreneurship itself will be low. Therefore, self-efficacy is also very important for students to become future entrepreneurs (Cardella et al., 2020; Liu et al., 2022; Mugiyatun & Khafid, 2020).

Furthermore, the results of this study are also in line with the Theory of Planned Behavior as expressed in the research of (Saoula et al., 2023; Yan et al., 2023). This theory states that if people believe that most people expect them to behave in a certain way, they are more likely to do so. Conversely, if the person believes that most people, he looks up to expect him not to behave in a certain way, he tends to avoid that behavior. According to this theory (Utari & Sukidjo, 2020), when students receive support from their family, they follow their family's wishes. Therefore, someone who receives support from their parents and family will be better prepared to become an entrepreneur because a good family environment fosters high self-efficacy.

This study shows that the family environment significantly influences a student's interest in entrepreneurship. Moral support and direct involvement in family businesses can strengthen students' entrepreneurial confidence. Schools can use this information to encourage family involvement in entrepreneurship programs. Self-efficacy is an important mediator between the family environment and entrepreneurial interest. While the family environment significantly impacts students' entrepreneurial decisions, it depends on their trust and confidence in entrepreneurship. Improving communication between schools and families can create a family environment that supports students in entrepreneurship, providing emotional and financial support. Schools can organize activities that involve families directly, such as an entrepreneurial family day, to provide students with direct support from their families. Collaboration between families and schools is essential to maximize the potential of the family environment. Schools could also create a mentoring program for parents, teaching them how to support their children in developing confidence in entrepreneurship.

The Effect of Entrepreneurial Spirit on Entrepreneurial Interest through Self-Efficacy of Computer and Network Engineering Expertise Competency Students in Makassar City

The results of the seventh hypothesis test (H_7) prove that entrepreneurial spirit has a positive and significant effect on the entrepreneurial interest of students at Computer and Network Engineering Expertise Vocational Schools in Makassar

City, via their self-efficacy. Self-efficacy is proven to have a significant mediating effect in increasing the influence of entrepreneurial spirit on fostering student entrepreneurial interest. This is because confidence and optimism are two indicators used to measure entrepreneurial spirit, closely related to self-efficacy. Entrepreneurial spirit exhibit characteristics such as: (1) self-confidence (indicators: full of confidence, optimistic, committed, disciplined, responsible); (2) initiative (indicators: full of energy, dexterous in action, active); (3) achievement motivation (indicators: orientation to results, foresight); (4) leadership spirit (indicators: daring to be different, trustworthy, tough in action); and (5) risk-taking with full calculation. Meanwhile, regarding self-efficacy, (Harahap et al., 2023) define it as a person's belief in their ability to overcome various situations that arise in life. Self-efficacy is a psychological factor significantly influencing student success in completing tasks and solving problems. Therefore, self-efficacy and the entrepreneurial spirit are strongly related. Self-efficacy positively influences entrepreneurial spirit through their research. Therefore, increasing students' entrepreneurial spirit can be achieved by first increasing their self-efficacy. Self-efficacy can be developed through four sources: 1) mastery experience, 2) social modelling, 3) social persuasion and 4) physical and emotional conditions (Burnette et al., 2020; Xiong et al., 2023).

In addition to local empirical evidence, these findings are consistent with international literature. Self-efficacy and entrepreneurial spirit have a dual mediating effect (parallel and serial) in the relationship between entrepreneurship education and entrepreneurial intention. This study shows that self-efficacy and entrepreneurial spirit act as dual mediators in the relationship between entrepreneurship education and students' interest in entrepreneurship. In parallel mediation, both independently mediate the influence of entrepreneurship education, with self-efficacy and entrepreneurial spirit each increasing interest in entrepreneurship. Meanwhile, in serial mediation, entrepreneurship education increases self-efficacy, which then increases entrepreneurial spirit and ultimately encourages entrepreneurial interest. These findings confirm that both factors are important in translating the influence of entrepreneurship education into entrepreneurial interest, both through independent and sequential pathways (Che Embi et al., 2019; Hanandeh et al., 2021; Z. Li & Islam, 2021).

Overall, this study sheds light on the interplay between entrepreneurial spirit and self-efficacy in fostering students' interest in entrepreneurship. Schools and other stakeholders can develop a program combining these two factors to support students in entrepreneurship. The research findings emphasize the importance of strong self-efficacy in enabling students to act on their entrepreneurial spirit. Therefore, experiential learning, project-based learning and business simulation methods can increase students' confidence in overcoming challenges in the entrepreneurial world.

CONCLUSION

This study analyzes the influence of entrepreneurial knowledge, family environment, and entrepreneurial spirit on students' interest in entrepreneurship, with self-efficacy as a mediating variable. The results show that entrepreneurial knowledge has no significant effect. In contrast, family environment and

entrepreneurial spirit have a positive and significant effect on interest in entrepreneurship, both directly and through self-efficacy. The highest influence is that of the family environment. Theoretically, this study expands the application of Bandura's self-efficacy theory in the context of vocational education (TVET) by showing that self-efficacy acts as a bridge between psychological factors, such as entrepreneurial spirit, and social factors, such as family environment, in shaping entrepreneurial interest. Practically, vocational high schools need to strengthen experience- and project-based entrepreneurship learning that fosters self-confidence. For those with technical skills, it is important to master their skills first to run a business. To develop entrepreneurs from vocational high school graduates, the role of the family, government, and school is very important in instilling an entrepreneurial spirit. Entrepreneurship education has long been part of the curriculum, but to date, it has not had a significant impact on the unemployment rate among vocational school graduates. This may be due to the suboptimal implementation of the curriculum in terms of learning. Another important thing is to ensure that entrepreneurship teachers are competent in the skills they teach. In Indonesia, it is necessary to implement experience-based learning methods to increase students' interest in entrepreneurship, as this has been proven in various countries around the world.

This study has several limitations. The sample size in this study is still limited to one region, namely Makassar City in South Sulawesi Province. Therefore, for further research, it is hoped that the region used as a sample can be more comprehensive with a larger sample size. This study only focuses on computer and network technical skills, so further research is expected to be conducted on various other skills to determine whether there are differences in handling the increase in entrepreneurial interest between computer and network technical skills and other skills. The author used tests to measure entrepreneurial knowledge in this study. The questionnaire method can be tried for further research, as many international studies use this method. This study uses PLS-SEM. Therefore, if additional research uses a larger sample size, it would be better to use SEM AMOS.

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