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BOARD #151: WIP: Fostering Collaborative Entrepreneurship Skills in Technical Disciplines

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Evaluating a teaching approach to foster collaborative entrepreneurship skills in technical students

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Abstract

This study evaluates a pedagogical model aimed at enhancing collaborative entrepreneurship competencies in students pursuing technical careers, addressing the gap in current technical education regarding entrepreneurial skills. Entrepreneurship is recognized as essential for the economic and social development of a country, yet technical career programs often lack sufficient focus on the collaborative aspects of entrepreneurship, such as leadership, team communication, and mediation. The research sought to test Moscoso's pedagogical model, integrating these competencies into the curriculum. Specific objectives included designing a model for developing these skills, assessing its impact through a student questionnaire, and proposing practical implementation strategies. The theoretical framework explored entrepreneurship-related concepts, including the entrepreneur profile and collaborative competencies. A quantitative methodology with a non-experimental, cross-sectional design was employed, using a 50-question survey with Likert scales to evaluate students' collaborative entrepreneurship competencies. The target population consisted of 49 randomly selected students. The results indicated an average level of development in collaborative entrepreneurship skills, with mediation communication scoring the highest at 4.531, followed by leadership at 4.035, and team communication at 3.708. The study confirmed a positive and significant correlation between the model's dimensions and the development of these competencies, supporting the hypothesis that the model enhances students' professional skills. The findings suggest that implementing this model could improve graduates' work performance, and future research should expand to include a broader range of entrepreneurial skills and a more diverse student population.

Keywords: Entrepreneurship, Collaborative Competencies, Pedagogical Model, Technical Careers, Ecuador.

INTRODUCTION

The global landscape of entrepreneurship has evolved significantly, playing a vital role in economic development, especially through collaboration in entrepreneurial processes [1,2]. Entrepreneurship is often seen as more than just business creation; it reflects an inherent human attitude that includes risk-taking, identifying opportunities, and adapting to shifts in the labor market [3–7]. The increasing demand for entrepreneurship education emphasizes its importance

in fostering an entrepreneurial culture on a global scale [8]. At the international level, entrepreneurship is considered a fundamental competency for achieving a competitive and dynamic economy [9]. However, South American countries, including Ecuador, face notable challenges in this field. While progress in democracy and macroeconomic stability has been made, education and knowledge generation remain underdeveloped [10]. Compared to other South American nations, Ecuador struggles with limited-growth, trade-oriented ventures. Despite government policies designed to promote entrepreneurship, the lack of innovation and a human capital gap, particularly in education quality, have constrained its effectiveness [11].

In Ecuador, many new businesses emerge out of necessity rather than opportunity, leading to smaller, less innovative ventures primarily focused on trade. This pattern highlights the critical importance of entrepreneurship education in developing the skills needed for innovation and the creation of sustainable businesses. The gap in human capital, particularly in the quality of education, has been identified as a significant obstacle to innovation in the region [11]. Despite public policy efforts to promote entrepreneurship, a mismatch between the types of entrepreneurial initiatives being encouraged and the country's real needs remains a challenge.

Research suggests that entrepreneurship driven by opportunity, rather than necessity, results in higher income levels and economic development [12]. In South America, a notable paradox exists where high levels of entrepreneurship coexist with a disconnect between academic training and actual entrepreneurial ventures. This misalignment often leads to the creation of nascent businesses that struggle to grow and lack innovation [13].

The present research aims to address this gap in Ecuador entrepreneurial education by exploring the design of a pedagogical model to develop collaborative entrepreneurship competencies in students pursuing technical careers. The study sought to answer the question: How can a pedagogical model enhance collaborative entrepreneurship skills among technical students? To assess its effectiveness, the study used a questionnaire to measure the model's impact on key collaborative competencies essential for entrepreneurship. This research is part of a broader effort to improve entrepreneurship education at the university level, recognizing that strengthening the national education system is crucial for preparing students to face both technical and socio-economic challenges upon graduation. The goal is to foster graduates who are not only capable of managing companies but also equipped with entrepreneurial thinking that fosters innovation and contributes to Ecuador economic development [14].

BACKGROUND

Technical careers are vital for preparing professionals with the skills necessary to manage resources effectively within companies [15–17]. By equipping graduates with the right knowledge and techniques, these programs contribute to increasing business competitiveness, promoting innovation, and ensuring the quality of products in the market [18,19]. The curriculum of these programs often spans diverse fields, such as accounting, quantitative methods, and other specialized disciplines. Among the most critical competencies that students must develop are leadership, communication, and conflict mediation. Leadership is particularly essential, as it involves listening to team members, motivating them, and ensuring the collective effort to meet objectives. According to the Multifactor Leadership Questionnaire (MLQ), a leader is defined as

someone who can influence, motivate, and maintain focus on achieving team goals, while fostering enthusiasm and a commitment to shared objectives [20]. Effective communication within teams is also crucial for fostering a positive organizational environment [21–24]. Additionally, the ability to mediate conflicts is becoming increasingly important in today's rapidly changing world, where societal shifts demand adaptive responses to challenges [25]. In developing countries, the rising demand for skilled professionals in technical fields emphasizes the urgency for universities to deliver graduates who possess solid competencies [3,19,26–31].

The structure of technical careers typically spans five years, consisting of basic, humanistic, professional, and optional/complementary courses, in Ecuadorian context. These programs are designed to provide practical, hands-on knowledge, thereby contributing to the country's economic development and improvement of the productive matrix. However, despite the goals of these programs, studies suggest that some universities are not fully meeting their objectives. Research has shown that students in technical careers often display average academic performance, which points to potential shortcomings in the delivery of key competencies and skills [32–35]. This situation highlights the importance of addressing issues related to entrepreneurship. Entrepreneurship, as a concept, encompasses various definitions, from individuals who create and lead businesses to those who take calculated risks in the market. Entrepreneurs must develop specific competencies such as risk tolerance, managing ambiguity, and the ability to think unconventionally while maintaining emotional control [36]. In the context of entrepreneurship, transformational leadership is defined by vision, adaptability and innovation, focusing on inspiring and guiding others towards change [37]. Furthermore, the diverse perspectives on what constitutes essential entrepreneurial competencies, ranging from cognitive and procedural skills to attitudinal and axiological traits, underline the complexity of the issue [38]. These competencies are crucial for transforming ideas into successful ventures, yet the lack of consensus on which skills are most necessary makes it difficult to standardize the approach to entrepreneurship training in academic settings.

The alignment between the academic training provided in technical careers and the real-world needs of the business environment is a topic of significant importance. The findings in the literature indicate a mismatch between what is taught in technical programs and the skills required by the market. To address this, some experts advocate for the inclusion of experiential teaching strategies that foster practical, hands-on learning and continuous improvement [39,40]. This approach is suggested to help students better connect theoretical knowledge with practical applications, which is essential for their future professional success [36]. It is also crucial for academic programs to adapt to the evolving demands of the marketplace. This includes adjusting curricula to develop entrepreneurs who can navigate uncertainty and take calculated risks effectively [41]. In addition, discrepancies in the definition of entrepreneurship across different academic perspectives complicate the identification of key competencies for entrepreneurial success. It is necessary to explore how these differences influence the way competencies are defined and assessed within academic programs. Scholars often disagree on the essential skills required for entrepreneurship, making it difficult to align educational goals with the real-world demands of entrepreneurship. Potential solutions may be investigated to tackle the identified gaps in the development of competencies within current academic programs, considering the viewpoints of different scholars and research [42]. Consequently, finding common ground in how entrepreneurial competencies should be integrated into the curriculum is a critical challenge for higher education institutions.

Another point of discussion in the literature is the integration of terminal objectives and procedural elements in entrepreneurship education [43]. An effective mediator, using creativity, collaboration, and motivation, guides conflicts towards calm, harmony, and self-reflection. This approach, which fosters the development of emotional and communication skills, is complemented by a coherent and synergistic framework that integrates instrumental, cognitive, attitudinal, and axiological dimensions, preparing students for entrepreneurial success [44]. In the specific case of Ecuador, pre-professional internships are viewed as an effective way to bridge the gap between theoretical learning and practical application. These internships allow students to gain direct exposure to real-world scenarios, helping them apply their academic knowledge in professional contexts [42]. However, barriers identified in various studies point to the need for improvements in the quality of academic programs. It is suggested that institutions must innovate in their pedagogical approaches, incorporating strategies that adapt to the changing dynamics of the business world. Furthermore, academic curricula should be continuously updated to meet the demands of the job market, ensuring that graduates are equipped with both hard and soft skills necessary for success in a competitive environment. In addition to this, comprehensive training programs should emphasize the development of entrepreneurship skills, including leadership, communication, and the ability to manage change. By doing so, educational institutions can play a pivotal role in shaping graduates who are capable of thriving in the rapidly evolving global economy [45].

METHODOLOGY

This study follows an applied approach as defined by Concytec (2018), using a non-experimental, descriptive-projective design within a quantitative framework. Its aim is to propose solutions based on a solid theoretical foundation to address the central problem identified. The research focuses on evaluating and interpreting a pedagogical model for developing collaborative entrepreneurship competencies, conducted at a university in Ecuador. The target population consists of students in technical careers, with a sample of 49 participants selected based on inclusion criteria (registered students) and exclusion criteria (those who chose not to participate). Data were collected using surveys and a structured questionnaire, which examined the intervention and students' theoretical-practical learning related to the proposed model. This questionnaire was adapted from established instruments in peer-reviewed literature, such as the Multifactorial Leadership Questionnaire (MLQ) and the Scale for Effective Communication in Teams (SECTS), modified for an educational context [20,46,47], and can be seen in Table 1.

The collected data were processed using the Qualtrics platform, which allowed for filtering and cleaning, facilitating numerical analysis. The Pearson correlation coefficient was applied to the data from the questionnaires, with the results exported to statistical software for further analysis. The quality of the research was ensured through expert evaluation of the instrument’s validity, and its reliability was confirmed with a high Cronbach's alpha coefficient of 0.887, indicating strong internal consistency. Ethical principles, including responsibility, honesty, and confidentiality, were strictly followed throughout the study. However, the research has some limitations, including potential biases in participant responses and the limited generalizability of the results to other populations or educational contexts. The study upheld the dignity, well-being, and justice of the participants, presenting results transparently and ensuring that intellectual property rights were respected.

Table 1. *A list of collaborative skills along with their corresponding questionnaires and objectives.*

	LEADERSHIP	TEAM COMMUNICATION	MEDIATION COMMUNICATION
Questionnaire applied to measure the progress of collaborative competence	Multifactorial Leadership Questionnaire - MLQ	Scale for Effective Communication in Team Sports -SECTS	Scale for Effective Communication in Team Sports -SECTS
Objective of this study	Distinguish the characteristics of effective and effective leaders in class groups	It measures communication in a team, including verbal and nonverbal forms of social communication.	To know the satisfaction of the participants after the mediation process in class.

RESULTS

The survey results present an analysis of the current level of students' collaborative entrepreneurship competencies. The independent variable is the pedagogical model, which covers aspects like leadership (3 indicators), team communication (2 indicators), and communication mediation within teams (2 indicators). The dependent variable is the students' performance in collaborative entrepreneurship competencies, divided into theoretical knowledge (5 indicators) and practical application (5 indicators). The statistics for the responses to each indicator are included.

Table 2. *Average values derived from the pedagogical model variable of collaborative entrepreneurship competencies.*

Questionnaire & Answers				
Questionnaire		Average per question	Standard deviation	Variance
Item	Questions			
Transformational		4.356	0.584	0.291
Transactional		3.588	0.791	0.557
Passive/Evasive		3.714	0.608	0.326
AVERAGE Leadership		4.035	0.534	0.285
Questionnaire		Average per question	Standard deviation	Variance
Item	Questions			
Acceptance		5.765	0.958	0.918
Distinctiveness		1.650	0.979	0.959
AVERAGE Team Communication		3.708	0.969	0.939
Questionnaire		Average per question	Standard deviation	Variance
Item	Questions			
Positive Conflict		5.526	1.430	2.045
Negative Conflict		3.536	1.407	1.979
AVERAGE Mediation communication in a team		4.531	1.419	2.012

The Table 2 displays the average scores for the "pedagogical model of collaborative entrepreneurship competencies" variable. For the leadership dimension, the average score is 4.035

out of 5, with a standard deviation of 0.534 and a variance of 0.285. The team communication dimension has a mean score of 3.708 out of 7, a standard deviation of 0.959, and a variance of 0.939. In the team mediation communication dimension, the mean is 4.531, with a standard deviation of 1.1419 and a variance of 2.012. Furthermore, the response frequencies for these dimensions show that only 40.14% of respondents rated leadership at the highest level. For team communication and team mediation communication, only 17.35% and 25.51%, respectively, selected the highest rating.

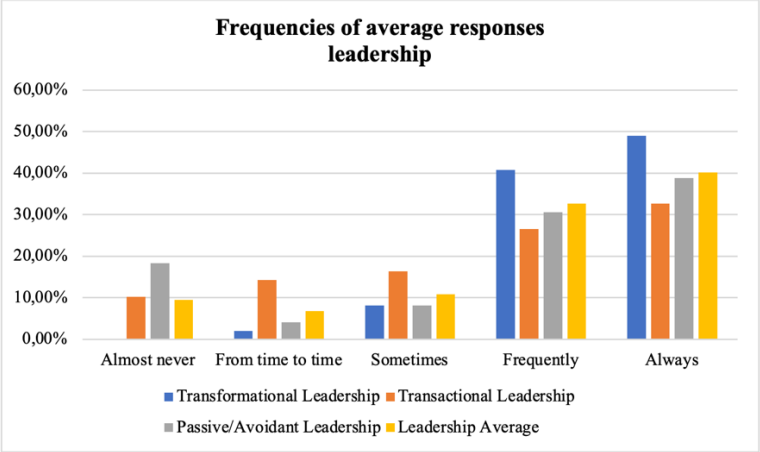

Figure 1. *Frequencies of Average Leadership Responses*

The Leadership dimension includes three indicators: transformational, transactional, and passive/evasive leadership, as in Figure 1. For the Transformational Leadership indicator, the average score was 4.35 out of 5. Among the students, 48.54% reported always experiencing transformational leadership, 40.64% reported experiencing it with some frequency, and 8.77% reported rarely or never experiencing it. The Transactional Leadership indicator had an average score of 3.59 out of 5. Regarding response frequency, 32.22% of students chose the most frequent option, while 27.46% reported lower or no frequency. For the Passive/Evasive Leadership indicator, the average score was 3.71 out of 5, with 37.09% of students selecting the frequently or always response options.

A descriptive statistical analysis was performed on the students' responses to evaluate the team communication dimension, with the results summarized in the Figure 2.

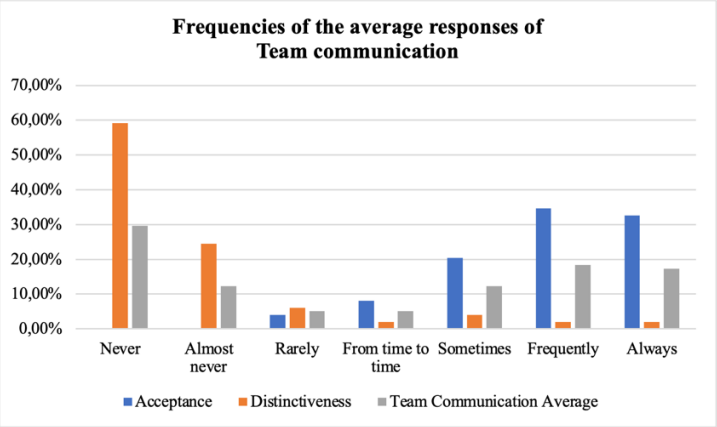

Figure 2. *Average Team Communication Response Frequencies*

For the questions related to the team communication indicator, specifically regarding Acceptance, an average score of 5.89 out of a possible 7 was recorded. In terms of response frequency, 38.78% of students selected the option of always or almost always, 34.01% rated it as somewhat frequent, and 17.69% indicated it occurs occasionally. Regarding the questions related to Distinctiveness within the team communication indicator, the average score was 1.56 out of 7. For response frequency, 60.56% of students reported never or almost never using this dimension of team communication, while only 1.41% stated they always or almost always use it.

A descriptive statistical analysis was conducted on the students' responses to assess the dimension of mediation communication in teams, with the results presented in the Figure 3.

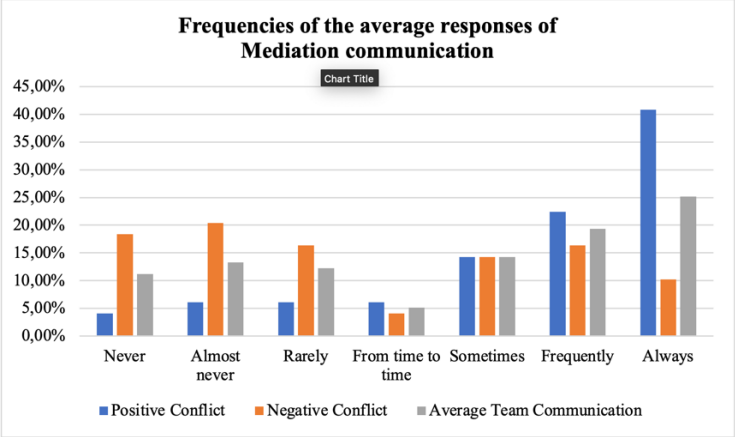

Figure 3. *Average Response Frequencies of Mediation Communication*

The students' average score in mediation communication is 4.53 out of a possible 7 points. In terms of response frequency, 29.37% reported always using effective mediation communication, 21.52% said they never use it, and 15.75% almost never do. For the positive conflict indicator within the mediation communication dimension, the pretest average score was 5.53 out of 7. Regarding response frequency, 40.84% of students selected the options of always or almost always, 21.99% responded frequently, and 3.14% stated they never or rarely encounter this type of conflict. In the

case of the negative conflict indicator, the average score was 3.54 out of 7. Regarding frequency, 38.78% of students selected always or almost always, 34.01% answered frequently, and 17.69% reported never or almost never experiencing this type of conflict.

Normality Test

The Kolmogorov-Smirnov normality test was performed, producing an absolute difference of 0.088 between the extremes and a test statistic of 0.088. These findings suggest that the data for the variable follow a normal distribution. The details of the test are provided below, see Table 3.

Table 3. *Kolmogorov-Smirnov Normality Test*

	Values	**V1.C. Colab**
Number		49
Parameters Normala, b	Stocking	3.306
	Deviation Estd.	0.664
More Extreme Differences	Absolute	0.088
	Positive	0.078
	Negative	-0.088
Test Statistics		0.088
Asim. Sig (2-tails) [c]		0.200D

The Kolmogorov-Smirnov normality test was applied to the V1 variable, C. Colab, with a sample size of 49. The normal parameters revealed a mean of 3.306 and a standard deviation of 0.6641. The test statistic was 0.088, with an asymptotic significance (2-tailed) of 0.200. Given that the p-value exceeds 0.05, there is insufficient evidence to reject the null hypothesis of normality, indicating that the variable likely follows a normal distribution.

Correlation Analysis

Table 4. *Correlation of Variables*

	N	Minimal	Maximum	Average	Desv. Standard
V1. C.Colab	49	1.726	4.351	3.306	0.664
V2. C.Colab	49	1.665	6.125	3.857	1.167

In Table 4, a bilateral Pearson correlation analysis was performed between the two variables of interest in this study, revealing a strong relationship between them, as indicated by the confidence interval estimate. Specifically, a robust correlation was found, with a Pearson correlation coefficient of 0.533 and a significance level of 0.01, as the p-value was below 0.001. In terms of the statistical description of both variables, variable 1 has a mean of 3.306 and a standard deviation of 0.664, while variable 2 has a mean of 3.857 and a standard deviation of 1.167. Furthermore, a Pearson correlation analysis was conducted between the dimensions of variable 1, including Leadership, Team Communication, and Mediation Communication, and variable 2, which relates to the development of collaborative competencies in students.

Table 5. *Pearson's correlation analysis between the dimensions of variable 1 Pedagogical Model with respect to variable 2, Development of collaborative competencies in students.*

		V2.C. Colab	Leadership	C. Equipment	C. Mediation
V2. C.Colab	**Pearson's correlation**	1	0.533**	0.458**	0.509**
	Sig. (2-tails)		<0.001	<0.001	<0.001
	Number	49	49	49	49
Leadership	**Pearson's correlation**	0.533**	1	0.804**	0.880**
	Sig. (2-tails)	<0.001		<0.001	<0.001
	Number	49	49	49	49
C. Equipment	**Pearson's correlation**	0.458**	0.804**	1	0.781**
	Sig. (2-tails)	<0.001	<0.001		<0.001
	Number	49	49	49	49
C. Mediation	**Pearson's correlation**	0.509**	0.880**	0.781**	1
	Sig. (2-tails)	<0.001	<0.001	<0.001	
	Number	49	49	49	49
**. The correlation is significant at the level of 0.01 (2-tails)g.					

In Table 5, a Pearson correlation analysis was performed between the dimensions of the variable—Leadership, Team Communication, and Mediation Communication—and variable 2, which represents the development of collaborative competencies in students. The results show Pearson correlation coefficients of 0.533 for Leadership, 0.458 for Team Communication, and 0.509 for Mediation Communication, all significant at the 0.01 level, with p-values below 0.001. These results highlight the importance of proposing a pedagogical model to enhance collaborative entrepreneurship competencies in students.

DISCUSSION

The need to enhance collaborative entrepreneurship competencies in students pursuing technical careers is pressing, especially through comprehensive pedagogical reinforcement. A significant percentage of students express interest in engaging in future ventures, but they often lack the necessary entrepreneurial skills for success in the business world. This gap underscores the importance of cultivating entrepreneurial knowledge and skills as part of the academic process. A key challenge in pedagogical competency construction is how to teach students to transform their visions into reality, a skill essential for achieving success and realizing goals [43]. The academic process must focus on developing these competencies in a dynamic and practical manner, emphasizing interaction with the environment, peers, and real-world situations. This dynamic approach should foster the entrepreneurial attitudes of students, helping them develop strategic thinking to meet objectives while maintaining motivation [43].

Leadership and Team Communication Competencies

A critical aspect of fostering collaborative competencies is leadership development. Some students display transformative leadership traits, but these need to be nurtured and strengthened. Transformational leadership is characterized by vision, flexibility, and innovation, with an emphasis on motivating and guiding others towards change [37]. However, when examining transactional leadership, it is found that only one-third of the students evaluate themselves as possessing this trait, with 40.82% mentioning they apply it only occasionally or never. Communication within teams is another key area for improvement, as 41.84% of students report rarely applying effective communication strategies. Additionally, the level of acceptance, which reflects honesty and trust among team members, remains low, with only 32.65% highly valuing this aspect of teamwork. Building a culture of collaboration where team members empathize, negotiate, and provide feedback to one another is essential for achieving common goals. This reinforces the need to actively develop these competencies during students' university careers, as successful teamwork depends on clear communication and mutual trust [48].

Findings and Interpretation

The study’s results confirm the need to strengthen leadership, team communication, and mediation competencies for fostering collaborative entrepreneurship. The lack of development in these areas points to the necessity of a pedagogical model that addresses these skills. Previous research highlights the importance of entrepreneurship education in university contexts, and the results of this study align with these findings [49]. Specifically, less than 50% of the participants showed adequate mediation skills, and only 63.27% were able to handle disagreements with respect. Furthermore, 38.78% of students struggled to manage differences within their teams. An effective mediation style requires creativity, collaborative negotiation, and motivation. The mediator is skilled in guiding the conflict towards calmness, harmony, empathy, and self-reflection on their behaviors and attitudes [44]. These findings indicate that improvements are needed in conflict resolution and communication strategies to strengthen the collaborative competencies that are essential for successful entrepreneurship.

Practical Implications and Contributions

The research provides practical and empirical support for a pedagogical model designed to strengthen collaborative entrepreneurship competencies in students. The three dimensions—leadership, team communication, and mediation—are shown to be positively and significantly correlated with one another, suggesting that they are complementary and synergistic for achieving entrepreneurial success. This model can be applied in the training of future entrepreneurs, enhancing their ability to contribute to economic, social, and environmental development. The study emphasizes that the development of these competencies is essential for students' ability to manage real-world entrepreneurial challenges. By implementing the proposed model, students will gain the necessary skills to lead teams, communicate effectively, and mediate conflicts, all crucial aspects of successful entrepreneurship.

Recommendations for Implementation

Based on the study's findings, several recommendations are proposed. Teachers should incorporate the pedagogical model into their curricula, using the suggested strategies and resources. It is essential to continually assess and adjust the model based on feedback from students, ensuring that the pedagogical approach meets their evolving needs. Students should be encouraged to actively engage with the model, reflect on their strengths and weaknesses, and apply their learning to real-life projects that contribute to societal development. For academic authorities, it is recommended to provide the necessary resources, including material, human, and financial support, to facilitate the model's implementation. Moreover, fostering a culture of entrepreneurship in the institution is crucial, and the experiences and achievements of both students and teachers should be recognized and celebrated to promote the widespread adoption of entrepreneurial values across the academic community.

CONCLUSIONS

Many students express interest in pursuing entrepreneurship in the future, but they often lack the essential skills needed for success in the business world. This highlights the need for pedagogical reinforcement to develop collaborative entrepreneurship competencies in students enrolled in technical careers, ensuring they can apply these skills effectively in their professional lives. Within the realm of collaborative competencies, leadership dimensions reveal that some students display transformative leadership traits. However, these traits require further development to be solidified as strong, consistent characteristics. In addition, there is a clear disparity in team communication among students, with some demonstrating skills in acceptance and distinctiveness while others do not. A pedagogical intervention is necessary to improve team communication and foster greater collaboration.

Similarly, the competence of mediation communication shows a noticeable divide, though the gap is less pronounced than in team communication. More students are acquiring skills in this area, yet it remains crucial to significantly increase the number of students proficient in mediation, as handling conflicts effectively can be pivotal to success in entrepreneurship. To address these gaps, a pedagogical model focused on collaborative entrepreneurship competencies should be integrated

into the curriculum. Incorporating specific subjects that target these competencies within various courses will enhance students' knowledge, while ensuring lathat entrepreneurship skills are developed throughout their education.

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