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Enhancing Students' Technopreneurship Intention through Team-Based Project Learning: A CIPP Evaluation Approach

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A B S T R A C T

Developing students' technopreneurship intention has become an important objective of entrepreneurship education in higher education. Although Team-Based Project Learning has been widely applied to enhance entrepreneurial competencies, studies integrating effectiveness testing with a comprehensive evaluation of learning implementation remain limited. This study aimed (1) to examine the effectiveness of Team-Based Project Learning in improving students' technopreneurship intention and (2) to evaluate its implementation using the Context, Input, Process, and Product (CIPP) evaluation model. A quasi-experimental design with a pretest–posttest control group was employed involving 95 undergraduate students, consisting of 48 students in the experimental group and 47 students in the control group. Learning effectiveness was analyzed using gain score analysis, independent sample t-test, and Cohen's d effect size, while the quality of learning implementation was evaluated using the CIPP model through a 20-item evaluation instrument. The results indicate that students in the experimental group achieved significantly higher learning improvement than those in the control group ($t = 7.067$, $p < .001$), with a large effect size (Cohen's $d = 1.45$). The CIPP evaluation showed that the overall implementation of Team-Based Project Learning was categorized as very good (83.2%), with the Process dimension receiving the highest evaluation score (85.6%). These findings suggest that Team-Based Project Learning effectively strengthens students' technopreneurship intention, while the CIPP evaluation provides comprehensive evidence regarding the quality of learning implementation. This study contributes to entrepreneurship education by integrating learning effectiveness testing with CIPP-based program evaluation within a single research framework and provides practical insights for designing and systematically evaluating collaborative, project-oriented learning to support the achievement of Sustainable Development Goal 4 (Quality Education) in higher education.

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1. INTRODUCTION

The development of digital technology has driven fundamental transformations across various sectors, including the economy and higher education, (Akour & Alenezi, 2022; Ashmel et al., 2022). The Industrial Revolution 4.0, characterized by the utilization of digital technology, the internet, and artificial intelligence, has shifted conventional business patterns toward a digital-based economy, (Troise et al., 2026; Yaqub & Alsabban, 2023). This condition requires higher education institutions to produce human resources who are adaptive, innovative, and possess technology-based entrepreneurial orientation, (Ahn et al., 2022; Pacheco et al., 2023). Digital transformation has also affected labor market dynamics, making them increasingly competitive and innovation-driven, (Cefis et al., 2023). Therefore, university graduates are no longer expected to possess only academic competencies and basic technical skills, but also the ability to create employment opportunities through the creative and sustainable use of technology, (Kolade & Owoseni, 2022). In this context, technology-based entrepreneurship is considered a strategic solution to address educated unemployment while simultaneously promoting innovation-driven economic growth, (Tondro & Jahanbakth, 2025). Thus, strengthening *technopreneurship* orientation in higher education has become an essential part of enhancing graduates' competitiveness in the digital economy era.

Technopreneurship, which integrates technological capabilities, creativity, and business competencies to develop technology-based products and services, has become an essential component of entrepreneurship education in higher education, (Arora & Singh, 2025; Rafiana, 2023). Beyond developing technical skills, higher education is expected to foster students' technopreneurship intention through contextual and practice-oriented learning, (Sudaryana et al., 2025; Teoh et al., 2026). However, students' participation and interest in technology-based entrepreneurship remain relatively low because entrepreneurship learning is still predominantly theoretical and provides limited opportunities for authentic learning experiences, creativity, collaboration, and innovation, (Pham et al., 2023; Sansone et al., 2024).

Team-Based Project Learning (TBPL) is considered an effective approach to addressing these challenges by engaging students in collaborative, real-world problem solving and project development, (Afzal & Tumpa, 2025; Sukackė et al., 2022). Through authentic learning experiences, TBPL promotes entrepreneurial competencies and essential 21st-century skills, including critical thinking, creativity, communication, and collaboration, (Omelianenko & Artyukhova, 2024; Rosário & Raimundo, 2024). However, previous studies have primarily evaluated its effectiveness based on learning outcomes, providing limited evidence regarding the quality of its implementation. Therefore, the Context, Input, Process, and Product (CIPP) evaluation framework is employed to comprehensively evaluate the learning program from planning and implementation to learning outcomes (Kwok et al., 2025; Rahmat et al., 2022).

Previous studies conducted by Lee et al., (2025) revealed that experiential and practice-based entrepreneurship learning has a positive influence on the development of technology-based entrepreneurial intention. In addition, project-based and team-collaborative learning models have been proven to enhance students' engagement, creativity, and problem-solving skills in entrepreneurial contexts, (Chitamba et al., 2025; Zhang & Ma, 2023). On the other hand, the CIPP evaluation model has been widely applied in program and curriculum evaluation because it provides a comprehensive overview of program effectiveness, (Muqorobin et al., 2022; Ratnaya et al., 2022). However, the implementation of the CIPP evaluation model in entrepreneurship learning within higher education remains relatively limited, particularly in measuring changes in students' affective aspects such as technopreneurship intention (Nguyen & Condry, 2023).

The development of technopreneurship in higher education needs to be systematically designed and grounded in empirical evidence so that it does not remain merely at the level of

policy or normative discourse, (Touijer et al., 2026). Without appropriate learning design and comprehensive evaluation, entrepreneurship learning may fail to develop students' intention and readiness to engage in technopreneurship. This condition highlights the importance of integrating innovative learning approaches with evaluation models capable of capturing learning dynamics as well as changes in students' attitudes and intentions holistically, (Bhardwaj et al., 2025; López et al., 2024). Most previous studies have focused learning evaluation primarily on learning outcomes or entrepreneurial skills in a partial manner, without systematically integrating the evaluation of context, planning, and learning processes, (Lin et al., 2023; Sitaridis & Kitsios, 2023). In addition, the implementation of the team-based project learning model has generally been evaluated separately, thus failing to provide a comprehensive understanding of the effectiveness of project-based entrepreneurship learning, (Xie et al., 2025; Zhang et al., 2024).

Based on these conditions, the novelty of this study lies in integrating evidence of learning effectiveness with a comprehensive evaluation of learning implementation. The effectiveness of Team-Based Project Learning is examined using a quasi-experimental pretest-posttest control group design by measuring changes in students' technopreneurship intention, while the Context, Input, Process, and Product (CIPP) framework is employed to evaluate the quality of the learning program implementation. This integrated approach provides a more comprehensive understanding of both learning outcomes and implementation quality, thereby contributing to the development of entrepreneurship learning evaluation in higher education. Accordingly, this study aims (1) to examine the effectiveness of Team-Based Project Learning in improving students' technopreneurship intention using a quasi-experimental design and (2) to evaluate the implementation of the learning program using the Context, Input, Process, and Product (CIPP) evaluation framework.

2. METHOD

This study employed a quantitative approach using a quasi-experimental pretest-posttest control group design, (Creswell & Creswell, 2018). The design enables comparison of learning outcomes between the experimental group, which received Team-Based Project Learning, and the control group, which received conventional instruction, while controlling for baseline differences through pretest and posttest measurements.

Table 1. Research Design

Group	Pretest	Treatment	Posttest
Experimental	O1	X	O2
Control	O3	–	O4

Description:
O1 : Pretest of the experimental group
O2 : Posttest of the experimental group
O3 : Pretest of the control group
O4 : Posttest of the control group
X : Treatment using the Team-Based Project Learning model. The implementation of the learning program was subsequently evaluated using the CIPP evaluation framework.
– : Conventional learning without treatment

In this design, the pretest was administered to both groups to verify their baseline equivalence before the intervention. Following the learning intervention, the posttest was conducted to measure students' technopreneurship intention. Learning improvement was subsequently calculated using gain scores (posttest minus pretest), and the gain scores of the

experimental and control groups were compared using an independent sample t-test to determine the effectiveness of Team-Based Project Learning.

The study was conducted at Universitas Negeri Semarang involving students of the Economic Education Study Program enrolled in the Digital Business course during the 2024/2025 academic year. The sample consisted of 95 students selected using a cluster random assignment technique from two classes with relatively homogeneous academic characteristics. A total of 48 students were assigned to the experimental group and 47 students to the control group. The experimental group received Team-Based Project Learning over four meetings. The implementation of the learning program was subsequently evaluated using the Context, Input, Process, and Product (CIPP) evaluation framework., while the control group participated in conventional learning.

Table 2. Structure of the CIPP Evaluation Instrument

Dimension	Indicators	Number of Items	Sample Statement
Context	Learning objectives, relevance of learning, students' needs, project relevance, expected learning outcomes	5	The learning objectives were clearly aligned with the development of technopreneurship competencies.
Input	Learning materials, lecturer readiness, learning resources, facilities, team organization	5	The learning resources adequately supported the implementation of the team-based project.
Process	Student participation, teamwork, lecturer feedback, project implementation, problem solving	5	I actively collaborated with my team throughout the project activities.
Product	Learning outcomes, project quality, technopreneurship intention, entrepreneurial readiness, learning satisfaction	5	The learning activities increased my readiness to develop a technology-based business.
Total		20	

Source: (Stufflebeam & Zhang, 2017)

The CIPP evaluation instrument consisted of 20 items measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument comprised four dimensions: Context (5 items), Input (5 items), Process (5 items), and Product (5 items). Each dimension evaluated different aspects of the learning program implementation, and a higher score indicated better implementation quality.

The implementation quality of the learning program was evaluated using the Context, Input, Process, and Product (CIPP) evaluation model. Descriptive statistics were employed to calculate the percentage score for each CIPP dimension and the overall program implementation using the following formula:

$$\text{Percentage} = \frac{\text{Obtained Score}}{\text{Maximum Score}} \times 100\%$$

The percentage scores were then interpreted according to the evaluation criteria adapted from Riduwan, (2019), as presented in Table 3. These criteria were used to classify the implementation quality of each CIPP dimension (Context, Input, Process, and Product) as well as the overall quality of the learning program.

Data were analyzed using descriptive and inferential statistics. Prior to hypothesis testing, the data were examined for normality using the Kolmogorov–Smirnov test and for homogeneity using Levene's test. An independent sample *t*-test was first conducted to compare the pretest scores of the experimental and control groups in order to verify baseline equivalence

before the intervention. Learning improvement was subsequently measured using gain scores (posttest minus pretest), and an independent sample *t*-test was performed to compare the gain scores between the two groups. Cohen's *d* effect size was also calculated to determine the magnitude of the treatment effect.

$$d = \frac{M_1 - M_2}{SD_{pooled}}$$

$$SD_{pooled} = \sqrt{\frac{(n_1 - 1)SD_1^2 + (n_2 - 1)SD_2^2}{n_1 + n_2 - 2}}$$

The interpretation of the effect size value followed Cohen's criteria, namely .20 (small), .50 (medium), and ≥ .80 (large effect). All data analyses were conducted using IBM SPSS Statistics version 26. All respondents voluntarily agreed to participate in the study, and their data confidentiality was maintained and used solely for academic purposes.

Table 3. Criteria for Interpreting CIPP Evaluation Scores

Percentage (%)	Category
81–100	Very Good
61–80	Good
41–60	Fair
21–40	Poor
0–20	Very Poor

3. RESULTS AND DISCUSSION

3.1 Result

3.1.1 Baseline Equivalence of the Experimental and Control Groups

Before testing the effectiveness of the intervention, baseline equivalence between the experimental and control groups was examined. The normality of the pretest scores was first assessed using the Kolmogorov–Smirnov test.

Table 4. Normality Test of Pretest Scores

Group	Kolmogorov–Smirnov Statistic	Sig.	Interpretation
Experimental	.098	.200	Normal
Control	.092	.200	Normal

The Kolmogorov–Smirnov test showed significance values of .200 for both the experimental and control groups, exceeding the significance level of .05. These results indicate that the pretest scores were normally distributed, thereby satisfying the normality assumption required for parametric statistical analysis. The homogeneity of variance was subsequently examined using Levene's test.

Table 5. Homogeneity Test of Pretest Scores

Levene Statistic	df1	df2	Sig.	Interpretation
.017	1	93	.896	Homogeneous

The homogeneity test produced a significance value of .896 (> .05), indicating that the variances of the experimental and control groups were homogeneous. Therefore, the

assumption of equal variances was satisfied. Descriptive statistics of the pretest scores are presented in Table 6.

Table 6. Descriptive Statistics of Pretest Scores

Group	N	Mean	Std. Deviation
Experimental	48	62.50	10.639
Control	47	62.87	10.506

The descriptive statistics indicate that the mean pretest score of the experimental group (M = 62.50, SD = 10.639) was very similar to that of the control group (M = 62.87, SD = 10.506), suggesting comparable initial levels of technopreneurship intention prior to the intervention. The equivalence of the two groups was further examined using an independent sample *t*-test.

Table 7. Independent Sample *t*-Test of Pretest Scores

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.017	.896	-.172	93	.864	-.372	2.170	-4.681	3.936

The independent sample *t*-test confirmed that there was no statistically significant difference in pretest scores between the experimental and control groups ($p > .05$). These findings indicate that both groups had equivalent baseline levels of technopreneurship intention before the implementation of Team-Based Project Learning. Consequently, any subsequent differences observed after the intervention can reasonably be attributed to the learning treatment rather than to initial differences between the groups.

3.1.2 Learning Improvement Based on Gain Scores

To evaluate the effectiveness of Team-Based Project Learning in improving students' technopreneurship intention, learning improvement was measured using gain scores, calculated by subtracting each student's pretest score from the corresponding posttest score. The gain score represents the magnitude of improvement achieved by each student during the learning intervention. Descriptive statistics of the gain scores are presented in Table 8.

Table 8. Descriptive Statistics of Gain Scores

Group	**N**	**Mean**	**Std. Deviation**
Experimental	48	24.646	8.702
Control	47	12.192	8.469

As shown in Table 6, the experimental group obtained a mean gain score of 24.646 with a Standard Deviation of 8.702, whereas the control group achieved a mean gain score of 12.192 with a Standard Deviation of 8.469. These descriptive statistics indicate that students who participated in Team-Based Project Learning experienced substantially greater improvement in technopreneurship intention than those who received conventional instruction. Moreover, the relatively similar Standard Deviation values in both groups suggest that the variability of students' learning improvement was comparable. Before conducting hypothesis testing, the

assumptions of normality and homogeneity were examined to determine the suitability of parametric statistical analysis.

Table 9. Normality Test of Gain Scores

Group	Kolmogorov–Smirnov Statistic	Sig.	Interpretation
Experimental	.119	.084	Normal
Control	.079	.200	Normal

The normality test was performed using the Kolmogorov–Smirnov test. As presented in Table 7, the experimental group obtained a significance value of .084, while the control group obtained a significance value of .200. Since both significance values exceeded the threshold of .05, the gain score data for both groups were considered to be normally distributed. Therefore, the normality assumption required for parametric analysis was satisfied.

Table 10. Homogeneity Test of Gain Scores

Levene Statistic	df1	df2	Sig.	Interpretation
.000	1	93	.986	Homogeneous

The homogeneity of variance assumption was examined using Levene's test. The analysis produced a significance value of .986, which is greater than .05. This result indicates that the variances of the gain scores between the experimental and control groups were homogeneous. Consequently, the assumption of equal variances was fulfilled, and the Equal Variances Assumed results were used for interpreting the independent sample *t*-test.

Table 11. Independent Sample t-Test of Gain Scores

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Gain Score	Equal variances assumed	.000	.986	7.067	93	.000	12.45434	1.76221	8.95494	15.95374

The effectiveness of Team-Based Project Learning was further examined using an independent sample t-test. As shown in Table 9, the analysis revealed a statistically significant difference in gain scores between the experimental and control groups ($t = 7.067$, df = 93, $p < .001$). The experimental group achieved a significantly higher gain score than the control group, with a Mean Difference of 12.454 points. Furthermore, the 95% Confidence Interval ranged from 8.955 to 15.954, indicating that the observed difference was statistically reliable. These findings demonstrate that students who learned through the Team-Based Project Learning model showed significantly greater improvement in technopreneurship intention than students who received conventional learning. Therefore, the results provide empirical evidence that Team-Based Project Learning is more effective in enhancing students' technopreneurship intention.

3.1.3 Effect Size Analysis Based on Gain Scores

In addition to hypothesis testing, the practical significance of the learning intervention was evaluated by calculating Cohen's *d* based on the gain scores of the experimental and control

groups. Effect size analysis provides complementary evidence regarding the magnitude of the intervention effect beyond statistical significance.

Table 12. Effect Size Analysis Based on Gain Scores

Variable	Experimental Group Mean	Control Group Mean	Mean Difference	Cohen's *d*	Effect Size Category
Gain Score	24.646	12.192	12.454	1.45	Large

As presented in Table 10, the experimental group achieved a mean gain score of 24.646, whereas the control group obtained a mean gain score of 12.192, resulting in a mean difference of 12.454 points. The calculated Cohen's *d* value was 1.45, indicating a large effect according to the classification proposed by Cohen (1988), where effect sizes of .20, .50, and .80 represent small, medium, and large effects, respectively. These findings demonstrate that the implementation of this learning model not only produced a statistically significant improvement in students' technopreneurship intention but also generated a substantial practical effect. The large effect size indicates that the improvement achieved by students in the experimental group was considerably greater than that of students in the control group. Therefore, Team-Based Project Learning can be considered an effective instructional approach for fostering students' technopreneurship intention through collaborative, project-oriented, and authentic learning experiences.

3.1.4 Results of the CIPP Evaluation Model Implementation

The implementation of Team-Based Project Learning was evaluated using the Context, Input, Process, and Product (CIPP) evaluation model to assess the quality of the learning program. Unlike the gain score analysis, which examined the improvement in students' technopreneurship intention, the CIPP model was employed to evaluate the implementation of the learning program across its four evaluation dimensions.

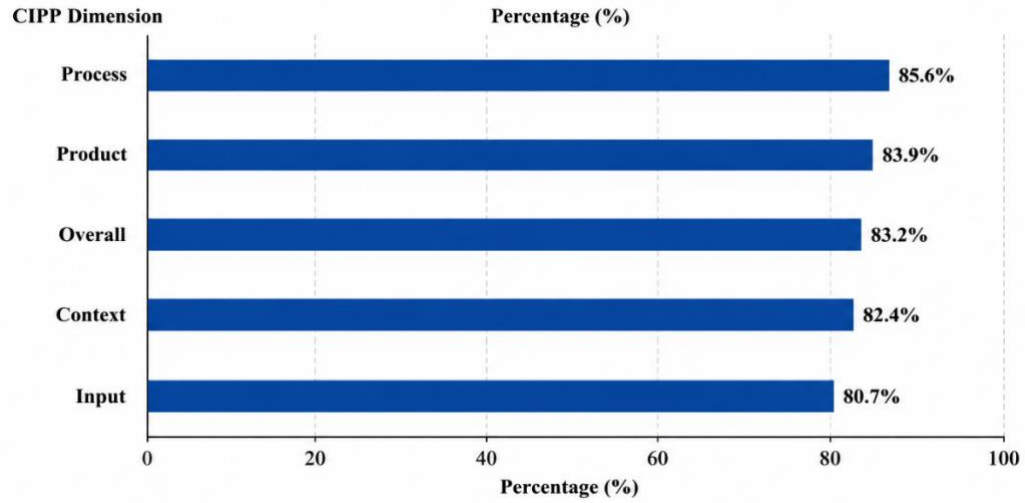

Figure 1. CIPP Evaluation Results of Team-Based Project Learning Implementation
Source: Data Analysis Results, 2025.

The evaluation results indicate that the overall implementation of Team-Based Project Learning achieved an average score of 83.2%, which falls into the very good category. Among the four CIPP dimensions, the Process component obtained the highest score (85.6%) and was categorized as very good, reflecting high levels of student participation, effective teamwork, continuous lecturer facilitation, and constructive monitoring and feedback throughout the

learning process. The Context (82.4%) and Product (83.9%) dimensions were also categorized as very good, whereas the Input dimension (80.7%) was categorized as good.

These results indicate that the learning objectives were well aligned with students' needs, the instructional resources and learning support adequately facilitated project implementation, and the learning activities were conducted systematically to achieve the intended instructional outcomes. Overall, the CIPP evaluation demonstrates that the learning program was implemented with high quality across all evaluation dimensions. Rather than measuring changes in students' technopreneurship intention, the CIPP evaluation provides systematic evidence regarding the quality of the program planning, learning resources, implementation process, and instructional outcomes, thereby complementing the effectiveness analysis based on the gain score.

3.2 Discussion

3.2.1 Effectiveness of Team-Based Project Learning in Improving Students' Technopreneurship Intention

The results of this study demonstrate that Team-Based Project Learning effectively improved students' technopreneurship intention. The gain score analysis revealed that students in the experimental group achieved significantly greater learning improvement than those in the control group, as confirmed by the independent sample *t*-test ($t = 7.067$, $p < .001$). Furthermore, the effect size analysis yielded a Cohen's *d* value of 1.45, indicating a large effect according to Cohen's (1988) classification. These results suggest that the observed improvement was not only statistically significant but also educationally meaningful, indicating that Team-Based Project Learning provides substantial benefits in strengthening students' technopreneurship intention compared with conventional learning approaches. These findings indicate that the proposed learning model represents an effective instructional approach for strengthening students' intention to pursue technology-based entrepreneurship.

The effectiveness of Team-Based Project Learning in improving students' technopreneurship intention can be explained by the characteristics of project-based learning, which actively engages students in solving authentic problems, collaborating in teams, and developing technology-based business projects. Unlike conventional instruction that mainly emphasizes conceptual understanding, this instructional approach enables students to apply entrepreneurial knowledge through project planning, implementation, and evaluation. Such learning experiences foster creativity, critical thinking, communication, collaboration, and entrepreneurial decision-making, all of which are essential competencies for technopreneurship, (Dias-Oliveira et al., 2024). These findings are consistent with previous studies demonstrating that project-based learning enhances entrepreneurial competencies through authentic and collaborative learning experiences, (Afzal & Tumpa, 2025).

Although Team-Based Project Learning differs conceptually from Experiential Learning, both approaches share similar pedagogical principles. Project-based learning emphasizes the completion of authentic projects, whereas Experiential Learning focuses on transforming experience into knowledge through the cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb). In this study, Team-Based Project Learning facilitated each stage of this learning cycle by allowing students to design, implement, evaluate, and refine technology-based business projects, (Dincă et al., 2023). Consequently, Team-Based Project Learning operationalizes the principles of Experiential Learning and creates meaningful learning experiences that strengthen students' technopreneurship intention, (Makry, 2026; Wang et al., 2025).

The improvement in students' technopreneurship intention can also be explained through the Theory of Planned Behavior (TPB), which posits that entrepreneurial intention is influenced by attitude toward the behavior, subjective norms, and perceived behavioral control, (JingyiWang & Syed, 2025). Team-Based Project Learning provides authentic entrepreneurial experiences that strengthen these three determinants simultaneously. Students develop more positive attitudes toward technology-based entrepreneurship through direct involvement in designing and implementing digital business projects. Collaborative teamwork and continuous interaction with peers and lecturers reinforce subjective norms by creating a supportive entrepreneurial learning environment, (Al-Mamary & Alraja, 2022; Maheshwari & Kha, 2022). At the same time, students gain greater confidence in their ability to identify opportunities, solve business problems, and manage entrepreneurial activities, thereby enhancing their perceived behavioral control. Previous studies have similarly reported that authentic entrepreneurial experiences improve self-efficacy and perceived behavioral control, which subsequently strengthen entrepreneurial intention, (Devkota, 2026). Therefore, the significant improvement observed in this study reflects not only increased entrepreneurial knowledge but also the development of key psychological factors that encourage students to pursue technology-based entrepreneurial careers.

The present study is consistent with previous studies demonstrating that project-based entrepreneurship education enhances students' entrepreneurial competencies and intentions through authentic and collaborative learning experiences, (Williamson, 2024). Similarly, (Sukackė et al., 2022) highlighted that collaborative project-based learning promotes critical thinking, creativity, communication, and teamwork, which are essential competencies for entrepreneurship in the twenty-first century. However, previous studies have predominantly focused on measuring learning outcomes, providing limited evidence on how the quality of learning implementation contributes to those outcomes. Addressing this gap, the present study integrates gain score analysis with a comprehensive Context, Input, Process, and Product (CIPP) evaluation, enabling both the effectiveness of Team-Based Project Learning and the quality of its implementation to be examined within a single research framework. This integrated approach represents the primary contribution of the study by providing a more comprehensive understanding of whether the instructional model improves students' technopreneurship intention and how its implementation supports the achievement of learning objectives. These findings also offer practical implications for entrepreneurship education by emphasizing the importance of collaborative, project-oriented, and systematically evaluated learning experiences to better prepare students for technology-driven entrepreneurial careers. The following section further discusses the quality of the learning program implementation based on the CIPP evaluation model.

3.2.2 Evaluation of Team-Based Project Learning Using the CIPP Model

The evaluation results indicate that the learning program achieved an overall score of 83.2%, which falls within the very good category. The Process component received the highest score (85.6%) and was categorized as very good. Likewise, the Context (82.4%) and Product (83.9%) dimensions were also categorized as very good, whereas the Input dimension (80.7%) was categorized as good. These findings indicate that the learning program was systematically planned, adequately supported, effectively implemented, and successfully achieved its intended instructional objectives. Overall, the CIPP evaluation provides comprehensive evidence regarding the quality of learning implementation across all stages of the instructional program.

Among the four evaluation dimensions, the Process component received the highest evaluation score, indicating that the implementation of Team-Based Project Learning was the strongest aspect of the program, (Zhang et al., 2023). This finding reflects the successful

facilitation of collaborative learning activities, active student participation, continuous lecturer guidance, and regular feedback throughout the project implementation, (Zitha et al., 2023). According to the CIPP evaluation framework, the Process dimension assesses whether a program is implemented as planned and whether instructional activities are carried out effectively to achieve the intended objectives, (Stufflebeam & Zhang, 2017). This finding suggests that the instructional strategy was implemented consistently and successfully created meaningful learning experiences for students, (Imbaquingo & Cárdenas, 2023). This finding is consistent with previous studies reporting that collaborative project-based learning enhances student engagement, teamwork, and active participation, thereby improving the overall quality of the learning process (Zhang & Ma, 2023).

The remaining CIPP dimensions also received positive evaluations, indicating that the learning program was implemented with adequate preparation and successfully achieved its intended objectives. The Context dimension confirmed that the learning objectives, curriculum design, and students' needs were well aligned with the development of technology-based entrepreneurial competencies, (Jokić et al., 2024). The Input dimension demonstrated that learning resources, instructional materials, technological facilities, and lecturer preparedness sufficiently supported the implementation of Team-Based Project Learning, (Hu & Chan, 2025). Although this dimension obtained the lowest score among the four components, it remained within the good category, indicating that the available learning resources adequately supported the instructional process while highlighting opportunities to further improve learning facilities and technological support. Meanwhile, the Product dimension indicated that the learning program successfully achieved its intended instructional outcomes, (Jaya & Hamzah, 2022). The empirical evidence is consistent with the purpose of the CIPP model, which emphasizes continuous program improvement through systematic evaluation of planning, implementation, and outcomes, thereby providing useful information for educational decision-making, (K.C. & Baral, 2023).

Overall, the CIPP evaluation complements the effectiveness findings by providing comprehensive evidence that the positive learning outcomes were supported by a well-designed and systematically implemented learning program. While the gain score analysis demonstrates whether this instructional approach effectively improves students' technopreneurship intention, the CIPP evaluation explains how the instructional program was planned, supported, implemented, and evaluated to achieve those outcomes. This integrated perspective represents the principal contribution of the present study, as it combines learning effectiveness and program evaluation within a single research framework. Accordingly, integrating effectiveness testing with CIPP-based program evaluation offers a more holistic framework for designing, implementing, evaluating, and continuously improving entrepreneurship learning in higher education**.**

4. CONCLUSION

This study addressed two research objectives: (1) to examine the effectiveness of Team-Based Project Learning in improving students' technopreneurship intention and (2) to evaluate its implementation using the Context, Input, Process, and Product (CIPP) evaluation model. The results indicate that Team-Based Project Learning effectively improved students' technopreneurship intention, as evidenced by significantly higher gain scores and a large effect size (Cohen's d = 1.45). The CIPP evaluation further indicated that the learning program was implemented with high quality across the Context, Input, Process, and Product dimensions, with the Process dimension receiving the highest evaluation score. These results suggest that Team-Based Project Learning provides an effective instructional approach for entrepreneurship education, while the CIPP model offers a comprehensive framework for evaluating the quality

of its implementation. The Theory of Planned Behavior and Experiential Learning provide relevant perspectives for interpreting the findings; however, they should be regarded as explanatory frameworks because their core constructs were not directly measured in this study. This study contributes to the entrepreneurship education literature by integrating effectiveness testing with CIPP-based program evaluation within a single research framework. Practically, the findings encourage higher education institutions to adopt collaborative, project-oriented learning while systematically evaluating its implementation to continuously improve the quality of entrepreneurship education.

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