Development of a Contextually Based Teaching Factory Model for the Effectiveness of the Vocational School Center of Excellence Program in Medan City

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Abstract. The aims of this research are to describe the characteristics of the Contextual Based Teaching Factory model at SMK Negeri 1 Percut Sei Tuan, which implements the Center of Excellence Program. Measuring the level of feasibility of the Contextual Based Teaching Factory model, Describe the effectiveness of the Contextually Based Teaching Factory model using level 3 research of development. Research in the development stage (Development) to test the effectiveness of the model using the Delphi and FGD models, was carried out with three experts, 12 practitioners and teachers. Data was collected using questionnaires, interviews and observations. Quantitative data analysis techniques were carried out by calculating the average score for each Teaching Factory program. Thus, it can be concluded that the teaching factory development model is feasible and effective in increasing the acceleration of the vocational school.

Keywords: Center of Excellence Model, Teaching Factory, Center of Excellence Model, Vocational High School

1 Introduction

Vocational High Schools (SMK) play a crucial role in preparing skilled human resources who are ready to compete in the industrial sector. The industry demands competent individuals equipped with practical skills that can be directly applied in the workplace [1]. The implementation of Vocational Schools has at least 9 characteristics, but the reality is that the expectations of Vocational School graduates to go straight to work are not in line with expectations, based on the statistical data below:

Table 1. Open Unemployment rate at education level.

Education Level	Open Unemployment rate at education level		
	2020	2021	2022

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No education/ Have never been to school/ Have not finished elementary school	3,61	3,61	3,59
Junior High School	6,46	6,45	5,95
Senior High School	9,86	9,09	8,57
Vocational High School	13,55	11,13	9,42
Diploma I/II/III	8,08	5,87	4,59
University	7,35	5,98	4,80

This research aimed to describe the characteristics of the Contextual Based Teaching Factory model at SMK Negeri 2, SMK Negeri 6, SMK Negeri 8, SMK Negeri 10, which implement the Center of Excellence Program.Measuring the feasibility level of the Contextual Based Teaching Factory model at SMK Negeri 2, SMK Negeri 6, SMK Negeri 8, SMK Negeri 10, which implement the Center of Excellence Program.

2 Research Metodology

This study employs research and development (R&D) methodology, utilizing a model approach developed by Plomp (1997) in Fajaryati. The Plomp model was selected due to its suitability for addressing educational challenges in development research. The model comprises five stages: (1) preliminary investigation, (2) design, (3) realization/construction, (4) evaluation and revision, and (5) implementation [1]. The research was conducted at SMK Negeri 1 Percut Sei Tuan, with the participants being all teachers at the school, totaling 71 individuals, including adaptive, normative, and productive teachers.

Data collection for the development of the Website-Based Staff Meeting Technique Academic Supervision Model, aimed at enhancing the professional competence of teachers at SMK Negeri 1 Percut Sei Tuan, was carried out through multiple methods: (1) Expert validation, (2) Interviews, (3) Observation of collegial supervision implementation, (4) Testing, and (5) Documentation. Data analysis focused on evaluating the website-based collegial supervision model, and the results informed revisions to improve the research product.

Both quantitative and qualitative descriptive analysis were employed in this study. Quantitative descriptive analysis summarized the findings using percentages and frequency distributions, while qualitative descriptive analysis involved organizing and categorizing data to present an accurate depiction of the study outcomes. The specific data analysis techniques used in this research are outlined as follows:

a. Normality Test

The normality test serves as a prerequisite for conducting data analysis and is performed before data processing according to the proposed research models. The purpose of this test is to determine whether the data distribution for a particular variable follows a normal distribution, which is critical for further statistical analysis. In this study, the Shapiro-Wilk test is used to assess data normality. Decision-making is based on the following probability criteria:

1. If the probability value is > 0.05 then it is said that the population is normally distributed.

2. If the probability value is ≤ 0.05 then it is said that the population is not normally distributed

b. Homogenity Test

The homogeneity test is used to determine whether the variants of several populations are the same or not. The significance level used is α = 0.05. The way to interpret the levene test according to Arifin (2012:98) is as follows:

1) If the calculated value is <0.05, then it is said that the variance of two or more population data groups is not the same.
2) If the calculated value is <0.05, then it is said that the variance of two or more population data groups is not the same.

c. T-test

This study utilizes a paired t-test to examine whether there is a significant difference in the means between two related samples. The paired t-test is applied when the same subjects are exposed to two different treatments. In this research, the pretest and posttest results were analyzed using the t-test to determine whether there was a significant improvement. Through this test, the effectiveness of the website-based collegial supervision model was evaluated.

$$\frac{T_{o1} - T_{o2}}{\sqrt{\frac{\sum b^2}{N(N-1)}}}$$

To1 and To2 = Each is the mean of the pretest results and the mean of the posttest results

□ b2 = The number of deviations from the mean difference

N = Number of Subjects

The results of the t test analysis between pre-test and post-test were converted to a t table at a significance level of 5%. Meanwhile, the average pre-test and post-test scores are converted using the following guidelines for converting pre-test and post-test scores:

Table 2. Guidelines for Conversion of Pre-Test and Post-test Results adapted from (Groundlund & Linn, 1990).

No.	Score	Interval	Category
1	A	90 -100	Very Good
2	B	80 -89	Good
3	C	55 – 79	Enough
4	D	40 -54	Less

d. Normalized N-Gain

Normalized Gain or N-Gain score aims to determine the effectiveness of using a particular method or treatment in One Group pretest posttest design research. The formula used to calculate normality gain is as follows [2]:

$$\text{N gain} = \frac{\text{Post test score - Pre test score}}{\text{Ideal score - Prr test score}}$$

The categorization of N-Gain score results refers to Table 3

Table 3. N-gain Effectiveness Interpretation Category

Percentage (%)	Interpretation
> 75	Effective

56 – 75	Quite effective
40 – 55	Less effective
< 40	Ineffective

The process of testing the validity of the instrument was conducted through expert judgment, where feedback and suggestions were solicited from experts to assess the appropriateness of both the content and the media. The aspects evaluated in the instrument included its alignment with the research objectives and the clarity of its meaning. The initial step involved presenting the research instrument to three selected expert lecturers specializing in instrument design. These experts provided their feedback on the prepared instruments. The subsequent step involved refining the instrument based on the suggestions offered by the expert lecturers. Data from the validation process, including feedback from experts in educational supervision and website media, were collected and tabulated using a specific formula for analysis.

$$\text{Percentage of Validity Level (P)} = \frac{\text{Score}}{\text{Maximum score}} \times 100\%$$

Table 4. Feasibility Model/ Practicality Criteria

Percentage (%)	Validation Criteria
81 – 100	Highly feasible
61 - 80	Feasible
41 - 60	Moderately feasible
21 - 40	Not feasible

e. Effectiveness Test

The research design employed in this study is the Single Group Pretest-Posttest Design. This design involves conducting the experiment on a single group, meaning that all testing is carried out within one class. The pretest and posttest are used to assess the effectiveness and success of the intervention. Since there is no control or comparison group in this design, the pretest serves as a baseline, and the posttest measures any changes after the intervention. Below is a schematic representation of the one-group pretest-posttest design.

Table 5. Feasibility Model/ Practicality CriteriaOne Grooup Pretest-Posttest design Research

Pretest	Treatment	Post Test
O1	X	O2
O3	X	O4

Information:

O1 = Teacher's pretest score (trial I) before being given treatment

O3 = Teacher's pretest score (trial II) before being given treatment

O2 = Teacher's posttest score (trial I) after being given treatment

O4 = Teacher's posttest score (trial II) after being given treatment

X = Website-Based Collegial Supervision

Data processing was carried out by collecting pretest and posttest data. The data that has been collected is then analyzed with the help of the SPSS (Statistical Product and Service Solutions) Version 22 program with a significance level of 95%.

3 Finding and Discussion

This research uses level 3 research of development with the following steps; conducting research on existing models, conducting literature studies, making model development plans, conducting internal testing, model design, revising model designs, conducting external model field tests (effectiveness tests), research dissemination [4].The first stage (research) is carried out in study programs TKR (Light Vehicle Engineering) using qualitative methods, data was collected through in-depth interviews, observation, documentation studies, informants were determined using purposive and snowball, data analysis techniques in 3 flows, reducing data, presenting data (Data Display) and collecting data (Verification) [5].The validity of the data was tested by triangulation. Development stage research to test the effectiveness of the model using the Delphi and FGD models, was carried out with three experts, 12 practitioners and teachers. Data was collected using questionnaires, interviews and observations. Quantitative data analysis techniques were carried out by calculating the average score for each Teaching Factory program.

The findings of this research support research [6]. Research found that indicators of success for Teaching Factory (2015), namely; (1) application of real concepts, (2) problem solving abilities, (3) active involvement of resources. Qualitatively, it can be applied that real concepts (Contextual) have been implemented, this is based on facts in the field where students are actively involved in applying effective skills, psychomotor skills and Teaching Factory activities even though in some problems students still find it difficult to solve them, in the sense that they still need the role of instructor, in general factual, especially the use of tools, practices in schools, really require the involvement of human resources from the industrial world, school principals. Quantitatively, the effectiveness of teaching factory activities can be described as follows: (1) that the teaching factory achievements ended well, with an average score of (3.93) product (service) quality is in the good category (3.92) industry involvement is in the very good category (4.01) for student competency achievement is in the good category (3.93). The average score of all aspects (parameters) is at tpr 80% or the good category. Thus, it can be concluded that the teaching factory development model is feasible and effective in increasing the acceleration of the vocational school center of excellence at SMK Negeri 1 Percut Sei Tuan. The results of this research can be implemented as a basis for optimizing the Teaching Factory program. Based on the findings above, it can be summarized in the table below:

Table 6. Result

Aspect	Average Score	Fixed Score	TPR	Category
Achievement of program objectives	3,93	5		Good
Product/service quality	3,92	5		Good
Industry Engagement	4,01	5		Very Good
Achievement of Student Competencies	3,93	5		Good
Overall average value				

The average score for each aspect obtained an average TPR power score of 80% in the good category. Thus, it can be concluded that the contextual-based Teaching Factory development module produces a positive role in accelerating the center of excellence at SMK Negeri 1 Percut Sei Tuan.

4 Conclusion

Based on data reduction and quantitative data display, it can be concluded that the implementation of the Teaching Factory at SMK Negeri 1 Percut Sei Tuan is in accordance with government policy, the business world (and the industrial world) where students are required to be exposed to real conditions in the world of work. This research supports the findings of Monica, Ridwan, Waskito [7] who found that based on the implementation of the Teaching Factory evaluation, through this research it is recommended that communication between industry and educational institutions continue to be carried out, so that synchronization of materials, human resources, especially practical facilities in schools can follow technological developments in the industry [8].

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