The Influence of Teaching Factory on Student Competency Using Creativity as an Intervening Variable in The Construction and Housing Engineering Program of SMKN 2 Salatiga

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ABSTRACT

The Teaching Factory is one of the suitable learning models for vocational high schools. It combines student competence with production, where learning at school is conducted as it would be in an industrial/work environment by running service activities or production activities. SMKN 2 Salatiga is one of the schools that have implemented the teaching factory learning model, especially in the Construction and Housing Engineering expertise program, which includes making rosters, often accompanied by practical paving block production. This research aims to determine the influence of the teaching factory on competence through the creativity of 11th-grade students in the Construction and Housing Engineering program at SMKN 2 Salatiga. This study uses a quantitative approach with path analysis techniques. The conclusions of this study are: (1) Partially, the teaching factory positively affects the increase in student competence and creativity. (2) Creativity has a negative influence on the increase in student competence, and (3) The teaching factory learning model positively affects the increase in student competence through creativity as an intervening variable, although creativity cannot fully function as a connecting variable.

Keywords: *Teaching factory, Competence, Creativity*

1. Introduction

The Teaching Factory is one of the suitable learning models for vocational high schools. It combines student competence with production, where learning at school is conducted as it would be in an industrial/work environment by running service activities or production activities [1]. This learning model was first introduced in Regulation Number 41 of 2015, which explains that the teaching factory is a production facility operated based on actual working procedures and standards to produce products according to real industrial conditions and is not committed to seeking profit.

SMKN 2 Salatiga is one of the schools that have implemented the teaching factory learning model, particularly in the Construction and Housing Engineering expertise program, which involves making rosters, often accompanied by practical paving block production. The initial implementation of roster production learning was based on cooperation between SMKN 2 Salatiga and Daiwa Roster in Boyolali as the industrial partner. This cooperation involved several teachers undergoing training on how to make rosters at Daiwa Roster, with the expected outcome that SMKN 2 Salatiga would meet the supply shortage when the industry faced a shortage of rosters. The roster production is still done manually without machine assistance, and each student can make one to two rosters in one session. Currently, paving block production is not yet considered a teaching factory product because it is still prioritized to meet the needs of SMKN 2 Salatiga itself. However, in the future, SMKN 2 Salatiga teachers plan to make paving blocks one of the teaching factory products, given the positive attitude towards students' productivity in making paving blocks. Unlike the manual roster production, paving block production is already done with machine assistance. SMKN 2 Salatiga has had a paving block machine since 2019, provided by the Public Service Agency (BLUD), whose initial purpose was similar to the implementation of the teaching factory.

In the implementation of teaching factory learning practices, there are still many shortcomings. Besides the lack of tools and materials, the number of teachers with the necessary competencies is also insufficient. However, the teaching factory learning in the Construction and Housing Engineering expertise program at SMKN 2 Salatiga is a highlight because it has attracted many visits from external

parties, such as the Provincial Education Office of North Sumatra and SMKN 3 Semarang, who wish to observe and eventually implement it themselves. Despite the shortcomings and issues in its implementation, this teaching factory learning model holds great promise for enhancing both the competence and creativity of students to better prepare them for the business and industrial world.

In a previous study by Suryati et al. [2] on the influence of the teaching factory on competence, it was concluded that aspects such as facilities, curriculum, and teacher competence can foster student competence. Additionally, in a study by Febriani et al. [3] on the influence of the teaching factory on creativity, it was concluded that creativity has a significant impact on teaching factory learning. Both studies examined the influence of the teaching factory on competence and creativity separately.

Given the positive goals of teaching factory learning on student competence and creativity, the researcher will conduct further research by examining the influence of the teaching factory on competence, with creativity as an intervening variable.

2. Metode

2.1. Type of Research

This study utilizes a quantitative approach with path analysis techniques. According to Sugiyono [4], quantitative methods are also known as traditional methods because they have been widely used and have become a tradition in research. The study is ex-post facto, as the independent variables are events that have already occurred [5]. Path analysis is employed to identify direct and indirect effects between the independent (teaching factory) and dependent variables (student competence), with creativity as an intervening variable.

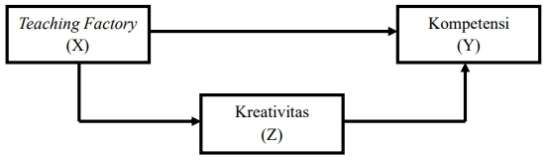

Figure 1 Path Diagram

2.2. Research Venue

The research is conducted at SMKN 2 Salatiga, Jl. Parikesit 50722, Salatiga City, Central Java.

2.3. Population and Sample

Population consists of 11th-grade students in the Construction and Housing Engineering program at SMKN 2 Salatiga. Simple Random Sampling is employed due to the homogeneous nature of the members. From a total of 108 students, the researcher used the Slovin's formula with a 10% significance level, resulting in 52 students selected as the research sample.

2.4. Research Variables

In this research, there are three variables: teaching factory as the independent variable, competence as the dependent variable, and creativity as the intervening variable.

2.5. Data Collection Techniques

Questionnaire is a data collection tool consisting of written statements systematically arranged to gather information about the variables under study [6]. Data collection is conducted using a numeric scala referencing Likert assessments with 4 options to avoid ambiguous responses. These options range from strongly agree to strongly disagree [7].

2.6. Data Validity Techniques

2.6.1. Validity Test

In this study, content validity and construct validity are utilized. Content validity involves expert evaluation using the Gregory formula, comparing the results from two experts. Once the instrument is deemed content valid, construct validity follows.

Construct validity here uses the product moment formula. According to Gozali [8], validity testing is used to measure whether a questionnaire is valid or not; a questionnaire is considered valid when its questions can effectively measure what is intended to be measured.

2.6.2. Reliability Test

A questionnaire is considered reliable if responses to questions are consistent or stable. In this study, reliability testing is conducted using Internal Consistency by administering the instrument once and then analyzing the results using a specific technique. Since the research involves interval data, the Cronbach's Alpha technique is employed.

3. Results and Discussion

3.1. Research Data

3.1.1. Description of the Teaching Factory Learning Model

Data on the teaching factory variable were assessed by Mr. Okta Gunarso, S.Pd., as the teacher of the Construction and Housing Engineering program at SMKN 2 Salatiga. The assessment was conducted by accumulating three items: Work

Results, Work Neatness, and Timeliness, with an average score of 80.23.

3.1.2. Competency Description

The competence variable consists of 9 questions divided into 3 dimensions: knowledge, skills, and work attitude [9]. The minimum score is 9 if students choose 1 point for each question, and the maximum score is 36 if students choose 4 points for each statement. From the data collection, the smallest score obtained was 26, and the highest score was 35.

3.1.3. Description of Creativity

The creativity variable consists of 12 statements divided into 4 dimensions: flexibility, fluency, elaboration, and originality [10]. The minimum score is 12 if students choose 1 point for each statement, and the maximum score is 48 if students choose 4 points for each statement. From the data collection, the smallest score obtained was 24, and the highest score was 44.

3.2. Results

3.2.1. Normality Test

The normality test is used to assess whether data in regression model analysis are normally distributed. The normality test results for the influence of teaching factory and creativity on competence show a significance value of 0.200. Therefore, it can be concluded that the data are normally distributed because the significance value is greater than 0.05.

3.2.2. Multicollinearity Test

The aim is to test whether in the regression model, relationships are found between independent variables; a good regression model is one where the independent variables are not correlated. The results of multicollinearity testing for the competence variable as the dependent variable are as follows:

Tabel 1 Multicollinearity Test

Variable	*Collinearity Statistics*	
	Tolerance	VIF
TEFA	0.481	2.078
Creativity	0.481	2.078

The results indicate that the tolerance values for the teaching factory and creativity variables are greater than 0.1, and their VIF (Variance Inflation Factor) values are less than 10. Therefore, it can be concluded that there is no linear relationship between teaching factory and creativity.

3.2.3. Heteroscedasticity test

Used to ensure there is no equality of variance and residuals for each respondent. Conclusions about the heteroscedasticity nature of the data are observed from scatterplot graphs; a good regression model is not heteroscedastic. The graph of the equation of creativity as the dependent variable is as follows:

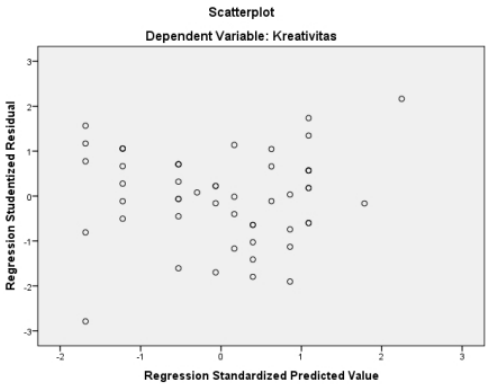

Figure 2 Scatterplot creativity as a dependent variable

And the second graph with competence as the dependent variable is as follows:

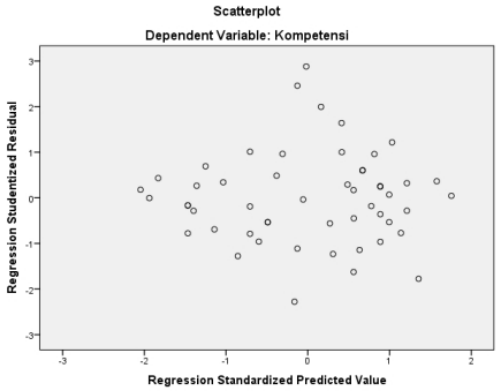

Figure 3 Scatterplot competencies as a dependent variable

Both graphs above do not show any specific pattern or are evenly dispersed, indicating that both equations do not exhibit heteroscedasticity.

3.3. Path Analysis

3.3.1. Competence as a Dependent Variable

Table 2 Coefficient of Determination, Creativity as the Dependent Variable

Model Summary		
Model	R	R Square
1	.720	.519

The table shows an R-Square value of 0.591, indicating that 59.1% of the creativity variable is influenced by the teaching factory variable, while

the remaining 40.9% is influenced by other variables outside the regression model.

Table 3 Path Analysis, Creativity as the Dependent Variable

Coefficients				
Model		Beta	t	Sig.
1	(Constant)		-1.981	.053
	TEFA	.720	7.341	.000

Results of Regression Based on Path Analysis:

Creativity = 0.720 *TEFA* + 0.855 (e1)

3.3.2. Creativity as the Dependent Variable

Table 4 Coefficient of Determination, Competence as the Dependent Variable

Model Summary		
Model	R	R Square
1	.850	.723

The table shows an R-Square value of 0.723, indicating that 72.3% of the competence variable is influenced by the teaching factory and creativity variables, while the remaining 27.7% is influenced by other variables outside the regression model.

Table 5 Path Analysis, Competence as the Dependent Variable

Coefficients				
Model		Beta	t	Sig.
1	(Constant)		-4.484	.000
	TEFA	1.064	9.812	.000
	Creativity	-.345	-3.181	.003

Results of Regression Based on Path Analysis:

Competency = 1.064 *TEFA* – 0.345 Creativity + 0.691 (e1)

3.3.3. Total Influence

The indirect effect of the teaching factory on competence through creativity is 0.720 − 0.345 = 0.375, thus the total effect is 1.064 − 0.375 = 0.689. Based on these results, the path analysis model of the research is as follows:

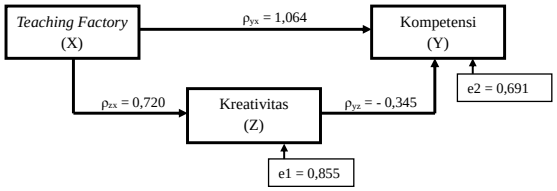

Figure 4 Total influence of path analysis

3.3.4. Hypothesis Testing

1. Test T

The first model with creativity as the dependent variable can be tested for its partial effects using a t-test with the assistance of IBM SPSS 24. The test results can be seen in Table 3. Based on the table, the calculated t-value for the teaching factory variable is 7.341, which is greater than the tabulated t-value of 2.006, with a significance value of 0.00 < 0.05. Therefore, it can be concluded that the teaching factory significantly influences creativity, thus supporting H1.

The second model with competence as the dependent variable can be tested for its partial effects using a t-test with the assistance of IBM SPSS 24. The test results can be seen in Table 5. Based on the table, the calculated t-value for the teaching factory variable is 9.812, which is greater than the tabulated t-value of 2.006, with a significance value of 0.00 < 0.05. Therefore, it can be concluded that the teaching factory significantly influences competence, thus supporting H2.

With a calculated t-value of -3.181, which is less than the tabulated t-value of -2.006, and a significance value of 0.003, which is also less than 0.05, it can be concluded that the creativity variable has a significant influence on competence. Therefore, H3 is accepted in this study.

2. Sobel Test

The Sobel test was conducted using the Sobel Test Calculation for Significance of Mediation tool on danielsoper.com to examine the indirect influence of the independent variable on the dependent variable through the intervening variable.

Based on manual calculations, a t-value of -3.7015 was obtained, while through the application, a t-value of -3.6114 was found. The difference between these values is 2.4%, indicating their validity. The t-value used for the conclusion is -3.6114, which is less than -1.676. From the Sobel test, a significance value of 0.0001523 was obtained, which is less than 0.05. Therefore, it can be concluded that the teaching factory significantly influences competence with creativity as the mediating variable.

3.4. Discussion

3.4.1. The Influence of Teaching Factory on Creativity

Teaching factory has a positive and significant effect on creativity; thus, the first hypothesis is accepted. In the path analysis, the teaching factory variable has a coefficient of 0.720, meaning that for every unit increase in the teaching factory variable, creativity increases by 0.720 units.

In the creativity variable, there are four dimensions: fluency, flexibility, elaboration, and originality. From the data analysis, it was found that all four dimensions have a percentage of >50% of students meeting the criteria of good, based on the accumulation of very good (SB) and good (B) criteria. This suggests that the implementation of teaching factory learning has a positive influence on all four dimensions.

3.4.2. The Influence of Teaching Factory on Competence

Teaching factory has a positive and significant effect on student competence. These results indicate that the second hypothesis is accepted. In the path analysis, the teaching factory variable has a coefficient of 1.064, meaning that for every unit increase in the teaching factory variable, competence increases by 1.064 units.

In the competence variable, there are three dimensions: knowledge, skills, and work attitude. From the data analysis, it was found that all three dimensions have a percentage of >50% of students meeting the criteria of good, based on the accumulation of very good (SB) and good (B) criteria. It can be concluded that teaching factory has a positive influence on all three dimensions.

3.4.3. The Influence of Creativity on Competence

Creativity has a negative and significant effect on student competence. These results indicate that the third hypothesis is accepted. In the path analysis, the competence variable has a coefficient of -0.345, meaning that for every unit increase in competence, creativity decreases by 0.345 units.

The negative influence of creativity is due to the teaching factory learning, especially in the Construction Engineering and Housing program at SMKN 2 Salatiga, which involves the production of roster products with specific guidelines and procedures in practice.

3.4.4. The Influence of Teaching Factory on Competence Through Creativity

The hypothesis testing results show that there is a positive and significant influence of teaching factory on competence through creativity. This means there is a positive indirect effect of teaching factory on competence through creativity. After calculations, the indirect coefficient between teaching factory and competence through creativity is 0.816.

Based on the test results, it is known that the direct effect has a coefficient larger than the indirect effect. However, the fourth hypothesis can still be considered to have a positive and significant impact. The lower indirect effect suggests that the intervening variable has partial mediation, indicating that creativity cannot fully mediate the influence of teaching factory on competence.

4. Conclusion

1. There is a positive and significant influence of teaching factory on the creativity of students in the Construction Engineering and Housing program at SMKN 2 Salatiga. Every one-unit increase in teaching factory enhances student creativity by 0.720 units.
2. There is a positive and significant influence of teaching factory on the competence of students in the Construction Engineering and Housing program at SMKN 2 Salatiga. Every one-unit increase in teaching factory enhances student competence by 1.064 units.
3. There is a negative and significant influence of creativity on the competence of students in the Construction Engineering and Housing Program at SMKN 2 Salatiga. Every one-unit increase in creativity decreases student competence by 0.345 units.
4. There is a positive and significant influence of teaching factory on the competence through creativity of students in the Construction Engineering and Housing Program at SMKN 2 Salatiga. However, the intervening variable does not fully mediate the influence of teaching factory on competence, resulting in a direct coefficient larger than the indirect coefficient, which is 0.816.

REFERENSI

[1] Prasetiyo, B. (2020). Manajemen Teaching Factory Pada Era Industri 4.0 di Indonesia. Jurnal Bisnis dan Teknologi, 12(1), 12-18.

[2] Suryati, L., Ganefri, G., Ambiyar, A., & Yulastri, A. (2023). Pengaruh Penerapan Program Teaching Factory dalam Mempersiapkan Kompetensi Kewirausahan Siswa pada Pendidikan Vokasi. Jurnal Penelitian dan Pengembangan Pendidikan, 7(1).

[3] Febriani, I., Nurjanah, N., & Setiawati, T. (2021). Kreativitas Kuliner dalam Pembelajaran Teaching Factory Peserta Didik SMK Tata Boga se-Malang Raya. Jurnal Ilmiah Pendidikan dan Pembelajaran, 5(3), 465-471.

[4] Sugiyono, D. (2021). Metode penelitian pendidikan pendekatan kuantitatif, kualitatif dan R&D. Bandung : Alfabeta

[5] Sugiyono, D. (2021). Statistika untuk penelitian. Bandung : Alfabeta

[6] Sarwono, J. (2006). Metode penelitian kuantitatif dan kualitatif edisi 2. Yogyakarta : Suluh Media.
[7] Adjii, K. (2019). Instrumen penilaian kedisiplinan siswa sekolah menegah kejuruan. Arisen: Assessment and Research on Education, 1(1), 1-10.
[8] Ghozali, I. (2020). Aplikasi analisis multivariete dengan program IBM SPSS 23.
[9] Catio, M., & Sunarsi, D. (2020). Analisa Pengaruh Kompetensi, Disiplin Kerja Dan Motivasi Terhadap Kinerja Guru Pada SMK Sasmita Jaya 1 Pamulang Kota Tangerang Selatan. Equilibrium: Jurnal Penelitian Pendidikan dan Ekonomi, 17(02), 16-26.
[10] Alwi, A., Rozak, A., & Wiradinata, R. (2021). Penguatan Aspek Kreativitas Melalui Pembelajaran Menulis Teks Narasi Dengan Model Berbasis Proyek.