WIP: Developing Collaborative Entrepreneurship Competencies for Technical Majors

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Testing a Pedagogical method to Develop Collaborative Entrepreneurship Competences for Technical Majors

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Abstract

This study focuses on testing a pedagogical model designed to foster collaborative entrepreneurship competencies in students pursuing technical careers. Entrepreneurship as a key competence for the economic and social progress of the country. However, the current training in technical careers does not adequately cover the collaborative skills associated with entrepreneurship. The general objective was to test Moscoso´s pedagogical model that integrates specific competencies, such as leadership, team communication, and team mediation, within the curriculum of technical careers. The specific objectives focused on designing and proposing a pedagogical model for the development of each of these competencies, comparing responses to a questionnaire applied to students to evaluate the model's impact, and elaborating a concrete proposal for its implementation. Therefore, the theoretical framework of the study reviews key concepts related to entrepreneurship, the entrepreneur profile, entrepreneurship competencies, and collaborative competencies. The adopted methodology is quantitative, with a non-experimental and cross-sectional design, using a questionnaire with 50 questions. Among them, 35 belong to a Likert scale of 5 possibilities, while the remaining 15 are formulated on a Likert scale of 7 possibilities with free choice, to evaluate dimensions and indicators of collaborative entrepreneurship competencies. The target population consisted of 49 students selected by simple random sampling. The study's results revealed that students have an average level of development in collaborative entrepreneurship skills, with an average score of 4.091. Mediation communication scores an average of 4.531, followed by leadership with an average score of 4.035, and team communication with an average of 3.708. The study found a positive and significant correlation between the pedagogical model dimensions and development of collaborative competencies, confirming the proposed hypothesis. This suggests the implementation of the model to improve the professional profile and work performance of graduates. Additionally, pilot pedagogical and didactic studies are recommended, covering diversity in the student population and the inclusion of other entrepreneurial skills, such as innovation, creativity, and project management.

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

INTRODUCTION

The dynamic global entrepreneurship landscape has undergone a significant transformation, playing a crucial role in economic development through collaboration with entrepreneurial processes [1]. The literature emphasizes that entrepreneurship goes beyond the simple creation of companies, being an intrinsic attitude of human beings reflected in their ability to take risks,

identify opportunities, and adapt to fluctuations in the labor market [2–6]. In this context, the demand for entrepreneurial education has been increasing, highlighting its importance in creating an entrepreneurial culture globally [7]. At the international level, entrepreneurship is recognized as an essential competency to achieve the most competitive and dynamic economy in the world [8]. However, South America, including Ecuador, faces challenges in the entrepreneurial field, with advances in democracy and macroeconomic stability but lagging in education and knowledge generation [9]. Compared to other South American countries, Ecuador exhibits limited-growth, trade-focused ventures. Despite public policy efforts to promote entrepreneurship, the lack of innovation and the human capital gap, especially in the quality of education, have limited its impact [10].

In South America, a peculiar phenomenon is observed with high levels of entrepreneurship, but there is a disconnect between academic training and entrepreneurial initiatives, resulting in incipient companies with little innovation [11]. The relationship between opportunity and the need for entrepreneurship is highlighted, indicating that countries where entrepreneurship is motivated by the identification of opportunities have higher levels of income [12]. This nuance suggests that entrepreneurship education plays a key role in the development of new businesses. Despite the increase in entrepreneurship in Ecuador, studies indicate that local enterprises, for the most part, arise out of necessity, are of limited growth, and are focused on commerce. The human capital gap, especially in the quality of education, has been identified as one of the fundamental factors explaining the lack of innovation in the region [10]. Although there is significant interest in promoting entrepreneurship through public policies, the lack of alignment between the type of entrepreneurship promoted and the real need of the country stands out as an area for improvement.

The research, which aims to address the existing gap in the training of entrepreneurs in Ecuador, begins to fill this void in entrepreneurship training in the country. The following question was posed: What is the design of the proposal for a pedagogical model to develop collaborative entrepreneurship competencies in students of technical careers? To answer this question, the impact of this model was evaluated through a questionnaire applied to students, measuring its effectiveness in the development of key collaborative skills for entrepreneurship. In this regard, the research focused on exploring how to improve entrepreneurial education at the university level, recognizing the need to strengthen the national education system. This approach aimed to prepare students with entrepreneurial thinking to face technical and socio-economic challenges after their professional training. This emphasis on entrepreneurship education was grounded in the understanding that the most productive and competitive societies are made up of innovative and enterprising citizens [13]. It seeks to contribute to the development of graduates who are not only prepared to manage companies but also possess entrepreneurial skills to promote innovation and economic development in Ecuador.

BACKGROUND

Technical careers represent a fundamental field for understanding the principles, techniques, and practices that facilitate the effective management of resources in companies. This area essentially contributes to increasing business competitiveness, promoting innovation, and ensuring quality in the variety of products available on the market [14]. In the context of developing countries, the growing demand for professionals in technical careers highlights the urgency for universities to train graduates with strong skills [15–19]. The profile of graduates in technical careers covers various branches of specialization, from accounting to quantitative methods. A fundamental skill

that students must develop is leadership. According to the Multifactor Leadership Questionnaire (MLQ), a leader is defined as a person who listens to the opinions and ideas of the team, possesses the ability to influence and motivate, and ensures that all team members work with enthusiasm. The leader is focused every day on achieving the goals and objectives of the group [20]. Another important skill is team communication, which, according to [21–25], emphasizes that effective communication within the team and the quality of communication among its members contribute to fostering a positive atmosphere within the organization. The last skill that students should develop is team mediation, which is a conflict resolution technique that can be highly useful in addressing the new challenges that arise in today's society, characterized by constant change [26].

In Ecuador, the average duration of technical careers is five years and is structured in four training pillars: basic, humanistic, professional, and complementary/optional. National universities mainly educate professionals with practical knowledge in key areas, thus contributing to economic development and the improvement of the productive matrix. However, despite these goals, some studies indicate that current programs sometimes fail to fully meet their objectives. For instance, in a national university, it was found that students in technical careers demonstrated an average academic level, pointing out possible deficiencies in the impartation of competencies and skills by the institutions [27–30]. At the same time, the issue of entrepreneurship and the profile of the entrepreneur must be addressed in various definitions, from generating agents of productive entities to leaders and cautious individuals who take risks in the market [7]. Also, the importance of specific competencies for entrepreneurship, including risk-taking, tolerance for ambiguity, and the ability to control emotions and think unconventionally [31]. In this context, it is necessary to explore the diversity of opinions on the competencies of the entrepreneur, from cognitive and procedural skills to attitudinal and axiological [32]. This leads to emphasizing that entrepreneurship, as a competency, encompasses motivational, cognitive, and procedural dimensions, and its development is crucial to transform ideas into successful realities. On the other hand, in terms of specific research, it should be mentioned that the challenges in identifying competencies associated with entrepreneurship create a lack of clear consensus in the literature on which skills are essential for entrepreneurs. In this sense, a solid foundation is established to address the challenges and opportunities in the training of professionals in technical careers and entrepreneurs. The literature highlights the importance of developing both soft and hard competencies in students, underlining the need for comprehensive training to prepare them for the challenges of the business world.

The discussion can focus on how the findings of the literature on training in technical careers and entrepreneurship align with the reality observed in Ecuador and other similar contexts. Additionally, possible solutions can be explored to address the identified deficiencies in the impartation of competencies in current academic programs, considering the perspectives of different authors and studies [33]. In this context, the relevance of integrating experiential teaching strategies to enhance hands-on learning and foster continuous improvement in all areas can be discussed, as suggested by [31]. The discussion also delves into the relationship between technical career training and entrepreneurship, examining how the skills acquired during the degree can influence graduates' ability to become successful entrepreneurs. It is pertinent to adjust academic programs to meet changing market demands and promote the training of entrepreneurs who can face uncertainty and take risks effectively [34]. Moreover, the discussion may address the discrepancy in the definitions of entrepreneurship and entrepreneurial competencies presented by

different authors. It is crucial to explore how these divergences can affect the identification and assessment of competencies in academic programs.

The duality of terminal objectives and procedural elements proposed by [35] can also serve as a focal point for analyzing how instrumental, cognitive, attitudinal, and axiological dimensions interact to form a coherent and synergistic unit in the context of entrepreneurship. In relation to the specific situation in Ecuador, the discussion can address the effectiveness of pre-professional internships as a means to bring students closer to the practical application of their theoretical knowledge [33]. Additionally, possible initiatives to improve academic quality can be explored, considering the barriers identified in the study carried out at a university in Ecuador. The paragraph can conclude with concrete proposals to enhance training in technical careers and entrepreneurship, integrating perspectives and recommendations from various authors and reviewed studies into the theoretical framework. The need for innovative pedagogical approaches, continuous adaptation of academic programs to market demands, and the promotion of competencies that prepare students to face the changing challenges of the business environment can be highlighted [36].

METHODOLOGY

The research follows an applied approach, according to the classification of Concytec (2018), employing a non-experimental and descriptive-projective design. It is framed as quantitative research, proposing solutions based on a theoretical foundation for the central problem identified. The study focuses on the evaluation, comparison, interpretation, and precedent-setting around a pedagogical model for the development of collaborative entrepreneurship competencies. The research scenario encompasses a university in Ecuador, with the population of interest comprising students in technical careers. The specific participants are 49 students in technical careers, with inclusion criteria focusing on registered students and exclusion criteria covering those who choose not to participate. Data collection utilized the survey technique, employing a structured questionnaire as an instrument. This questionnaire includes inquiries about the intervention conducted and the theoretical-practical learning of the students in relation to the proposed pedagogical model. The questions are based on established questionnaires in peer-reviewed scientific studies. Validated instruments, such as the Multifactorial Leadership Questionnaire (MLQ) and the Scale for Effective Communication in Teams (SECTS), adapted to an educational context, were employed.

The Qualtrics platform is utilized to filter and clean data, facilitating numerical comparisons of the Likert scale. Data analysis involves employing specific procedures for the established questionnaires, with Pearson's correlation coefficient applied to the section developed in the research. The data are exported to statistical software for analysis. Quality of Research: The research's quality is buttressed by the validity of the instrument, evaluated through expert judgment, and reliability assessed by Cronbach's alpha coefficient. The instrument's reliability is set at a high level (0.887), indicating internal consistency. Despite adhering to ethical protocols, the study's limitations include the potential for bias in participants' responses and the limited generalizability of results to other populations or educational contexts. The firm adheres to ethical principles such as responsibility, honesty, and confidentiality. The participants' dignity is respected, their well-being and justice are prioritized, and integrity and equal treatment are ensured. Intellectual property is respected, and results are presented transparently.

Table 1. *List of collaborative competencies with their respective questionnaires and their objective.*

	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 results of surveys providing a diagnosis of the current state of students in collaborative entrepreneurship competencies. The independent variable is the pedagogical model, encompassing dimensions of leadership (3 indicators), team communication (2 indicators), and mediation communication in teams (2 indicators). The dependent variable is students' performance in collaborative entrepreneurship competencies, divided into theoretical knowledge (5 indicators) and practical application (5 indicators). The statistics of responses obtained for each indicator are included.

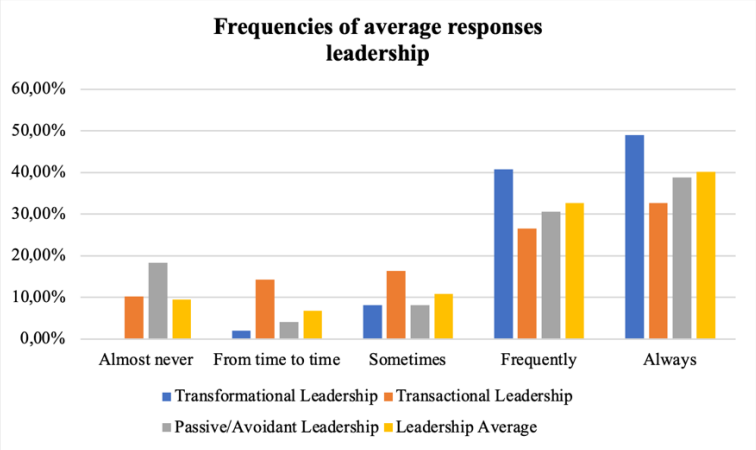
Table 2. *Average values obtained in the variable pedagogical model of collaborative entrepreneurship competencies.*

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 provides averages for the variable "pedagogical model of collaborative entrepreneurship competencies." For the leadership dimension, the average is 4.035 out of 5, with a standard deviation of 0.534 and a variance of 0.285. Regarding the dimension of team communication, the mean is 3.708 out of 7, with a standard deviation of 0.959 and a variance of 0.939. Team mediation communication has a mean of 4.531, a standard deviation of 1.1419, and a variance of 2.012.

Additionally, the frequencies of responses for these dimensions are presented, revealing that only 40.14% of respondents gave the maximum rating in leadership. In the dimensions of team communication and team mediation communication, only 17.35% and 25.51%, respectively, selected the best-rated option.

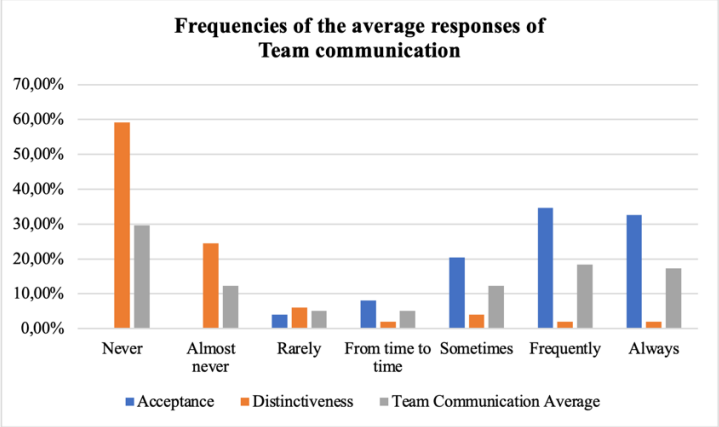
Figure 1. *Frequencies of Average Leadership Responses*



The Leadership dimension comprises three indicators: transformational, transactional, and passive/evasive leadership. Concerning the Transformational Leadership indicator, an average score of 4.35 out of 5 was recorded. 48.54% of the students indicated experiencing transformational leadership always, 40.64% with some frequency, and 8.77% less or not at all. For transactional leadership, an average score of 3.59 out of 5 was obtained. In terms of response frequency, 32.22% of students chose the usual option, while 27.46% indicated lower or no frequency. Regarding the passive/evasive leadership indicator, an average score of 3.71 out of 5 was achieved. Concerning response frequency, 37.09% of students selected the options of frequently or always.

A descriptive statistical analysis of the students' responses was conducted to assess the dimension of team communication. Evaluations of the obtained responses are presented in the table below.

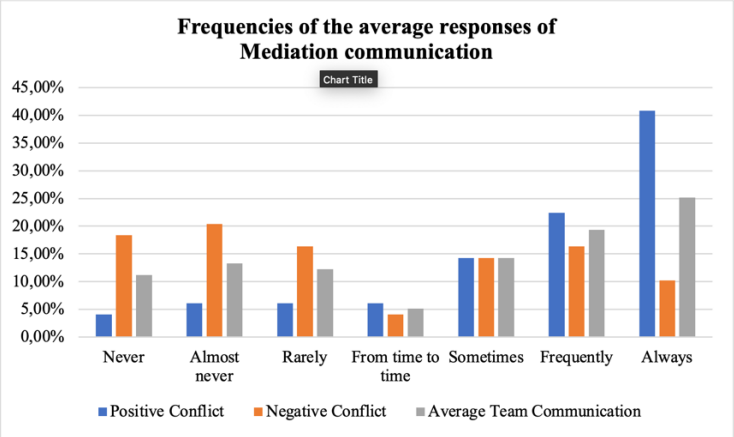
Figure 2. *Average Team Communication Response Frequencies*



Regarding the questions related to the team communication indicator, specifically in terms of Acceptance, an average of 5.89 out of the 7 possible points was recorded. Concerning the frequency of the answers, 38.78% of the students chose the alternative of always or almost always, 34.01% rated it as something frequent, and 17.69% indicated that it happens sometimes. For the questions related to the team communication indicator, concerning Distinctiveness, an average of 1.56 out of the 7 possible points was obtained. In terms of response frequency, 60.56% indicated that they never or almost never use this dimension of team communication, while only 1.41% indicated that they always or almost always use it.

A descriptive statistical analysis of the students' responses was performed to evaluate the dimension of mediation communication in a team. The resulting scores of the responses are presented in the table below.

Figure 3. *Average Response Frequencies of Mediation Communication*



The average score of the students in mediation communication is 4.53 out of the 7 possible points. Concerning the frequency of the answers provided by the students, 29.37% stated that they always use effective mediation communication, while 21.52% indicated that they never do so, and 15.75% almost never. Regarding the questions related to the positive conflict indicator of the mediation communication dimension, an average score of 5.53 out of the 7 possible points was obtained in the pretest. Concerning the frequency of the answers, 40.84% of the students selected the options of always or almost always, 21.99% answered frequently, and 3.14% indicated that they never or very rarely experience this type of conflict. In relation to the negative conflict indicator of the mediation communication dimension, an average score of 3.54 out of the 7 possible points was obtained. Regarding the frequency of the answers, 38.78% of the students selected the options of always or almost always, 34.01% answered frequently, and 17.69% indicated that they never or almost never experience this type of conflict.

Normality Test

The Kolmogorov-Smirnov normality test was conducted, yielding an absolute value of 0.088 for the differences between extremes and a test coefficient of 0.088. These results indicate that the variable data conform to a normal distribution. Below are the details of that test.

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 conducted for the V1 variable, C. Colab, with a sample size of 49. Normal parameters indicate a mean of 3.306 and a standard deviation of 0.6641. The test statistic is 0.088, and the asymptotic significance (2-tailed) is 0.200. With a p-value greater than 0.05, there is not enough evidence to reject the null hypothesis of normality, suggesting that the variable could have 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

A bilateral Pearson correlational analysis was conducted between the two variables of interest in this study, revealing a strong correlation between them, supported by the estimation of the confidence interval. In this specific context, a significantly robust correlation between the variables was identified, yielding a Pearson correlation coefficient of 0.533 with a significance level of 0.01, given that the p-value was less than 0.001. Regarding the statistical description of both variables, it is observed that variable 1 has an average of 3.306 and a standard deviation of 0.664, while variable 2 has an average of 3.857 and a standard deviation of 1.167. Additionally, a Pearson correlation analysis was carried out between the dimensions of the variable, such as Leadership, Team Communication, and Mediation Communication, in relation to variable 2, which pertains 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.					

A Pearson correlation analysis was conducted among the dimensions of the variable—Leadership, Team Communication, and Mediation Communication—in relation to variable 2, representing the development of collaborative competencies in students. The results reveal Pearson correlations of 0.533 for Leadership, 0.458 for Team Communication, and 0.509 for Mediation Communication, all significant at a level of 0.01, as the p-values are less than 0.001. These findings underscore the necessity of proposing a pedagogical model for the advancement of collaborative entrepreneurship competencies in students.

DISCUSSION

There is an urgent need to strengthen collaborative entrepreneurship skills in students pursuing technical careers through comprehensive pedagogical reinforcement. A significant percentage of students express interest in participating in future ventures, highlighting the lack of knowledge and development of entrepreneurial skills crucial for success in the business world. One of the great challenges and pretensions of the pedagogical construction by competencies is how to teach turning visions into reality [35]. Recognizing this deficiency is fundamental, and efforts should be directed towards the development of these skills to achieve planned goals and success. The academic training process emphasizes the importance of developing entrepreneurial skills in a reflective and practical manner. The proposal is to conceive training as a dynamic and social space where interaction with the environment, people, and situations fosters, exemplifies, and enhances entrepreneurial attitudes. This process of interaction of knowledge, skills, abilities, and values requires bold educational strategies that form in the student a strategic vision of the challenges and opportunities, helping to identify and meet objectives, and maintaining motivation to achieve success in the tasks undertaken [35].

In the area of collaborative competencies, the dimensions of leadership are addressed, recognizing that some students exhibit transformative leadership traits. However, emphasis is placed on the need to cultivate and promote these traits to solidify them as strong characteristics in students. Transformational leadership is characterized by being motivating, visionary, strategic, flexible, entrepreneurial, and innovative, promoting transformations both in the company and in its followers [37]. When exploring transactional leadership, it is revealed that only a third of students evaluate themselves as possessing this skill, while 40.82% mention applying it only occasionally or never. Team communication is analyzed in detail, showing that 41.84% of participants rarely apply this skill. Acceptance, which reflects the honest relationship between team members, shows that only 32.65% value it highly. Regarding distinction, 89.79% indicate low levels of cohesion in team interaction. However, according to [38], it is important to highlight that achieving objectives together means that projects are developed with the collaboration of others, influencing them with

empathy, negotiation, leadership, constantly providing feedback to the team about their role in achieving the proposed objectives. Hence the need to promote the development of this skill in students during their university career. In the mediation and conflict resolution contest, it is worth noting that less than 50% of the participants have developed skills in mediational communication. A good mediation style needs creativity, cooperative negotiation, motivation. The mediator is capable of leading the conflict towards serenity, harmony, empathy, self-evaluation of their behaviors and attitudes [39]. However, the results show that, although 63.27% show skills to handle disagreements with respect, 38.78% do not adequately manage differences within the team.

Interpretation of the results

The findings confirm the prevailing need to strengthen collaborative entrepreneurship competencies in students pursuing technical careers. The lack of knowledge and development of entrepreneurial skills highlights the importance of intervening with comprehensive pedagogical reinforcement. These results are consistent with previous research that underscores the relevance of entrepreneurship education in university contexts [40].

Implications

From a research perspective, the results provide empirical evidence of the effectiveness of a pedagogical model based on collaborative entrepreneurship competencies, contributing to the advancement of knowledge in this field. The three dimensions (leadership, team communication, and mediation communication) show positive and significant correlation with each other and with the dependent variable, suggesting that they are complementary and synergistic for the achievement of collaborative entrepreneurship competencies. From a practical standpoint, it offers a concrete and applicable proposal for the training of entrepreneurs in technical careers, with potential positive impacts on the economic, social, and environmental development of the country.

Recommendations

For teachers, it is recommended to incorporate the proposed pedagogical model into their teaching plans, using the suggested teaching strategies and resources. It is also urged to continuously evaluate the process and results of the application of the model, providing feedback to students and adjusting the design according to specific needs and contexts. For students, it is recommended to actively participate in the activities proposed by the pedagogical model, taking advantage of the opportunities for collaborative learning and the development of entrepreneurial skills. Likewise, it is suggested to reflect on strengths and weaknesses, identify interests and goals, and seek to apply knowledge and skills in real projects that add value to society. For academic authorities, it is recommended to support the implementation of the pedagogical model, providing the necessary material, human, and financial resources. In addition, it is urged to promote the dissemination and recognition of the experiences and achievements of teachers and students who participate in the pedagogical model, creating a culture of entrepreneurship in the institution.

CONCLUSIONS

Most students express an interest in participating in entrepreneurship in the future; however, they lack the necessary entrepreneurship skills for the business world. Therefore, pedagogical reinforcement is needed to enhance collaborative entrepreneurship skills in students pursuing technical careers, enabling them to apply these skills in the professional world. Within collaborative competencies, the leadership dimensions reveal students who exhibit traits of

transformative leadership; however, these traits need development and fostering to become strong characteristics. In terms of team communication, there is a noticeable divide among students with characteristics of acceptance and distinctiveness and those without. A pedagogical intervention is required to enhance productive communication within a team.

The dimensions of mediation communication also exhibit a clear division between those who have acquired this competence and those who have not. However, the divide is less pronounced, with more students understanding how to handle mediation communication. Nevertheless, it is essential to increase the number of students with this competence significantly, as effective communication in differences can determine the success or failure of a task in an enterprise. A pedagogical model for collaborative entrepreneurship competencies should be a central component of the curriculum and practices in various subjects. Incorporating specific subjects on entrepreneurship competencies or collaborative entrepreneurship competencies can enhance students' knowledge. However, to better develop specific entrepreneurship competencies, it is essential for this training to be integrated into all subjects.

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