Implementation of a Factory-Based Learning Workshop Management Model to Improve Student Competence at SMK Negeri 3 Tondano

Hartentus M Lalompoh[1]*, Harrychoon Angmalisang[1], Hiskia K. Mangopa[1], Parabelem Tinno Dolf Rompas[1]

[1]Department of Master Vocational Technology Education, Graduate Program, Universitas Negeri Manado, Indonesia

*Corresponding author: hartentuslalompoh@gmail.com

ABSTRACT

This study aims to determine the effect of the Implementation of the Factory-Based Learning Workshop Management Model (Teaching Factory) to Improve Student Competence at SMK Negeri 3 Tondano. This study uses quantitative research with data collection techniques through questionnaire instruments. Based on the results of the analysis and discussion, the Implementation of the Factory-Based Learning Workshop Management Model (Teaching Factory) to Improve Student Competence by 98% while the rest is determined by other variables that are not studied in this study. So, the conclusion in this study is that there is a direct positive effect of the Implementation of the Factory-Based Learning Workshop Management Model (Teaching Factory) to Improve Student Competence at SMK Negeri 3 Tondano. This means that the Implementation of the Factory-Based Learning Workshop Management Model (Teaching Factory) can Improve Student Competence. Therefore, considering the influence of Factory-Based Learning (Teaching Factory) on Improving Student Competence, it is expected that all Vocational High Schools will implement Factory-Based Learning (Teaching Factory).

Keywords: Factory-Based Learning, Improving Student Competence, Teaching Factory

INTRODUCTION

Vocational High Schools (SMK) play a crucial role in vocational education in Indonesia, serving as educators who prepare graduates with technical and non-technical competencies that meet the needs

125

of the business world and educators. National policies such as the SMK Development Program, SMK Centers of Excellence, and Teaching Factory (TeFa) demonstrate the government's commitment to strengthening the relevance of vocational education to job market demands. (Direktorat SMK+2Direktorat SMK+2, 2025).

The Center of Excellence (PK) Vocational High School (SMK) is a program for developing vocational schools with specific expertise in improving quality and performance, which is strengthened through partnerships and alignment with the business world, the industrial world, the world of work, which ultimately becomes a reference vocational school that can function as a driving school and center for improving the quality and performance of other vocational schools. The PK SMK program is accompanied by universities whose duties are, namely (1) carrying out coordination with the Ministry of Education, Culture, Research, and Technology, (2) assisting in fulfilling 8 national education standards, (3) implementing "link and match" with the business world and the industrial world, (4) providing training to teachers, principals, and school supervisors, and (5) implementing the Independent Curriculum. (Purworejo, 2025).

Given the complexity of issues concerning vocational school student competency, the researcher limited this study to the application of the Factory-Based Learning Workshop Management Model and the competency of students at SMK Negeri 3 Tondano. Furthermore, the research was limited to 12th-grade students majoring in Light Vehicle Engineering at SMK Negeri 3 Tondano.

The purpose of this study was to determine the impact of the implementation of the Factory-Based Learning Workshop Management Model (Teaching Factory) on improving the competency of students at SMK Negeri 3 Tondano.

LITERATURE REVIEW

Understanding Factory-Based Learning (Teaching Factory)

Factory-based learning, commonly referred to as Teaching Factory (TeFa), is a learning model in vocational schools that integrates the learning process with real-world production or service processes, similar to those in industry. According to the TeFa Implementation Guidelines from the Directorate of Vocational High School Development, Ministry of Education and Culture of the Republic of Indonesia, TeFa is defined as: "a production facility operated based on actual work procedures and standards to produce products in accordance with real-world industrial conditions and not oriented towards profit".

Understanding Student Competence

Student competence is a set of abilities encompassing knowledge, skills, and attitudes that must be possessed, internalized, and mastered by students as a result of the educational process. In the context of vocational education, competence is defined as a student's ability to perform specific tasks or jobs in accordance with industry standards. According to Spencer and Spencer (1993), competence is a basic individual characteristic related to effective or superior performance in a job. Meanwhile, the Ministry of National Education (2008) defines competence as a set of intelligent and responsible actions possessed by an individual as a requirement for being considered capable by society to perform certain tasks.

METHOD

Research Approach

This research uses a quantitative approach. The method employed is descriptive. This means that this study seeks to illustrate the improvement in student competency after receiving education that implements Teaching Factory-based learning. This is in accordance with the objective of descriptive research, which is to create a systematic, factual, and accurate (descriptive) plan regarding the facts and characteristics of a specific population or region (Suryabrata, 1983).

Research Location and Time

This research was conducted at the Light Vehicle Engineering Expertise Program, SMK Negeri 3 Tondano, from October 28 to completion.

Population and Sampling

The target population of this study was 27 students of grade XII of the Light Vehicle Engineering Expertise Program, SMK Negeri 3 Tondano, who received factory-based learning (Teaching Factory).

RESULTS AND DISCUSSION

SMK Negeri 3 Tondano is a state vocational high school in Minahasa Regency, North Sulawesi Province. This school offers several programs, one of which is Light Vehicle Engineering, the focus of this research. The school uses the Merdeka curriculum as a guide for the teaching and learning process. The teaching staff (teachers) are 32, with 8 serving as Government Employees with Work Agreements (PPPK), 4 as Honorary Employees, and 4 as Administrative Staff (PPPK) and 1 as Honorary Employees. The total number of teaching and administrative staff is 49.

Validity Test

The technique used in this validity test is the product-moment test. The r-table value (α,n-2) is obtained from the product-moment table. The validity test found that α = 5% and n is 27, the number of respondents. Therefore, rtable (5% (27-2) = 25) = 0.381. Each item is considered valid if the rtable is greater than the calculated r. This validity test was tested separately for each variable, both the Student Competency Improvement and the Implementation of the Factory-Based Learning Workshop Management Model (Teaching Factory), still using the same analysis from the same rtable value. The following are the results of the validity test:

a. Improving Student Competency

The validity test for Improving Student Competency was conducted using SPSS for Windows Version 31 on 30 statement items with 27 respondents. The rtable value (α,n-2) is from the product moment table. The validity test found that α = 5% and n is 27, the number of respondents. Therefore, rtable (5% (27-2) = 25) = 0.381. The test results indicate that all test items are valid.

b. Model Application Managing a Factory-Based Learning Workshop (Teaching Factory)

The validity test for the implementation of the Factory-Based Learning Workshop (Teaching Factory) Management Model was conducted using SPSS for Windows Version 31 on 30 statement items with 27 respondents. The r-table value (α, n-2) was obtained from the product-moment table. The validity test revealed that α = 5% and n = 27, the number of respondents. Therefore, r-table (5% (27-2) = 25 = 0.381). The test results indicated that all test items were valid.

Reliability Test

The reliability technique used in this study was Cronbach's Alpha. To determine whether an instrument is reliable, it must be measured with an alpha value of 0.6. A Cronbach's Alpha value ≥0.6 indicates that the instrument is reliable.

a. Student Work Readiness

Table 1. Reliability Test Improving Student Competence

Reliability Statistics	
Cronbach's Alpha	N of Items
0.543	30

Source: SPSS for Windows Test Results Ver. 31

Based on Table 1, the results of the Reliability Test increase student competency, resulting in a Cronbach's Alpha value of 0.543 ≥ 0.6 r count > r table. From these results, it can be seen that the results are reliable.

b. Implementation of Factory-Based Learning (Teaching Factory)

Table 2. Reliability Test of Variables for the Implementation of Factory-Based Learning (Teaching Factory)

Reliability Statistics	
Cronbach's Alpha	N of Items
0.890	30

Source: SPSS Test Results for Windows Version 31

Based on the reliability test results in table 2 for the implementation of Factory-Based Learning (Teaching Factory), the Cronbach's Alpha value was 0.890 ≥ 0.6 (r count > r table). These results indicate reliability.

Data Normality Test

A good regression model has a normal or near-normal data distribution. The following data are the results of the normality test for the research data.

Table 3. Data Normality Test.

128

One-Sample Kolmogorov-Smirnov Test

				Unstandardized Residual
N				27
Normal Parameters[a,b]	Mean			.0000000
	Std. Deviation			6.16547573
Most Extreme Differences	Absolute			.094
	Positive			.094
	Negative			-.093
Test Statistic				.094
Asymp. Sig. (2-tailed)[c]				.200[d]
Monte Carlo Sig. (2-tailed)[e]	Sig.			.776
	99% Confidence Interval	Lower Bound		.765
		Upper Bound		.787

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.
e. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.

Source: SPSS Test Results for Windows Version 31

Based on the normality test results, the significance value is 0.200 > 0.05. Asymp. Sig. (2-tailed) > 0.05. Therefore, it can be concluded that the residual values are normally distributed or follow a straight line.

Research Hypothesis Testing

After various analyses were conducted, the next step was to test the hypothesis to measure the magnitude of the positive influence between the research variables. The results of the calculations performed using regression analysis on the research hypothesis are described in table 4.

Table 4. Regression Testing Research Results

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.041	.101	-.082	-.409	.686
	Pembelajaran Berbasis Pabrik (Teaching Factory)	132.176	12.614		10.478	<.001
a. Dependent Variable: Meningkatkan Kompetensi Siswa						

Source: SPSS Test Results for Windows Version 31

The Implementation of Factory-Based Learning (Teaching Factory) has an effect on Improving Student Competence

The statistical hypothesis can be formulated as follows:

$H0: {}^{\beta}1 \leq 0$

$Ho: Py1 \leq 0$

Test criteria: reject H0 if thitung > ttabel and accept H0 if thitung < ttabel

Based on the calculation results, Df=n-k=27-1-1=25. t tabel = 2.059 thitung > ttabel, 10.478 >2.059. Sig. <0.05. 0.001 <0.005. Based on the calculation results, it can be concluded that Ha is accepted and H0 is rejected, meaning there is a positive effect of the Implementation of Factory-Based Learning (Teaching Factory) on Improving Student Competence at SMK Negeri 3 Tondano.

Data Analysis

Variables of Factory-Based Learning Implementation (Teaching Factory) on Improving Student Competence

The results of the regression analysis of the contribution of the variable "Teaching Factory" on Improving Student Competence are shown in the table 5.

Table 5. Regression Analysis of Factory-Based Learning Implementation Variables (Teaching Factory) towards Improving Student Competence

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.991[a]	0.980	0.980	1.02288

a. Predictors: (Constant), Pembelajaran Berbasis Pabrik (Teaching Factory)

b. Dependent Variable: Meningkatkan Kompetensi Siswa

Source: SPSS Test Results for Windows Version 31

The R-square (R2) in the table is 0.980. This figure indicates the significant contribution of the Teaching Factory implementation variable to improving student competency. We can determine this by calculating the coefficient of determination (KD) using the following formula:

KD = R2 X 100%

KD = 0.980 X 100%

KD = 98%

Therefore, it can be concluded that the contribution of the implementation of factory-based learning to improving student competency is 98%, with the remainder determined by other variables not examined in this study.

Aspects of Improving Student Competence that Students Can Master When Implementing Factory-Based Learning

Table 6. Regression Analysis of Improving Student Competence

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.623	1	6.623	6.168	.000[b]
	Residual	988.340	25	39.534		
	Total	994.963	26			
a. Dependent Variable: Meningkatkan Kompetensi Siswa						
b. Predictors: (Constant), Pembelajaran Berbasis Pabrik (Teaching Factory)						

Source: SPSS Test Results for Windows Version 31

The table 7 shows that the SPSS output yields an F-value of 6.168 > F-value of 0.000. Therefore, Ho is rejected and Ha is accepted. From these results, it can be concluded that the implementation of factory-based learning has a positive effect on improving the competency of students at SMK Negeri 3 Tondano.

Based on the hypothesis testing, it shows that the implementation of factory-based learning (teaching factory) has a direct positive effect of 98% on improving the competency of students at SMK Negeri 3 Tondano. Thus, the implementation of factory-based learning (teaching factory) is very important in improving student competency. This hypothesis testing shows that the implementation of factory-based learning (teaching factory) will have a direct positive effect on improving the competency of students at SMK Negeri 3 Tondano.

CONCLUSION

Based on the research results, data analysis, and discussion regarding the implementation of the factory-based learning workshop management model (Teaching Factory) to improve the competency of students at SMK Negeri 3 Tondano, the following conclusions can be drawn:

1. The implementation of the factory-based learning workshop management model (Teaching Factory) has a significant impact on improving student competency. This model makes the learning process more structured, standardized, and resembles an industrial environment, allowing students to gain a more realistic learning experience. With the implementation of SOPs, factory-like division of labor, and a results-oriented production system, students are able to improve their technical and non-technical competencies comprehensively. This impact is evident in improved practical skills, understanding of industrial work concepts, and a more disciplined, meticulous, and responsible work attitude.

2. After implementing the model, student competency has clearly improved in three main aspects: knowledge, skills, and work attitude. Students have a better understanding of the production process flow, are able to operate workshop equipment more effectively, and produce better-quality products. In terms of attitudes, students have become more disciplined, accustomed to working according to SOPs, are able to work in teams, and have a strong work ethic in

accordance with industry standards. Overall, students became more competent and better prepared to face the real demands of work in industry.

3. Based on the results of validity, reliability, and normality tests, all research instruments were declared valid and reliable, and the data were normally distributed. This indicates that the data used were suitable for further analysis.

4. 4. The results of a simple linear regression test showed that the implementation of factory-based learning (Teaching Factory) had a positive and significant effect on improving the competency of students at SMK Negeri 3 Tondano. The calculated t value (10.478) > t table (2.060) and the significance value was 0.001 < 0.005, indicating that Ha was accepted and H2 was rejected. Thus, the better the implementation of Teaching Factory, the higher the students' competency.

5. The coefficient of determination (R^2) value of 0.980 indicates that 98% of the increase in student competency was influenced by the implementation of factory-based learning (Teaching Factory), while the remaining 2% was influenced by other factors.

6. Overall, the results of this study prove that the Teaching Factory-based workshop management model is an effective learning strategy in improving the competency of vocational school students, especially in the Light Vehicle Engineering expertise program at SMK Negeri 3 Tondano.

Based on the research conclusions, the researcher offers the following recommendations:

1. For Schools (SMKN 3 Tondano): It is hoped that the implementation of the Teaching Factory will continue to be developed by engaging the industrial sector more intensively, through production collaborations, teacher internships, and upgrading workshop equipment to the latest industry standards.

2. For Teachers and Instructors: Teachers should continue to improve their pedagogical and technical competencies in managing production-based learning. Teachers need to act as facilitators, guiding students to think critically, creatively, and productively during the Teaching Factory activities.

3. For Students: Students are expected to utilize the Teaching Factory activities as a means to practice work skills, responsibility, and discipline. Students need to cultivate a professional attitude to prepare them for the real world of work after graduation.

4. For the Government and Industry: The government, through the Department of Education and Industry, needs to provide ongoing support for the implementation of the Teaching Factory in vocational schools, through equipment assistance, provision of practical materials, and student and teacher competency certification programs. 5. For Further Researchers: It is hoped that further research can develop this study by adding other variables such as learning motivation, learning facilities, or industrial support to obtain a more comprehensive picture of the factors that influence the improvement of student competence.

REFERENCES

Amin, M., Mustaghfirin. (2025). Panduan Pelaksanaan Teaching Factory (Tefa). Direktorat Pembinaan SMK, Kemendikbud. (Panduan Resmi) Kemdikbud Repository+1

Direktorat SMK. (2025). Direktorat SMK Luncurkan Program Pengembangan SMK Tahun 2025. Kemendikbudristek. Vokasi.Kemendikdasmen.Go.Id

Direktorat Pembinaan SMK. (2019). Panduan Implementasi Teaching Factory Di Sekolah Menengah Kejuruan. Jakarta: Direktorat SMK, Kemendikbud.

Direktorat Pembinaan SMK, Kementerian Pendidikan dan Kebudayaan Republik Indonesia. Panduan Pelaksanaan Teaching Factory (TeFa) di SMK.

Finch, C. R., & Crunkilton, J. R. (1999). Curriculum Development In Vocational And Technical Education. Boston: Allyn And Bacon.

Indonesia, S. I. (2025). Strategi Implementasi Dan Pengembangan Model Pembelajaran Berbasis Teaching Factory Dalam Meningkatkan Kualitas Pendidikan Kejuruan Di Indonesia. Yogi Pradana.

Kurniawan, A. (2022). Model Pembelajaran Teaching Factory Dalam Meningkatkan Kompetensi Siswa SMK. Jurnal Pendidikan Vokasional Indonesia. Jurnal.Unipasby.Ac.Id

Kutowinangun, P. M. (2025). Pengembangan Model Layanan Tefa Berbasis Aplikasi Sistem Informasi Manajemen Bengkel (Simbat) Di Smk Muhammadiyah Kutowinangun. Pawitno, E., Kuat, T., & Santosa, B.

Kolb, D. A. (1984). Experiential Learning: Experience As The Source Of Learning And Development. Englewood Cliffs: Prentice-Hall.

Mulyadi, D., & Kholis, M. (2020). Implementasi Model Teaching Factory Dalam Peningkatan Kompetensi Siswa SMK. Jurnal Pendidikan Vokasi, 10(2), 155–166.

Purworejo, P. T. (2025). Pendampingan Teaching Factory Pada Sekolah Menengah Kejuruan Pusat Keunggulan Di Smk Negeri 8 Purworejo. Widiyatmoko, W., Susanto, A., Antasari, M. E., & Wibowo, B. F.

Putra, D. A., Vratiwi, S., Hidayatullah, R. R., & Hasan, T. A. (2022). Manajemen Pembelajaran Teaching Factory Dalam Meningkatkan Kompetensi Keahlian Siswa Di Sekolah Menengah Kejuruan (SMK). (SINTA Profile Entry). Sinta.Kemdikbud.Go.Id

(UNNES) — Artikel: Pengaruh Pelaksanaan Pembelajaran Teaching Factory Terhadap Kesiapan Kerja Siswa. (Jurnal UNNES; Penelitian Empiris). Journal UNNES

(UPI) — Artikel: Pengaruh Teaching Factory Terhadap Kreativitas, Kompetensi, Serta Inovasi Siswa SMK. (Jurnal UPI/E-Journal). E-Journal UPI

Wibowo, A., Sudibyo, A., & Rahayu, S. (2020). Pengaruh Teaching Factory Terhadap Kompetensi Dan Kesiapan Kerja Siswa SMK. Jurnal Pendidikan Teknologi Dan Kejuruan (Sinta 2), 26(3), 312–324.

Supriyanto, E. (2021). Manajemen Bengkel Sekolah Berbasis Teaching Factory Di Era Revolusi Industri 4.0. Jurnal Teknologi Dan Kejuruan, 17(1), 45–56.

Susanto, A. (2022). Model Pengelolaan Bengkel Berbasis Produksi Sebagai Upaya Meningkatkan Kompetensi Lulusan SMK. Jurnal Pendidikan Teknologi Dan Kejuruan Indonesia, 4(1), 88–99.

Rachmadtullah, R., Et Al. (2021). Teaching Factory As A Learning Model For Vocational Education In The Industrial Revolution 4.0 Era. International Journal Of Instruction, 14(3), 875–892.

Mulyadi, D., & Kholis, M. (2020). Implementasi Model Teaching Factory Dalam Peningkatan Kompetensi Siswa SMK. Jurnal Pendidikan Vokasi, 10(2), 155–166.

Wibowo, A., Sudibyo, A., & Rahayu, S. (2020). Pengaruh Teaching Factory Terhadap Kompetensi Dan Kesiapan Kerja Siswa SMK. Jurnal Pendidikan Teknologi Dan Kejuruan (Sinta 2), 26(3), 312–324.

Supriyanto, E. (2021). Manajemen Bengkel Sekolah Berbasis Teaching Factory Di Era Revolusi Industri 4.0. Jurnal Teknologi Dan Kejuruan, 17(1), 45–56.

Susanto, A. (2022). Model Pengelolaan Bengkel Berbasis Produksi Sebagai Upaya Meningkatkan Kompetensi Lulusan SMK. Jurnal Pendidikan Teknologi Dan Kejuruan Indonesia, 4(1), 88–99.