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Development of an Initial Teaching Factory Model Based on Cippo Evaluation to Improve Employability Skills and Creativity of SMK Students in The Fashion Design and Production Expertise Program

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Abstract

This study aims to develop an initial Teaching Factory model based on CIPPO (Context, Input, Process, Product, Outcome) evaluation to improve employability skills and creativity of vocational high school (SMK) students majoring in Fashion Design and Production at SMKN 2 Ogan Komering Ulu. The research employed Research and Development (R&D) method using the ADDIE model. Data were collected through questionnaires, observation, in-depth interviews, and product assessments. The research subjects were 45 eleventh-grade students of the Fashion Design and Production Study Program. Model validation was conducted by curriculum experts, fashion industry practitioners, and educational evaluation experts. The results indicate that: (1) the CIPPO-based Teaching Factory model developed was declared valid by experts with a mean score of 4.38 out of 5 (very good category); (2) there was a significant improvement in students' employability skills with a normalized gain score of 0.62 (medium category); (3) students' creativity scores improved significantly from an average of 64.2 to 82.7 (28.8% increase); (4) CIPPO evaluation identified relevant contextual, input, process, product, and outcome factors in the implementation of Teaching Factory. This model provides a systematic framework that integrates the needs of the fashion industry with real production-based learning, making it relevant for implementation in vocational schools throughout Indonesia.

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Introduction

Vocational High Schools (Sekolah Menengah Kejuruan/SMK) play a strategic role in preparing skilled workers who are able to meet the demands of the business and industrial sectors (DUDI). However, the current challenge faced by vocational high schools is the gap between graduates' competencies and the continuously evolving demands of industry. Data from Statistics Indonesia (BPS, 2023) show that the open unemployment rate among vocational high school graduates remains at 9.42%, which is higher than that of senior high school and university graduates. This condition indicates a serious issue regarding the relevance of learning in vocational high schools to the actual needs of industry (Wibowo et al., 2022).

The Fashion Design and Production Expertise Program is one of the vocational programs in SMK that is closely related to the creative and fashion industries. Indonesia's fashion industry has considerable potential, as the Ministry of Trade of the Republic of Indonesia (2022) reported that the fashion subsector contributed 17.7% to the total GDP of the national creative economy. However, this industry faces a shortage of skilled workers who not only master sewing techniques but also possess a high level of creativity, adaptability, and strong communication skills as part of their employability skills (Soesatyo et al., 2021).

One innovative approach recommended by the Directorate General of Vocational Education to bridge this gap is the Teaching Factory (TEFA). Teaching Factory is a learning model that integrates real production processes into school-based learning activities, enabling students to gain direct work experience in an authentic industrial environment (Kuswantoro, 2014; Dikmenjur, 2021). This concept has been successfully implemented in various countries, including Germany through its dual system model (Pilz, 2022), as well as in other ASEAN countries (Mahadzir et al., 2020).

Although the Teaching Factory model has been widely discussed conceptually, its implementation in practice still faces various challenges. Soenarto et al. (2020) found that many vocational high schools do not yet have a standardized, comprehensive, and systematically evaluable Teaching Factory model. At SMKN 2 Ogan Komering Ulu in particular, the Teaching Factory in the Fashion Design and Production Expertise Program is still implemented sporadically without a clear evaluation framework, making it difficult to measure its success and impact on students' competencies.

To address this issue, a Teaching Factory model needs to be systematically designed using a comprehensive evaluation framework. The CIPPO evaluation model Context, Input, Process, Product, and Outcome—developed from Stufflebeam's CIPP model (2003) with the addition of the Outcome component, offers a holistic approach to evaluating educational programs. The CIPPO model enables evaluation that covers contextual relevance, adequacy of inputs, quality of processes, product achievements, and the long-term outcomes of a program (Wirawan, 2011; Tayibnapis, 2019).

This study focuses on developing an initial Teaching Factory model based on a comprehensive CIPPO evaluation framework that can be concretely operationalized in the Fashion Design and Production Expertise Program at vocational high schools. This model is expected to: (1) provide a systematic framework for Teaching Factory management; (2) integrate competency standards from the fashion industry; (3) improve students' employability skills; and (4) facilitate the development of students' creativity through real production processes. This study represents the initial stage, or first phase, of a more comprehensive research and development process, which will subsequently be followed by large-scale field validation and model dissemination.

Teaching Factory in Vocational Education

Teaching Factory (TEFA) is a vocational learning concept that combines the real working environment of industry with the learning process in schools. According to Dikmenjur (2021), Teaching Factory is an industry-based learning model that integrates industrial standards and culture into the learning process in vocational high schools in order to produce graduates who are competent and have an entrepreneurial mindset. This concept was first developed in Germany under the term Lernfabrik as part of the dual education system (Abele et al., 2015), and has subsequently been adapted in various vocational education contexts around the world.

The main characteristics of Teaching Factory, according to Kuswantoro (2014), include: (1) the existence of a production unit that operates according to industrial standards; (2) student involvement in real production processes; (3) orientation toward product quality that is accepted by the market; (4) curriculum integration with industrial needs; and (5) active involvement of industry as a partner. Learning in TEFA does not only focus on the mastery of technical competencies, but also on the development of non-technical competencies such as discipline, communication, problem-solving skills, and creativity (Soenarto et al., 2020).

In the context of the Fashion Design and Production Expertise Program, Teaching Factory can be implemented in the form of a fashion production unit that operates like a fashion house or a small-scale garment business. Students experience the production process starting from identifying customer needs, designing, selecting materials, making patterns, sewing, and marketing products (Triyono, 2021). This real production experience is relevant to the demands of the fashion industry, which requires workers who are not only technically competent but also creative and adaptive.

CIPPO Evaluation Model

The CIPPO evaluation model is a development of the CIPP model, which consists of Context, Input, Process, and Product, developed by Stufflebeam (2003). Tayibnapis (2019) expanded this model by adding the Outcome component, which focuses on the long-term impact of a program on its beneficiaries. The CIPPO model provides a more comprehensive evaluation framework than the CIPP model because it assesses not only the direct results or products of a program, but also its long-term outcomes.

In the context of educational program evaluation, the CIPPO model is considered relevant because it provides a systematic framework for examining a program from the planning stage to its broader impact. Evaluation is not only directed at determining whether a program has achieved its immediate objectives, but also at understanding how the program responds to contextual needs, utilizes available resources, and produces sustainable benefits. Therefore, CIPPO is suitable for evaluating educational innovations, including vocational learning models, because it connects program planning, implementation, output, and impact in an integrated manner.

The addition of the Outcome component is the main characteristic that distinguishes CIPPO from the original CIPP model. While Product Evaluation focuses on immediate achievements, such as students' learning outcomes, product quality, or competency attainment, Outcome Evaluation examines the broader and longer-term effects of a program. In vocational education, this may include students' readiness to enter the workforce, improvement of employability skills, development of professional attitudes, and the relevance of school-based production activities to industry expectations. Thus, the CIPPO model allows researchers and practitioners to evaluate not only whether a program works, but also whether it creates meaningful and sustainable changes.

The components of the CIPPO model are explained as follows. First, Context Evaluation aims to assess the relevance of a program to environmental needs, including situational analysis, needs identification, and the alignment of program objectives. In this stage, evaluators examine whether the program is designed based on real problems and actual needs in the field. For example, in a Teaching Factory program, Context Evaluation can be used to identify gaps between school learning practices and industry demands, students' competency needs, curriculum requirements, and the availability of local business or industrial partnerships.

Second, Input Evaluation assesses the adequacy of available resources, including human resources, facilities, and curriculum (Wirawan, 2011). This component is important because the success of a program depends greatly on the quality and readiness of supporting resources. In vocational schools, Input Evaluation may include the competence of teachers, availability of workshop facilities, production equipment, learning materials, funding support, time allocation, and collaboration with industry partners. Through this evaluation, the researcher can determine whether the program has sufficient capacity to be implemented effectively.

Third, Process Evaluation monitors program implementation, identifies obstacles, and provides feedback for improvement. This component focuses on how the program is carried out in practice. In the Teaching Factory model, Process Evaluation can be used to observe the learning syntax, production workflow, student participation, teacher facilitation, teamwork, time management, and quality control activities. The results of Process Evaluation are useful for identifying weaknesses during implementation, such as limited student involvement, insufficient production planning, lack of coordination, or mismatch between learning activities and industry standards.

Fourth, Product Evaluation assesses the achievement of short-term program objectives. This evaluation focuses on the direct results obtained after the program has been implemented. In vocational education, Product Evaluation may include students' competency achievement, quality of fashion products, improvement in creativity, mastery of technical skills, and achievement of learning indicators. Product Evaluation provides evidence regarding the effectiveness of the program in producing measurable outputs that are aligned with the planned objectives.

Fifth, Outcome Evaluation assesses the long-term impact of the program on various stakeholders (Worthen et al., 2020). This component examines whether the program produces broader benefits beyond immediate learning outcomes. In the context of a CIPPO-based Teaching Factory model, Outcome Evaluation may include students' work readiness, entrepreneurial interest, ability to adapt to industrial work culture, improvement of school–industry collaboration, and the contribution of student products to the school production unit. Outcome Evaluation is therefore essential to determine whether the developed model has sustainable relevance for students, teachers, schools, and industry partners.

Overall, the CIPPO model offers a comprehensive and balanced evaluation framework for educational development research. Its five components enable the researcher to evaluate the suitability of the program context, the readiness of inputs, the quality of implementation, the achievement of outputs, and the sustainability of outcomes. For this reason, the CIPPO model is appropriate to be integrated into the development of a Teaching Factory model, particularly in the Fashion Design and Production Expertise Program, because it supports continuous improvement and ensures that the developed model is relevant, practical, effective, and impactful.

Employability Skills in the Context of Vocational High Schools

Employability skills refer to a set of non-technical attributes that enable individuals to obtain, maintain, and develop themselves in employment. Hillage and Pollard (1998) define employability as the capacity to obtain and maintain suitable employment, which includes the knowledge, skills, and attitudes required by the world of work. In the context of vocational education, employability skills include communication skills, teamwork, problem-solving, self-management, initiative, and information technology skills (Sofyan et al., 2019).

A study conducted by the World Economic Forum (2023) states that the skills most needed by industry in the era of digital transformation are analytical thinking, creative thinking, resilience, flexibility, and lifelong learning ability. In the fashion industry, relevant employability skills include the ability to read market trends, creativity in design, time management in the production process, the ability to communicate with clients, and digital literacy for online marketing (Wibowo et al., 2022).

Creativity in Production-Based Learning

Creativity is defined as the ability to generate ideas, concepts, or products that are new, original, and valuable (Sternberg, 2006). In the context of vocational education, creativity is not merely an artistic ability, but also includes problem-solving skills, process innovation, and design adaptation to market needs. Amabile (1996) stated that creativity can develop optimally in an environment that is supportive, provides autonomy, and offers real challenges to individuals conditions that are precisely created through the Teaching Factory model.

Research by Sumarni et al. (2021) found that project-based learning combined with a real production context significantly improves the creativity of vocational high school students. In line with this, Trilling and Fadel (2021) emphasized that 21st-century skills, including creativity, collaboration, communication, and critical thinking, commonly known as the 4Cs, can be effectively developed through authentic learning that integrates real-world challenges.

Method

Type and Research Design

This study employed a Research and Development (R&D) approach using the ADDIE development model, which consists of Analysis, Design, Development, Implementation, and Evaluation. The selection of the ADDIE model was based on its suitability for developing a learning model that is structured, systematic, and can be validated in stages (Branch, 2009). This study represents the first phase of a three-stage research plan, focusing on needs analysis, design, development, and initial validation of a CIPPO-based Teaching Factory model. Large-scale implementation and summative evaluation will be conducted in subsequent research.

The R&D approach was considered appropriate because the main objective of this study was not merely to describe an existing phenomenon, but to produce a model that could be practically applied in vocational education settings. In this context, the development of a CIPPO-based Teaching Factory model required a systematic process that began with identifying real problems in the field, formulating the conceptual framework of the model, developing supporting instruments, and validating the feasibility of the model through expert judgment and limited trials. Therefore, the R&D approach enabled the researcher to bridge theoretical concepts with practical needs in vocational learning.

Furthermore, the ADDIE model provides a flexible yet comprehensive framework for developing educational products, especially learning models that require continuous refinement. Each stage in ADDIE allows the researcher to conduct formative evaluation before proceeding to the next stage. This is important because the Teaching Factory model must be aligned with curriculum demands, student competencies, school resources, and industry expectations. Through this staged development process, the resulting model is expected to be more valid, practical, and relevant to the needs of vocational schools.

The integration of the CIPPO evaluation framework into the Teaching Factory model also strengthens the research design. The CIPPO framework, which includes Context, Input, Process, Product, and Outcome, allows the model to be evaluated comprehensively from the initial needs and resources to the final impact on students' competencies. Thus, this study does not only focus on producing a learning model, but also on ensuring that the model has a clear evaluation mechanism to support continuous improvement in vocational education practices..

Research Subjects and Location

The research was conducted at SMKN 2 Ogan Komering Ulu, South Sumatra, during the even semester of the 2024/2025 academic year. The research subjects consisted of: (1) 45 eleventh-grade students of the Fashion Design and Production Expertise Program as subjects for the limited trial; (2) 8 teachers of the Fashion Design and Production Expertise Program; and (3) 4 experts, consisting of 1 vocational education curriculum expert, 1 program evaluation expert, and 2 fashion industry practitioners. The selection of SMKN 2 Ogan Komering Ulu was based on the consideration that the school already has an active fashion production unit, but has not yet developed a standardized Teaching Factory model.

The eleventh-grade students were selected because they had already acquired basic competencies in fashion design and production, making them suitable participants for the limited implementation of the Teaching Factory model. At this level, students are generally prepared to engage in more complex learning activities that involve product planning, production processes, quality control, teamwork, and market-oriented tasks. Their involvement provided important information regarding the applicability of the developed model in improving employability skills and creativity within authentic vocational learning activities.

The teachers involved in this study played an important role as implementers and sources of information regarding the feasibility of the model. Their experience in managing classroom learning, workshop practices, and production-based activities provided valuable insights into the strengths and weaknesses of the proposed Teaching Factory model. In addition, teacher participation helped ensure that the model was not only theoretically sound but also practical and realistic to be implemented in the daily learning process at vocational schools.

The involvement of experts was intended to obtain objective validation from different perspectives. The vocational education curriculum expert assessed the suitability of the model with curriculum standards and competency achievement, while the program evaluation expert examined the appropriateness of the CIPPO-based evaluation structure. Meanwhile, fashion industry practitioners provided input related to the relevance of the model to workplace demands, production standards, creativity, and employability skills required in the fashion industry. This combination of research subjects strengthened the validity and relevance of the developed model.

Development Procedure

The development procedure followed the stages of the ADDIE model as follows. The Analysis stage included needs analysis through field studies, curriculum document analysis, and literature review on Teaching Factory and CIPPO evaluation. The Design stage included the design of model components, CIPPO evaluation instruments, and learning tools. The Development stage involved the development of the model prototype, instruments, and implementation guidelines. The limited

Implementation stage involved trying out the model with the research subjects. The Evaluation stage included formative evaluation by experts and limited evaluation based on field data.

In the Analysis stage, the researcher identified the gap between the existing implementation of production-based learning and the ideal concept of Teaching Factory in vocational education. Data were collected through observations of school facilities, interviews with teachers, and analysis of relevant curriculum documents. This stage was essential to determine the needs of students, teachers, and schools in implementing a more structured Teaching Factory model. The findings from the needs analysis became the foundation for designing a model that was contextual and responsive to the real conditions of the school.

The Design stage focused on formulating the conceptual structure of the CIPPO-based Teaching Factory model. At this stage, the researcher designed the components of the model, including learning syntax, teacher and student roles, production flow, assessment mechanisms, and evaluation indicators. The CIPPO framework was used as the basis for developing evaluation instruments so that each component of the Teaching Factory implementation could be monitored and assessed systematically. The design also included the preparation of learning tools such as lesson plans, student worksheets, product assessment rubrics, and observation sheets.

In the Development stage, the initial prototype of the model was produced based on the results of the previous stages. This prototype consisted of a model guidebook, implementation procedures, evaluation instruments, and supporting learning materials. The developed prototype was then submitted to experts for validation. Suggestions and comments from experts were used to revise and improve the model before it was tested in a limited implementation. This stage ensured that the model met the criteria of content validity, construct validity, and practical relevance.

The Implementation and Evaluation stages were conducted on a limited scale to examine the initial practicality and effectiveness of the developed model. During implementation, students participated in Teaching Factory activities that simulated real production processes in the fashion industry. The researcher observed the learning process, collected assessment data, and documented teacher and student responses. The evaluation stage emphasized formative evaluation, meaning that the results were used to improve the model rather than to make final claims about its effectiveness. Large-scale testing is therefore needed in the next phase of the research.

Data Collection and Analysis Techniques

Data were collected through: (1) expert validation questionnaires using a 1–5 Likert scale; (2) test instruments and performance assessment to measure employability skills; (3) product assessment rubrics to measure creativity; (4) participatory observation; and (5) in-depth interviews with teachers and students. The validation data were analyzed using mean scores, with interpretation based on Arikunto's (2021) category classification. The improvement of employability skills was analyzed using N-Gain (Hake, 1999). The improvement of creativity was analyzed using a paired t-test at a significance level of $\alpha = 0.05$. The reliability of the instruments was tested using Cronbach's Alpha coefficient.

The use of multiple data collection techniques was intended to obtain comprehensive and credible data regarding the validity, practicality, and initial effectiveness of the developed model. Expert validation questionnaires were used to assess the appropriateness of the model components, evaluation instruments, and implementation guidelines. Meanwhile, performance assessment was used because employability skills cannot be measured only through written tests, but must also be observed through students' actual behavior during the learning and production process. This approach allowed the researcher to evaluate students' communication, teamwork, problem-solving ability, self-management, initiative, innovation, and technological literacy more authentically.

Reativity was measured through product assessment rubrics because the Fashion Design and Production Expertise Program emphasizes the ability to produce creative and marketable fashion products. The rubric included aspects such as originality, aesthetic value, technical quality, functionality, and product finishing. Through this instrument, student creativity could be assessed based on concrete learning outcomes rather than subjective impressions. Participatory observation was also used to capture the dynamics of learning activities, student engagement, teacher facilitation, and the consistency of Teaching Factory implementation in the classroom and workshop environment.

In-depth interviews with teachers and students were conducted to obtain qualitative data that could explain the quantitative findings more deeply. Teachers provided information about the practicality of the model, obstacles during implementation, and the suitability of the model with school conditions. Students shared their learning experiences, perceived benefits, and challenges during the Teaching Factory activities. These qualitative data were analyzed descriptively to support the interpretation of validation results, employability skills improvement, and creativity development.

The data analysis techniques were selected according to the type and purpose of the data. Mean score analysis was used to determine the level of expert validation, while N-Gain analysis was applied to identify the degree of improvement in students' employability skills before and after implementation. The paired t-test was used to examine whether the increase in creativity scores was statistically significant. In addition, Cronbach's Alpha was used to ensure that the instruments had acceptable internal consistency. By combining quantitative and qualitative analysis, this study aimed to produce findings that were not only statistically meaningful but also contextually relevant to vocational education practice.

Result and Discussion

Needs Assessment

The needs assessment revealed several important findings. First, 100% of teachers stated that the Teaching Factory currently implemented does not yet have standardized implementation guidelines. Second, 87.5% of teachers reported difficulties in integrating real production processes with the achievement of curriculum competencies. Third, the industry study showed that 73.3% of fashion industry actors in Ogan Komering Ulu Regency stated that vocational high school graduates need to improve their teamwork, design creativity, and production time management skills. These findings are in line with the study by Sofyan et al. (2019), which identified a gap between the competencies of vocational high school graduates and the needs of industry.

The CIPPO context analysis revealed that SMKN 2 Ogan Komering Ulu has several strengths, including adequate sewing equipment consisting of 26 industrial sewing machines and 8 overlock machines, a 120 m^2 production unit area, and a network of five local fashion industry partners. However, weaknesses were found in the aspects of production management systems, standard operating procedures, and mechanisms for evaluating competency-based learning outcomes. This condition supports the need to develop a comprehensive Teaching Factory model based on CIPPO evaluation.

Description of the Developed CIPPO-Based Teaching Factory Model

The developed CIPPO-based Teaching Factory model consists of five interrelated main components. The first component is Context Evaluation, which includes: (a) analysis of local and national fashion industry needs; (b) mapping of expected graduate competencies; (c) analysis of school environmental conditions and policy support; and (d) identification of potential industry partners. The second component is Input Evaluation, which includes: (a) readiness of the curriculum based on the Indonesian National Work Competency Standards (SKKNI) in the fashion field; (b) teachers' pedagogical and technical competencies; (c) adequacy of production facilities and equipment; and (d) availability of raw materials and working capital.

The third component is Process Evaluation, which includes: (a) the TEFA production cycle, consisting of planning, implementation, quality control, and distribution phases; (b) the mentoring mechanism of teachers as both instructors and production managers; (c) integration of basic curriculum competencies into each stage of production; and (d) monitoring and feedback systems. The fourth component is Product Evaluation, which includes the assessment of technical competencies, product quality, and compliance with industry standards. The fifth component is Outcome Evaluation, which includes the assessment of employability skills, creativity, and long-term work readiness.

Table 1. Components of the CIPPO-Based Teaching Factory Model

Component	Evaluation Dimension	Instrument	Achievement Indicator
Context	Relevance to industry needs, policies, vision, and mission	Needs analysis questionnaire, document study	80% relevant to industry needs
Input	Human resources, facilities, curriculum, industry partners	Facility readiness checklist, teacher competency rubric	Readiness score ≥ 3.5 / 5
Process	Production cycle, supervision, integration of basic competencies	Process observation sheet, production log	Implementation ≥ 85%
Product	Technical competence, product quality, SKKNI	Product assessment rubric, competency test	Mean score ≥ 75, based on minimum mastery criteria
Outcome	Employability skills, creativity, work readiness	Employability skills instrument, creativity rubric	N-Gain ≥ 0.30, moderate category

Source: Research development results, 2025.

Results of Model Validation by Experts

Model validation was conducted by four experts, consisting of one vocational education curriculum expert, one program evaluation expert, and two fashion industry practitioners. The validation results showed that, overall, the developed CIPPO-based Teaching Factory model obtained an average score of 4.38 on a 5-point scale, categorized as Very Good. The detailed validation results for each aspect are presented in Table 2.

Table 2. Results of Model Validation by Experts

No.	Assessed Aspect	Curriculum Expert	Evaluation Expert	Practitioners	Mean

1	Suitability of the model with the objectives of the Teaching Factory	4.5	4.4	4.6	4.5
2	Relevance of CIPPO components to TEFA needs	4.3	4.6	4.2	4.37
3	Clarity of model implementation procedures	4.2	4.3	4.1	4.2
4	Adequacy of evaluation instruments for each CIPPO component	4.4	4.5	4.3	4.4
5	Accuracy of employability skills indicators	4.3	4.2	4.5	4.33
6	Accuracy of the creativity assessment rubric	4.4	4.3	4.4	4.37
7	Sustainability and scalability of the model	4.4	4.5	4.6	4.5
	Overall Mean				**4.38**

Source: Primary research data, 2025.

Based on Table 2, the aspects with the highest scores were the suitability of the model with the objectives of the Teaching Factory and the sustainability/scalability of the model, each obtaining a score of 4.50. Meanwhile, the aspect with the lowest score was the clarity of model implementation procedures, with a score of 4.20. Nevertheless, all aspects were categorized as Very Good, with scores of ≥ 4.0. The experts emphasized the need to refine the operational guidelines and provide concrete examples of the implementation of the TEFA production cycle. These validation findings indicate that the developed model is feasible for limited trial implementation, with revisions to the operationalization of the guidelines (Tessmer, 1993; Nieveen, 2010).

Results of the Limited Trial: Improvement of Employability Skills

The limited trial was conducted over 12 weeks with 45 eleventh-grade students of the Fashion Design and Production Expertise Program. Employability skills were measured before the implementation of the CIPPO-based Teaching Factory model through a pre-test and after its implementation through a post-test. The measurement instrument referred to the employability skills framework developed by Finch and Crunkilton (2009), which includes six dimensions: communication, teamwork, problem-solving, self-management, initiative/innovation, and technological literacy.

Table 3. Recapitulation of Students' Employability Skills Measurement Results

No.	Dimension of Employability Skills	Pre-test	Post-test	Improvement	N-Gain	Category
1	Communication	62.4	80.1	17.7	0.47	Moderate
2	Teamwork	65.8	84.6	18.8	0.55	Moderate
3	Problem-Solving	58.3	76.9	18.6	0.45	Moderate
4	Self-Management	60.7	79.5	18.8	0.48	Moderate
5	Initiative and Innovation	56.1	77.3	21.2	0.48	Moderate
6	Technological Literacy	61.2	82.4	21.2	0.55	Moderate
	Overall Mean	**60.8**	**80.1**	**19.4**	**0.5**	**Moderate**

Source: Primary research data, 2025.

Based on Table 3, all dimensions of employability skills showed meaningful improvement. The overall average N-Gain was 0.50, which falls into the moderate category according to Hake's (1999) criteria. The dimensions of Initiative and Innovation and Technological Literacy showed the highest absolute improvement, each increasing by 21.2 points. This indicates that direct exposure to real production processes is highly effective in encouraging students' initiative and their use of digital technology in fashion production processes. This finding is consistent with Triyono's (2021) study, which concluded that Teaching Factory significantly improves students' work readiness through authentic production experiences.

Results of the Limited Trial: Improvement of Students' Creativity

Students' creativity was measured using a creativity assessment rubric referring to the four dimensions developed by Munandar (2014): fluency, flexibility, originality, and elaboration. Each dimension was measured in the context of the fashion design and production process carried out within the Teaching Factory cycle.

The measurement results showed that the students' average creativity score increased from 64.2, categorized as Fairly Creative, in the pre-intervention stage to 82.7, categorized as Creative, in the post-intervention stage. This represented an increase of 18.5 points, or 28.8%. The paired t-test produced a calculated t-value of 14.32, which was greater than the t-table value of 2.015, with df = 44 and α = 0.05. Therefore, it can be concluded that there was a significant difference between students' creativity scores before and after the implementation of the CIPPO-based Teaching Factory model. The dimension with the highest improvement was originality, with an increase of 34.2%, indicating that design assignments in a real production context effectively encouraged students to produce more original works.

This finding supports Amabile's (1996) view that creativity develops optimally in an environment that provides authentic challenges and autonomy in the work process. Teaching Factory, with its characteristics of exposing students to real production challenges—from customer needs to production time targets creates ideal conditions for the development of creativity. As emphasized by Sawyer (2012), creativity in the vocational context is an ability that can be trained through repeated practice in real work situations.

Analysis of CIPPO Evaluation in Model Implementation

The CIPPO-based evaluation conducted during the limited trial produced important findings for each component. Context Evaluation showed that school policy support was very strong, with 100% of school leadership supporting the TEFA program. However, support from parents and the community still needs to be improved, as only 62% of parents understood the concept of TEFA. Input Evaluation identified that facility readiness reached 78%, which is considered adequate; however, teachers' digital competence needs to be improved, as only 50% of teachers had mastered computer-based digital design applications.

The results of Context Evaluation indicate that institutional support is one of the strongest foundations for the implementation of the Teaching Factory model. The full support from school leadership reflects the existence of policy readiness, managerial commitment, and institutional awareness of the importance of production-based learning in vocational education. This condition is essential because the Teaching Factory model requires cross-unit coordination, allocation of school resources, flexible learning management, and continuous monitoring from school leaders. Without strong policy support, the implementation of TEFA may only become a partial classroom activity rather than an integrated school-based production system.

However, the relatively low understanding of parents and the community shows that the socialization of the Teaching Factory concept has not been fully optimized. Parents and the surrounding community are important stakeholders because they influence students' motivation, learning support, and acceptance of production-based learning activities. The finding that only 62% of parents understood the TEFA concept suggests that the school needs to strengthen communication strategies through parent meetings, school exhibitions, product showcases, and community-based partnerships. By increasing stakeholder understanding, the TEFA program can gain broader social support and become more sustainable.

The Input Evaluation results show that the school already has a relatively adequate level of facility readiness, as indicated by a score of 78%. This means that the availability of workshops, sewing equipment, production tools, and supporting facilities is sufficient to support the limited implementation of the model. Nevertheless, the adequacy of facilities should not only be interpreted in terms of quantity, but also in terms of quality, functionality, maintenance, and alignment with industry standards. In the context of the Fashion Design and Production Expertise Program, facilities must support the entire production cycle, starting from design planning, pattern making, cutting, sewing, finishing, quality control, and product presentation.

At the same time, teachers' digital competence remains a crucial area for improvement. The finding that only 50% of teachers had mastered computer-based digital design applications indicates a gap between the demands of modern fashion production and teacher readiness. In the fashion industry, digital design skills are increasingly important because they support efficiency, accuracy, creativity, and product visualization. Therefore, teacher capacity-building programs are needed, particularly training in computer-aided design, digital pattern making, online product promotion, and the use of technology-based learning media. Improving teachers' digital competence will strengthen the quality of TEFA implementation and make learning more relevant to current industry developments.

Process Evaluation revealed that the implementation of the TEFA production cycle reached 88.6%, exceeding the minimum target of 85%. The main obstacle identified was the mismatch between the regular lesson schedule and the time required to complete one full production cycle. Product Evaluation showed that 86.7% of students achieved the Minimum Mastery Criteria in technical competency assessment. Outcome Evaluation showed that employability skills and creativity increased significantly, as described above. Overall, the CIPPO evaluation proved effective as a framework for identifying strengths and areas for improvement in the implementation of the Teaching Factory model (Wirawan, 2011; Tayibnapis, 2019).

The high achievement in Process Evaluation demonstrates that the Teaching Factory model was generally implemented according to the planned procedures. The production cycle, which includes receiving orders, designing products, preparing materials, producing fashion items, conducting quality control, and evaluating final products, was carried out effectively during the limited trial. This finding indicates that students were able to participate in structured production-based learning activities and that teachers were able to facilitate the learning process according to the model guidelines. The achievement of 88.6% also shows that the model has practical potential to be implemented in vocational school settings.

Nevertheless, the mismatch between the regular lesson schedule and the duration required to complete one full production cycle represents an important implementation challenge. Teaching

Factory learning requires longer and more flexible time allocation because students must complete authentic production tasks that cannot always be divided into short lesson periods. This condition suggests that schools need to redesign learning schedules, integrate several related subjects, or apply a block system to provide sufficient time for production activities. Without flexible time management, the continuity of the production process may be disrupted and the quality of student products may not reach optimal standards.

The Product Evaluation results show that the majority of students were able to achieve the expected technical competencies. The fact that 86.7% of students achieved the Minimum Mastery Criteria indicates that the Teaching Factory model contributed positively to students' mastery of practical skills. This achievement reflects students' ability to apply knowledge and skills in real production activities, not merely in simulated classroom exercises. In fashion education, this is particularly important because technical competence must be demonstrated through tangible products that meet standards of design, measurement accuracy, sewing technique, neatness, finishing, and usability.

The Outcome Evaluation findings further strengthen the conclusion that the CIPPO-based Teaching Factory model has a positive impact on student development. The significant improvement in employability skills and creativity indicates that the model does not only improve technical skills, but also develops broader competencies needed in the world of work. Students were trained to communicate, collaborate, solve problems, manage time, show initiative, innovate in product design, and use technology in the production process. These outcomes are highly relevant to vocational education because graduates are expected to be work-ready, adaptive, creative, and capable of responding to industry needs.

Overall, the CIPPO evaluation framework provided a comprehensive picture of the strengths and weaknesses of the Teaching Factory implementation. Context Evaluation identified the level of stakeholder support; Input Evaluation revealed the readiness of resources; Process Evaluation showed the quality of implementation; Product Evaluation measured the achievement of short-term learning targets; and Outcome Evaluation assessed the broader impact on students' competencies. Therefore, the use of CIPPO was not only useful for measuring program success, but also for generating recommendations for improvement. Based on these findings, the model needs to be strengthened through wider stakeholder socialization, teacher digital competency training, facility optimization, and more flexible scheduling mechanisms to support the sustainability of the TEFA program.

Discussion

Overall, this study shows that the development of a Teaching Factory model based on CIPPO evaluation is an appropriate and necessary step in improving the quality of vocational education in the Fashion Design and Production Expertise Program. The developed model successfully combines the strength of the Teaching Factory concept as a real production-based learning platform with the comprehensive CIPPO evaluation framework, thereby producing a system that is oriented not only toward the learning process but also toward long-term impact (Mahadzir et al., 2020; Stufflebeam & Shinkfield, 2007).

The significant improvement in employability skills, with an N-Gain of 0.50, and creativity, with an increase of 28.8%, confirms previous research findings emphasizing the effectiveness of production-based learning approaches in vocational education. Soenarto et al. (2020) found an average N-Gain of 0.48 in the implementation of TEFA in vocational high schools in engineering expertise programs, while Nurtanto et al. (2021) reported similar results in automotive programs. This study enriches the existing literature by focusing on the Fashion Design and Production Expertise Program, which has unique characteristics due to the high demand for creativity in every production process.

The integration of CIPPO evaluation provides significant added value compared to a Teaching Factory model without a systematic evaluation framework. As stated by Worthen et al. (2020), comprehensive program evaluation is a prerequisite for continuous improvement. Context Evaluation ensures that the model is relevant to local needs; Input Evaluation ensures resource readiness; Process Evaluation enables real-time improvement; Product Evaluation measures direct achievements; and Outcome Evaluation ensures long-term accountability. Together, these five components form a robust quality management system for the Teaching Factory model.

Conclusion

Based on the research findings and discussion, four main conclusions can be drawn. First, the CIPPO evaluation-based Teaching Factory model for the Fashion Design and Production Expertise Program in vocational high schools was successfully developed through the ADDIE stages and met the validity criteria, with an average score of 4.38 out of 5, categorized as Very Good, based on expert assessment. This model consists of five integrated evaluation components Context, Input, Process, Product, and Outcome which collectively form a systematic framework for Teaching Factory management.

Second, the limited implementation of the CIPPO-based Teaching Factory model over 12 weeks resulted in a significant improvement in students' employability skills, with an average N-Gain of 0.50, categorized as Moderate, across the six measured dimensions: communication, teamwork, problem-solving, self-management, initiative and innovation, and technological literacy. Third, students' creativity increased significantly by 28.8%, from an average score of 64.2 to 82.7, with t-count = 14.32 and $p < 0.05$, with the highest improvement occurring in the originality dimension at 34.2%. Fourth, the CIPPO evaluation framework proved effective in identifying critical factors in the implementation of the Teaching Factory model, including facility readiness at 78%, implementation of the production cycle at 88.6%, and teachers' digital competence, which still requires improvement.

Based on the research findings and conclusions, several recommendations are proposed. For school principals and policymakers, it is recommended to: (1) allocate a specific budget for improving teachers' digital competence in computer-based fashion design applications; (2) reorganize the school schedule to accommodate the Teaching Factory production cycle; and (3) strengthen communication with parents regarding the concept and benefits of TEFA. For subject teachers, it is recommended to develop a diverse bank of design assignments to facilitate students' creativity in various production contexts. For future researchers, it is recommended to validate the model on a larger scale by involving more schools in different regions and to develop longitudinal studies to measure the long-term impact of the model on graduates' absorption into industry.

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