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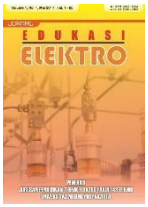

Evaluation of Collaborative Learning in the Development of Technology-Based Entrepreneurial Skills at Muhammadiyah Prambanan Vocational High School

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Abstract— The purpose of this research is to promote entrepreneurship education in universities, develop students' entrepreneurial soft skills, and create opportunities for students to produce creative works and innovative products. This study is evaluation research using a descriptive quantitative method. The research methodology follows the Context, Input, Process, and Product (CIPP) model. Context refers to the collaboration in learning and the standards for implementing entrepreneurship education. Input involves entrepreneurship program planning and program participants. Process refers to the execution of the entrepreneurship education program and workshops. Product refers to the effectiveness of the program's implementation and program evaluation. The sample of this research consists of 20 teachers and 20 students. The data analysis technique involves the use of descriptive statistical methods. The evaluation of context is found to be relevant, with an average score of 63.67, a mean of 3.35, and a TCR of 67.62%. The evaluation of input is highly relevant, with an average score of 9.11, a mean of 4.56, and a TCR of 91.11%. The evaluation of process is relevant, with an average post-test score of 73.11, a mean of 3.85, and a TCR of 76.96%. The evaluation of product is relevant, with an average score of 64.57, a mean of 3.4, and a TCR of 67.97%. The implication of this research is the existence of entrepreneurship education in universities, the development of students' entrepreneurial soft skills, and students producing creative works and innovative products.

Keywords: entrepreneurship, technology, entrepreneurial practices.

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1 Introduction

Education is a crucial foundation in shaping individuals to become more competent and ready to face the ever-evolving challenges of the workforce. As formal institutions, SMKs are expected to foster entrepreneurial spirits with high competence and adaptability to change [1]. Expertise in management, adaptability, and a dynamic mindset are challenges that today's human resources must overcome [2]. Vocational high schools still play a vital role in the development of knowledge and the creation of human resources with entrepreneurial characteristics, capable of making significant contributions to economic development.

Technology-based entrepreneurship is an aspect that needs attention in vocational education. Vocational high schools play a strategic role in preparing the younger generation to become

entrepreneurs capable of adopting and utilizing technology [3]. Technology-based entrepreneurship education can enhance the quality and achievements of institutions or organizations [4]. Technology-based entrepreneurship institutions have a positive impact on both schools and students [5]. Entrepreneurship at the higher education level collaborates with to enhance skills in technology-based entrepreneurship [6].

One effort to integrate technology-based entrepreneurship (technopreneurship) in vocational schools is through the implementation of technology-based entrepreneurial skills, with higher education institutions acting as partners in the evaluation process. This perspective emphasizes the importance of relevant and applicable education, such as the integration of technology-based entrepreneurship in SMKs, which not only prepares students for the future but also develops their abilities in the context of real-life situations [7]. Along with the development of other curricula, vocational education is built upon a curriculum integrated with industry, consisting of competency standards, material standards, achievement indicators, teaching/learning standards, assessment standards, and other guidelines relevant to achieving the expected competencies [8]. This formation process is based on the 21st-century education paradigm, which is intended for all (education for all), implements lifelong learning, is based on life-based learning, and creates a work-like environment (workplace learning) [9].

Higher education institutions play an important role in national development, particularly in the field of human resources. The importance of synergy between universities and vocational schools is becoming increasingly evident. Although the positive impact of entrepreneurial development at the university level on SMKs has not yet been significantly visible, by strengthening the collaboration between the two educational institutions, an educational ecosystem that supports the growth of entrepreneurship at the secondary education level can be created [10]. Consequently, broader opportunities are created for the younger generation to achieve success in entrepreneurship, bridging the gap between SMK graduates and university students in facing the increasingly complex demands of the job market. The higher education world is now required to change its vision and perspective in dealing with the dynamics of technological changes. Universities should strive to become institutions that are responsive to every dynamic change in the environment [11].

The university initiated an entrepreneurial practice program in vocational education aimed at developing technology-based entrepreneurial skills among students. This program collaborates in the development of learning at SMK Muhammadiyah Prambanan. The entrepreneurial learning, which includes the production of trainer kits, serves as a reference to encourage students to create innovative, technology-based business opportunities. The program includes various training sessions and workshops focusing on the operation of entrepreneurial trainer kits. These training sessions are designed to provide students with a deep understanding of the use of technological tools in a business context, from the basics to practical applications that meet students' needs [12]. The workshops also include hands-on practice sessions, where students can develop the technical skills necessary to become entrepreneurs in the technology field. Through these activities, students gain not only theoretical knowledge but also practical experience that strengthens their ability to run technology-based businesses [13].

The lack of collaboration between higher education institutions and vocational schools in entrepreneurial development has created a gap in the availability of skills and knowledge relevant to the job market among graduates of these institutions [14]. The collaboration between SMKs and universities is expected to enhance the achievement of competencies for students that align with market demands (demand-driven) [15]. This poses a significant barrier for the younger generation to enter the workforce with adequate preparation [16]. To address this issue, concrete measures such as the implementation of the entrepreneurship practice in vocational education program in collaboration with technology-based entrepreneurial learning development are potential solutions for developing students' skills [17].

To address these issues, this study will conduct an in-depth evaluation of collaborative learning in the development of technology-based entrepreneurial skills at SMK Muhammadiyah Prambanan Yogyakarta, as well as identify the challenges and opportunities in the collaboration between entrepreneurship at the university level and SMKs [18]. The CIPP evaluation approach provides a

structured and in-depth analysis of program success. With its comprehensive framework for evaluating programs holistically, this approach is well-suited for assessing collaboration- and learning-based programs from the planning stage to the final outcomes. It is hoped that the results of this study will contribute positively to enhancing the quality of entrepreneurial education at the SMKs level and strengthening collaboration between educational institutions to support the development of entrepreneurship in Indonesia [19].

2 Technology-Based Entrepreneurial Skills

The flow of Technology-Based Entrepreneurial Skills is presented in Figure 1.

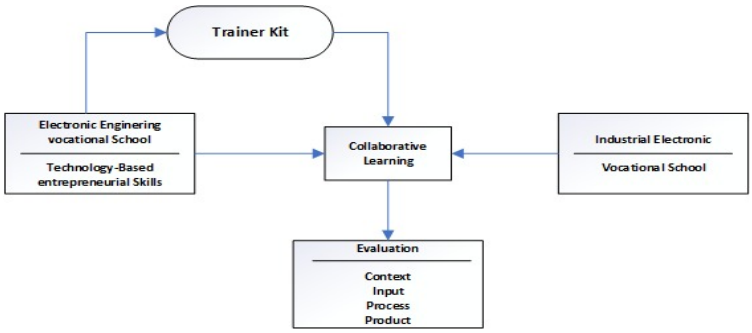

Fig. 1. The flow of technology-based entrepreneurial skills

Based on Figure 1, the implementation of the Technology-Based Entrepreneurial Skills program was applied in the Electronics Engineering Study Program, in collaboration with Industrial Electronics Vocational High Schools. This program aims to enhance technology-based entrepreneurial skills in vocational students, utilizing a trainer kit as the primary learning medium. The trainer kit is designed to provide practical and applicable learning experiences, enabling students not only to understand technological concepts in the field of industrial electronics but also to develop relevant entrepreneurial skills [20]. Through this collaborative learning approach, students are encouraged to solve real-world problems in the industry, thus refining both their technical and entrepreneurial abilities. To measure the effectiveness of the program, an evaluation was conducted using the CIPP model. The Trainer Kit produced through the Technology-Based Entrepreneurial Skills program is an Automatic Lighting Switch, as presented in Figure 2.

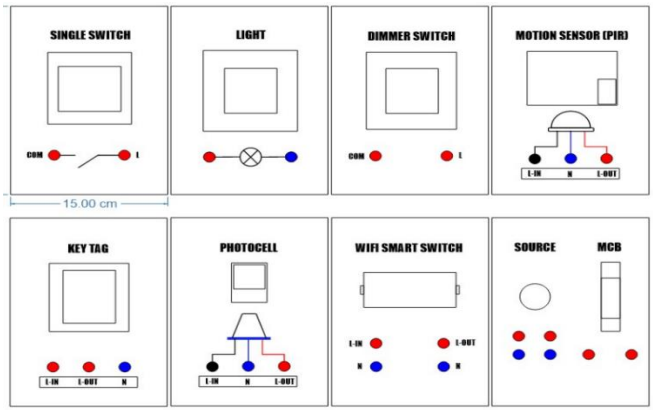

Fig. 2. Automatic lighting switch

Based on Figure 1, the modules include a single switch, lamp, dimmer switch, key tag, photocell, Wi-Fi smart switch, power source, and Miniature Circuit Breaker (MCB). The results of the tool's functional test before use are presented in Table 1.

Table 1. The results of the module functionality test

No	Module Name	Module Function Testing
1	Single Switch	Good
2	Light	Good
3	Dimmer Switch	Good
4	Motion Sensor (PIR)	Good
5	Key Tag	Good
6	Photocell	Good
7	Wifi Smart Switch	Good
8	Source and MCB	Good

Based on Table 1, it can be explained that the single switch module functions properly, the lamp functions properly, the dimmer switch functions properly, the motion sensor functions properly, the key tag functions properly, the photocell functions properly, the Wi-Fi smart switch functions properly, and both the power source and MCB function properly. The results of the module functionality test conclude that the Automatic Lighting Switch trainer kit, produced through the Technology-Based Entrepreneurial Skills program, is ready to serve as a platform for collaborative entrepreneurial learning.

3 Methods

This study is evaluation research using a descriptive quantitative method. The descriptive method in this research aims to provide an overview of the actual situation or events. The descriptive quantitative method in the CIPP model helps provide clear and measurable data on each evaluation component CIPP and allows researchers to analyze and communicate findings in a systematic and objective manner. The descriptive quantitative method serves to collect, process, and present data using statistical analysis [21]. This study uses the CIPP evaluation model technique from Daniel Stufflebeam [22]. The study aims to assess respondents' reactions to questionnaire statements regarding the evaluation of collaborative learning in the development of technology-based entrepreneurial skills at Muhammadiyah Prambanan Vocational High School. The respondents in this study include 20 teachers, 20 students. The sampling technique used in the study employs the Slovin formula, and the data collection method is through an online questionnaire created using Google Forms and distributed to the respondents [23]. The questionnaire distribution period is from January 14, 2024, to January 31, 2024. The four components of the CIPP model are as follows: 1) Context evaluation, collaboration in learning and program implementation standards for human resources (HR). 2) Input evaluation, HR program planning and program participants. 3) Process evaluation, HR program implementation, and training and workshops. 4) Product evaluation, program implementation effectiveness and program assessment [24]. The CIPP model evaluation diagram for this study is presented in Figure 3.

The Likert scale used in this study is designed to measure teachers' perceptions or opinions about the alignment of the implementation of collaborative learning in the development of technology-based entrepreneurial skills with the needs of teachers and students. This is based on the objectives of the collaborative learning program by providing statements to respondents according to the context evaluation framework, which will then be processed to produce results and conclusions of the study [25]. The aspects of the CIPP evaluation are to ensure that context evaluation aligns the curriculum with the needs of technology-based entrepreneurial education, input evaluation ensures that the materials and guides used are effective and aligned with competencies, process evaluation assesses the improvement of students' understanding throughout the program, and product evaluation ensures that the trainer kit functions optimally and supports the achievement of learning objectives. The range of the Likert scale for the CIPP questionnaire instrument is presented in. Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5).

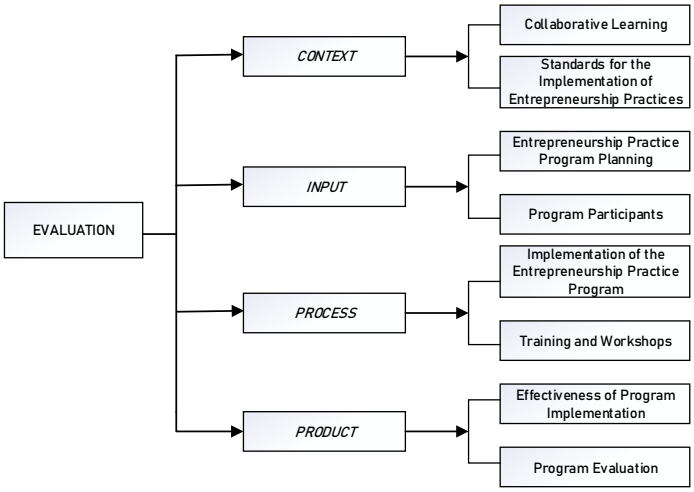

Fig. 3. CIPP evaluation model diagram

3.1 Data Analysis Techniques

The data obtained in this study is quantitative (in the form of a questionnaire) and must be processed to draw research conclusions. The data analysis technique involves using descriptive statistical methods to describe the research variables obtained from the measurement results. The statistical techniques used include calculating the score for each statement from all respondent answers, finding the mean score for each statement item, and determining the Respondent Achievement Level (TCR) for each statement item [26].

a) Calculate the Score for Each Statement from All Respondent Answers, using the formula:

$$((F1x1) + (F2x2) + (F3x3) + (F4x4) + (F5x5)) \quad (1)$$

Explanations:
F1: Frequency of respondents who answered 1 (Strongly Disagree)
F2: Frequency of respondents who answered 2 (Disagree)
F3: Frequency of respondents who answered 3 (Neutral)
F4: Frequency of respondents who answered 4 (Agree)
F5: Frequency of respondents who answered 5 (Strongly Agree)

b) Mean (X)

Mean is used to describe respondent data based on the average value of the respondents. The mean is obtained by summing the scores of all respondents and then dividing by the total number of respondents, using the formula:

$$X = \frac{X}{N} \quad (2)$$

Explanations:
X : Mean
ΣX : Sum of Scores
N : Number of Respondents

c) Respondent Achievement Level (TCR) for each statement item to determine the achievement category for each statement from all respondents, using the following formula.

$$TCR = \frac{Mean\ Score}{Maximum\ Score} x100\% \quad (3)$$

TCR Classification for CIPP Evaluation is presented in Table 2.

Table 2. TCR classification for CIPP evaluation

No	Achievement Percentage	Criteria
1	85% - 100%	Strongly Agree
2	65% - 84%	Agree
3	51% - 65%	Neutral
4	36% - 50%	Disagree
5	0% - 35%	Strongly Disagree

4 Result and Discussion

The entrepreneurial practice program in vocational education involves collaboration in technology-based entrepreneurial learning at Muhammadiyah Prambanan Vocational High School. This program is implemented to evaluate the execution of entrepreneurial practices in vocational education at Muhammadiyah Prambanan Vocational High School. Information is gathered to assess the reactions of teachers and students to the learning process using the CIPP model as an analytical framework. The collected data is analyzed based on this model to provide solutions to existing issues. The following are the specific results of the data processing.

4.1 Context Evaluation

Context evaluation shows the main indicators that serve as benchmarks in this study. The goal of implementing entrepreneurial practices in vocational education is to enhance the university's ability to develop technology-based entrepreneurial education and collaborate with SMK Muhammadiyah Prambanan on entrepreneurial learning development. The purpose of the entrepreneurial practice program is to understand the characteristics of the needs in school-based learning. The categories of teacher responses to the context aspects are presented in Table 3.

Table 3. Categories of teacher responses to context aspects

Achievement Percentage	Frequency	Relative Frequency
85% - 100%	21	7.32 %
65% - 84%	137	47.73 %
51% - 65%	66	22.99 %
36% - 50%	43	15.68 %
0% - 35%	18	6.27 %
Total		100%

Based on the context evaluation results, the mean is 3.35, obtained by summing the scores of all respondents and dividing by the total number of respondents. The TCR is 67.02%, calculated by dividing the mean score by the maximum score, with the result expressed as a percentage. This indicates that the context evaluation results are relevant. It shows the achievement of collaboration in the development of entrepreneurial and technology-based learning. The collaboration between higher education institutions and SMKs can design a curriculum that is more responsive to the needs of entrepreneurial education. Aligned research shows that, higher education institutions provide insights into the skills needed, entrepreneurship, and technology in line with the challenges faced in the field [27].

4.2 Input Evaluation

Input evaluation pertains to the materials and guidebooks to be used during the training process for students. Lecturers serve as validators to assess whether the materials and guidebooks meet the training needs. The first material evaluated is the installation of residential buildings using smart switches within the industrial electronics concentration at Muhammadiyah Prambanan Vocational High School. The second is the Trainer Kit Electric Smart Switch guidebook. The purpose of the material review by the lecturers is to ensure the alignment of competencies and the effectiveness of

the materials and guidebooks to be presented to the students. The categories of lecturer responses to the input aspects are presented in Table 4.

Table 4. Categories of lecturer responses to input aspects

Achievement Percentage	Frequency	Relative Frequency
85% - 100%	10	88.89 %
65% - 84%	8	11.11 %
51% - 65%	0	0%
36% - 50%	0	0%
0% - 35%	0	0%
Total		100%

Based on the input evaluation results, the mean is 4.56, obtained by summing the scores of all respondents and dividing by the total number of respondents and the TCR is 91.11%, calculated by dividing the mean score by the maximum score, with the result expressed as a percentage. This indicates that the input evaluation results are highly relevant. It shows that the materials and guidebooks used are aligned with competencies and effective for teaching students to understand the content. Aligned research shows that, well-designed teaching materials and guidebooks will enhance the quality of learning, making it easier for students to comprehend and achieve the desired competencies with relevant and structured content [28].

4.3 Process Evaluation

Process evaluation aims to ensure how the program is implemented in the field. This includes the preparation and presentation of materials according to student needs, the depth of content for developing entrepreneurial and technological skills. The program involves the presentation of materials and practical introduction to the project trainer kit. The categories of student responses to the process aspect in the pre-test are presented in Table 5 below:

Table 5. Categories of student responses to process aspects in the pre-test

Achievement Percentage	Frequency	Relative Frequency
85% - 100%	1	4.55 %
65% - 84%	11	50.00 %
51% - 65%	4	18.18 %
36% - 50%	1	4.55 %
0% - 35%	5	22.73 %
Total		100%

Based on the process evaluation results in the pre-test, the mean is 3.19, obtained by summing the scores of all respondents and dividing by the total number of respondents. and the TCR is 63.86%, calculated by dividing the mean score by the maximum score, with the result expressed as a percentage. This indicates that the process evaluation results are neutral. This evaluation, conducted before the materials were presented, provides an initial overview of students' understanding that needs improvement so that the training program can be more effective and aligned with student needs. The pre-test shows that students' understanding of the material is still at an intermediate level and requires further enhancement. Aligned research shows that, the pre-test is used to assess students' understanding before the learning begins, allowing instructors to adjust teaching methods and materials to effectively improve students' comprehension [29]. The categories of student responses to the process aspect in the post-test are presented in Table 6.

Table 6. Categories of student responses to process aspects in the post-test

Achievement Percentage	Frequency	Relative Frequency
85% - 100%	3	15.79 %
65% - 84%	14	73.68 %
51% - 65%	4	21.05 %
36% - 50%	1	5.26 %
0% - 35%	0	0.00 %
Total		100%

The next stage is the delivery of material to students. Based on the process evaluation results in the post-test, the mean is 3.85, obtained by summing the scores of all respondents and dividing by the total number of respondents, and the TCR is 76.96%, calculated by dividing the mean score by the maximum score, with the result expressed as a percentage. His indicates that the process evaluation results are relevant. It shows that students' understanding of the material improved after the delivery of the content, demonstrating that the training program successfully enhanced students' learning. Aligned research shows that, the increase in students' understanding after the training is an important indicator of educational success, as the material delivered meets students' needs and is effective in building new knowledge [30].

4.4 Product Evaluation

Product feasibility testing is conducted to assess the effectiveness and suitability of the trainer kit used during the entrepreneurial practice program. This evaluation aims to ensure that the trainer kit supports all topics and skills taught, functions properly without technical issues, and is safe and easy for students to use. The feasibility test also gathers feedback from students and instructors to evaluate how well the trainer kit helps in achieving learning objectives and meeting the expected quality standards. The categories of student responses to the product aspect are presented in Table 7.

Table 7. Categories of student responses to product aspects

Achievement Percentage	Frequency	Relative Frequency
85% - 100%	20	7.46 %
65% - 84%	134	50.00 %
51% - 65%	61	22.76 %
36% - 50%	36	13.43 %
0% - 35%	17	6.34 %
Total		100%

Based on the product evaluation results, the mean is 3.4, obtained by summing the scores of all respondents and dividing by the total number of respondents and the TCR is 67.97%, calculated by dividing the mean score by the maximum score, with the result expressed as a percentage. This indicates that the product evaluation results are relevant. It shows that the product effectively supports the topics and skills taught. The trainer kit functions optimally without technical issues, its components are durable, and it is safe to use. Students can operate the trainer kit easily, and the guidebook and supporting materials are sufficiently clear. Feedback from students and instructors indicates that the trainer kit is effective in aiding material comprehension and achieving learning objectives. Aligned research shows that, well-designed training equipment, such as the trainer kit, is crucial in active learning as it can engage students in the learning process, reinforce taught concepts, and facilitate understanding through practical experience [31].

The strengths and opportunities of this research are derived from the "Merdeka Entrepreneurship" program [32]. The research on collaborative learning in the development of technology-based entrepreneurial skills aims to promote entrepreneurship education in universities, develop students' entrepreneurial soft skills, create opportunities for students to produce creative works and innovative products, and enhance the ability of universities to advance entrepreneurship education. The limitation of implementing collaborative learning in the development of technology-based entrepreneurial skills is the lengthy duration of the program's execution.

5 Conclusions

This study evaluates collaborative learning in the development of technology-based entrepreneurial skills at SMK Muhammadiyah Prambanan Yogyakarta using the Context, Input, Process, and Product (CIPP) model. The context evaluation results are relevant, showing the achievement of collaboration in the development of entrepreneurship and technology learning. The input evaluation results are highly relevant, indicating that the materials and guides used align with

the competencies and are effective in delivering lessons to help students understand the material. The process evaluation results are relevant, demonstrating that students' understanding of the material improved after the delivery of the lessons, thus proving that the training program successfully enhanced student learning. The product evaluation results are relevant, showing that the products effectively support the topics and skills taught. The strengths and opportunities of this research are derived from the "Merdeka Entrepreneurship" program, while the limitation of implementing collaborative learning in the development of technology-based entrepreneurial skills is the lengthy duration of the program's execution. The implication of this research is the existence of entrepreneurship education in universities, the development of students' entrepreneurial soft skills, and students producing creative works and innovative products.

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