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The effect of ADDIE-based entrepreneurship education on entrepreneurial intentions: a quantitative study grounded in the theory of planned behavior and Dewey's learning by doing

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ABSTRACT

This research aims to assess the effect of entrepreneurship education through the ADDIE model on the entrepreneurial intentions of higher vocational college students in Hebei Province, integrating the Theory of Planned Behavior (TPB) and John Dewey's "Learning by Doing" theory as a foundational framework. This study used a cross-sectional design with a quantitative approach to evaluate the impact of an entrepreneurship education curriculum based on the ADDIE model. Data were collected at two time points: the Analysis phase (pre-test) and the Evaluation phase (post-test) after a 3-month curriculum. Participants included 260 vocational college students from eight universities in Hebei Province, specializing in Automotive Manufacturing Technology across all academic levels. A survey questionnaire with 28 questions was used to assess students' entrepreneurial intentions, attitudes, and perceived behavioral control. Data analysis was performed using SPSS 26.0, with independent t-tests and linear regression employed for statistical evaluation. The research indicates a positive influence of the entrepreneurship education curriculum on students' perceived entrepreneurial attitude and behavioral control. The t-tests showed significant changes with large effects. However, regression analysis indicated a possible deterioration in attitude and a lack of significant change in behavioral control, suggesting other factors influencing the situation. The impact of the curriculum on entrepreneurial intentions is therefore contradictory. The findings suggest that entrepreneurship education positively affects students' attitudes and perceptions about entrepreneurship, although perceived behavioral control presents some challenges.

Contribution/Originality: This study contributes to the existing literature by uniquely applying the ADDIE model to entrepreneurship education, grounded in the Theory of Planned Behavior and Dewey's experiential learning within Hebei vocational colleges. The research is one of the few studies evaluating the curriculum's impact on entrepreneurial intentions using pre- and post-intervention quantitative analysis.

1. INTRODUCTION

1.1. Research Background

According to the current global economy, entrepreneurship education has become an important component of teaching, particularly for young people and students. Currently, there have been increased efforts toward

entrepreneurship due to limited security in employment opportunities in the labor market (Istiqomah, Suparji, & Marniati, 2022). This is particularly relevant in vocational colleges, where on-the-job training is valued. The objective of raising the students' entrepreneurial skills not only equips the students with entrepreneurial capacity but also creates and molds the spirit of generating creativity and sustaining themselves in their chosen careers (Liang & Xu, 2024). Vocational training is fundamental as it helps in providing specialized training to learners in their areas of interest.

The incorporation of entrepreneurship education in these programs is crucial since there is always a difference between learning from textbooks and facing actual scenarios (Lv et al., 2021). However, while these studies highlight the importance of entrepreneurship education, they often fail to critically evaluate the specific mechanisms through which such education impacts entrepreneurial intentions. For example, the role of experiential learning, as emphasized by John Dewey's "Learning by Doing" theory, is underexplored in many studies, leaving a gap in understanding how practical engagement influences entrepreneurial attitudes and perceived behavioral control.

This integration creates additional value for students that enables them to develop both technical knowledge and skills related to business management, thus increasing their employment opportunities and entrepreneurial prospects (Andriadi & Idrus, 2024). Therefore, entrepreneurship education is most critical in vocational colleges, especially where technical education is pursued. There is a progression in the job market that requires innovative-minded students to cultivate entrepreneurial thinking to foster innovation within organizations (Nevalainen, Seikkula-Leino, & Salomaa, 2021). Despite this, existing literature often overlooks contextual factors, such as regional economic conditions and cultural attitudes toward entrepreneurship, which may moderate the effectiveness of entrepreneurship education. For example, while Nevalainen et al. (2021) emphasize the need for innovative thinking, they do not address how regional disparities, such as those in Hebei Province, might influence the outcomes of entrepreneurship education.

It is evident from research that students who take entrepreneurship courses are likely to engage in entrepreneurial activities after their studies Wang (2020). Thus, entrepreneur education not only helps in providing the skills for an entrepreneur to operate their regular business requirements but also how to face challenges that will emerge during their entrepreneurial life. However, Almahry, Sarea, and Hamdan (2018) argue that the real challenge for entrepreneurship education lies within the development of the dimensions. Thus, this statement highlights that the true challenge of entrepreneurship education lies not only in imparting theoretical knowledge but in effectively developing the practical dimensions that equip students to navigate real-world entrepreneurial obstacles and uncertainties.

However, there is a significant lack of emphasis on entrepreneurship education as part of vocational education in Hebei Province (He, Zheng, Cheng, Lau, & Yin, 2019; Jia & Deng, 2024; Li, He, & Zhao, 2020). Most of the existing curricula do not emphasize the dimension of entrepreneurship, and thus students have low chances of attaining higher levels of employment through the utilization of technical skills. An analysis of vocational education shows that there is a low level of integration of enterprise education, and this hampers the ability of the learners to take their technical education into an enterprise environment (Shegelman, Shchukin, & Vasilev, 2015). This criticism is consistent with other general results in the literature, which indicate that funding deficiency, improper curriculum, the limited number of qualified teachers, and a poor attitude toward the learning of entrepreneurship are the main issues that limit the adoption of entrepreneurial skills within the programs of technical colleges (Muhammad, Kamin, & Wahid, 2019).

Nevertheless, this deficiency in teaching the issues of entrepreneurship education can be addressed with a multi-faceted curriculum that will help to teach the necessary entrepreneurial skills, including technical skills, business management, and interpersonal skills, as well as increase the supply of qualified teachers and sufficient resources for vocational training (Muhammad et al., 2019).

Nevertheless, little focus on entrepreneurship education leads to the gap between the knowledge and skills that students are taught and the demands of the market; therefore, the curriculum should be changed to focus more on entrepreneurship education (Amjad, Rani, & Sa'atar, 2020).

The key issue highlighted by the past literature is that students in vocational colleges lack a good spirit and entrepreneurial skills, which limits their capabilities to venture into entrepreneurial activities once they complete their studies. Although Amjad et al. (2020) focus on the necessity of curriculum change, they do not consider the role of pedagogical models, including the ADDIE model, in the organization of effective entrepreneurship education enough. This lacuna highlights the relevance of trying to understand how systematic teaching design can help fill the disparity between the theoretical and the practical.

The importance of meeting this challenge is that the amount of education with positive intentions and perceived behavioral control on entrepreneurship among students would influence their innovation capacity and ability to create jobs in the area (Istiqomah et al., 2022).

Additionally, it is essential to note how these educational programs affect the outcomes to be used in future policies and courses. Nevertheless, even though the study by Istiqomah et al. (2022) points to the greater good of entrepreneurship education; the work is not critical about the long-term sustainability of the above effects. This begs the question of whether short-term benefits of entrepreneurial intentions are a predictor of long-term entrepreneurial activity, especially in areas with little economic opportunities such as Hebei Province.

1.2. Research Aim and Objectives

The purpose of the study is to evaluate the impact of entrepreneurship education with the ADDIE model on the entrepreneurial intentions of Hebei province higher vocational college students, which will combine the Theory of Planned Behavior (TPB) and the theory of Learning by Doing by John Dewey as an analytical framework.

Now, for this research objectives are given below:

1. To compare the attitudes and perceived behavioral control of students in vocational colleges in Hebei Province before and after participating in the entrepreneurship education curriculum.
2. To assess the effect of entrepreneurship education curriculum on the entrepreneurial attitude of students in vocational colleges in Hebei Province.
3. To examine the effect of entrepreneurship education curriculum on students' perceived behavioral control in vocational colleges in Hebei Province.

1.3. Research Hypotheses

Hypothesis 1: There is a significant difference in the attitudes and perceived behavioral control of students in vocational colleges in Hebei Province before and after participating in the entrepreneurship education curriculum.

Hypothesis 2: The entrepreneurship education curriculum has a significant positive impact on the entrepreneurial attitude of students in vocational colleges in Hebei Province.

Hypothesis 3: The entrepreneurship education curriculum significantly enhances students' perceived behavioral control in vocational colleges in Hebei Province.

2. LITERATURE REVIEW

2.1. Entrepreneurship Education in Vocational Colleges

It is worth using entrepreneurship education at vocational colleges as this will equip students with the skills and knowledge needed in the business world. The students are taught and trained on skills relevant to entrepreneurship. Due to the growth in demand for skilled entrepreneurs, simple entrepreneurship should be included in vocational training. A study indicates that an entrepreneurship course enhances students' innovative capacity and prepares them for real-life experiences in business ventures (Istiqomah et al., 2022; Lv et al., 2021). Nonetheless, although these

studies emphasize the importance of entrepreneurship education, they tend to overlook the challenges faced by vocational colleges in implementing such curricula. As an example, Istiqomah et al. (2022) discuss the significance of innovation skills and do not examine how the limitations on resources in vocational institutions may restrict the practical use of these skills. The existing gap highlights the necessity of further context-sensitive studies that would take into account the peculiarities of vocational education.

With the application of certain learning methods involving the Business Model Canvas, students can better understand the organization of businesses and strategic planning that allows alignment of learning frameworks with career-oriented objectives (Nasri, Che'Rus, & Syuhaiza, 2024). Experiential learning and simulation solutions are some of the teaching strategies implemented and used in vocational colleges, whose benefits in the development of entrepreneurial skills are very high.

These teaching methods provide students with practical exposure similar to business situations, thus enabling the enhancement of problem-solving and decision-making skills among students (Shao, 2023). While Shao (2023) highlights the effectiveness of experiential learning, there is limited discussion on how these methods can be adapted to different cultural and economic contexts, such as those in Hebei Province. This lack of adaptability may hinder the broader applicability of these strategies, particularly in regions with limited access to advanced simulation tools or experienced educators.

The use of cases also enhances the growth of analytical skills required for the efficient running of businesses, other than granting scholarships as mentioned in the case studies (Miller & Konstantinou, 2022). However, Miller and Konstantinou (2022) do not critically evaluate the long-term impact of case-based learning on entrepreneurial success. While case studies may improve analytical skills, their effectiveness in fostering entrepreneurial intentions or actual business creation remains underexplored. This raises questions about whether such methods are sufficient on their own or need to be supplemented with other pedagogical approaches.

However, there are still significant barriers that vocational institutions must overcome to offer effective entrepreneurship education. Lack of funds, inadequate preparation of professors, and a gap between concept and reality render these programs less efficient (Sun, 2023; Xu, 2024). Although Xu (2024) and Sun (2023) identify key barriers; their analyses do not provide actionable solutions to address these challenges. For example, while they mention inadequate preparation of professors, they do not explore how targeted professional development programs or partnerships with industry experts could mitigate this issue. This omission highlights the need for more practical recommendations to improve the level of entrepreneurship education.

Moreover, a failure to embrace innovation and entrepreneurship competitions deters the creation of evaluation programs that offer insights into students' performance (Xu, 2024). Therefore, it is crucial to deal with these challenges since it will enhance the quality and effectiveness of entrepreneurship education in vocational colleges, 'producing' students who will be ready to practice as well as thrive as enterprising citizens. However, the emphasis on innovation and competition, while valuable, may not fully address the broader systemic issues such as curriculum rigidity or lack of institutional support. Xu (2024) does not critically examine how these competitions can be integrated into existing curricula without overburdening students or educators. This points to a need for a more holistic approach to entrepreneurship education that balances innovation with practical feasibility.

Although vocational colleges have incorporated aspects of entrepreneurship education into their curricula, concerted efforts to address this current state must be intensified to better equip students to handle the exigencies of entrepreneurship in the future. However, the available literature tends to lack critical insights into how such cumulative efforts can be optimally applied across various educational environments. For example, while the promotion of integrating entrepreneurship education is active, questions regarding how these programs can be coordinated with the local economy and culture receive limited attention, especially in regions such as Hebei Province. This discrepancy highlights the need to adapt entrepreneurship teaching to the specific needs and limitations of different vocational schools.

2.2. Entrepreneurial Attitudes and Their Development

Among the aspects of attitude development of students towards entrepreneurship, influenced by education, motivation, risk perception, and self-beliefs, may be outlined. Based on recent research, through education on the topic and knowledge of entrepreneurship, students achieve a positive attitude towards success and self-confidence in the successful application of business practices (Jiatong et al., 2021; Saadat, Aliakbari, Majd, & Bell, 2022). To give an example, Jiatong et al. (2021) it has been observed that entrepreneurial education, as prepared by the subject, not only equips students with sufficient knowledge and skills but also enhances their confidence in identifying market opportunities.

Moreover, a key point from the research by Saadat et al. (2022) is that effective entrepreneurship education fosters positive outcomes, such as developing an entrepreneurial mindset that increases students' entrepreneurial alertness. However, despite the positive findings regarding the usefulness of entrepreneurship education, many studies lack discussion of individual differences in outcomes, which may include socio-economic background, previous exposure to entrepreneurial activities, and other factors. This limitation suggests that a one-size-fits-all approach to entrepreneurship education may not be effective, and more tailored interventions are necessary to address the diverse needs of students.

However, the negative impacts on the planned development of entrepreneurial attitudes are caused by psychological and contextual factors. Economic uncertainty could be another possible antecedent, as it is likely to increase students' risk aversion, which, in turn, will negatively affect their entrepreneurial intentions (Bazkiaei, Heng, Khan, Saufi, & Kasim, 2020). Other cultural aspects entail the fact that in cultures with a low or stifled brave entrepreneurship spirit, students fear failure of an endeavor they have undertaken and decrease their willingness to engage in any entrepreneurial undertaking (Karyaningsih, 2020; Sun, Shi, & Zhang, 2023). Although both in Bazkiaei et al. (2020) and Sun et al. (2023) studies, there is essential information on the influence of external factors; the study does not go deeper into how they can be addressed through entrepreneurship education. As an example, the issues of resilience and failure management could be included in the curriculum to help students overcome the fear of failure, which is not mentioned in the literature. The gap also highlights the importance of conducting further studies on ways in which education can overcome psychological and cultural obstacles to entrepreneurship.

These external influences define the conditions that young people are exposed to as individuals in relation to the phenomenon of entrepreneurship, which is why the educational issue cannot be resolved within a simple framework. Measuring the level of entrepreneurial attitudes in university students employs various methods such as self-completion questionnaires and behavioral tests and measurements. Nevertheless, these tools are objective as they measure students' attitudes and beliefs; however, self-deception or social desirability bias might also inflate responses, Li, Cao, and Jenatabadi (2023); Supriyanto, Pardiman, and ABS (2020). Although Li et al. (2023) and Supriyanto et al. (2020) identify potential biases in measurement tools, they do not propose concrete solutions to address these issues. For instance, combining self-reported data with observational or longitudinal studies could provide a more accurate picture of entrepreneurial attitudes, but this approach is underexplored in the existing literature. This limitation underscores the need for methodological advancements in assessing entrepreneurial attitudes.

Research findings indicate the need to adopt uniform assessment approaches with components of both quantitative and qualitative data as an added advantage in identifying the nature of entrepreneurial attitudes and elements that prompt them (Green et al., 2015). However, while Green et al. (2015) advocate for mixed-method approaches, they do not critically evaluate the challenges of implementing such methods, such as resource constraints or the potential for conflicting findings between qualitative and quantitative data. Addressing these challenges is crucial for developing more robust and actionable insights into entrepreneurial attitudes. Therefore, there is a necessity to further advance the existing practices to obtain more concrete information regarding the entrepreneurial attitudes of students at learning institutions.

2.3. Perceived Behavioral Control and Entrepreneurial Confidence

Another TPB construct used in explaining the intention of individuals to become involved in entrepreneurial activities, especially in vocational education, is Perceived Behavioral Control (PBC). PBC is defined as how individuals believe they have the ability required to engage in a behavior like entrepreneurial emergence. Some empirical findings have confirmed that the higher the perceived behavioral control, the higher the intention of the student to practice entrepreneurship (Noor & Malek, 2021; Noor, Malek, Yaacob, & Omar, 2021; Saraswati, Indrawati, & Wardana, 2021). The reason behind this is that, once students feel comfortable coping with some of the challenges that are bound to come their way in terms of resources and decisions to undertake, they are likely to venture into entrepreneurship.

Nevertheless, although such studies provide evidence of a positive correlation between PBC and entrepreneurial intentions, they tend to overlook the sustainability of this correlation in the long term. As an example, it is not yet clear whether the initial increase in PBC can be reduced to successful entrepreneurial survival or wears off in the long run because of external factors like market competition or economic fluctuation. This discrepancy indicates the necessity of longitudinal studies as a better way to comprehend how persistent PBC is in its influence on entrepreneurial performance.

PBC in entrepreneurship is influenced by many factors, including resources at hand, exposure to role models, exposure to other businesses and entrepreneurs, and personal beliefs. As an example, sufficient financial and educational support raises the perceived self-efficacy of the student concerning the development of entrepreneurship and their readiness for entrepreneurship (Duong, 2022; Hendriana, Bhinekawati, & Farransahat, 2025; Shi, Yuan, Bell, & Wang, 2020). Mentorship is also important because it offers a source of information that can also increase self-efficacy resulting in the enhancement of students' perceived capacity to achieve in entrepreneurship (Hendriana et al., 2025). While mentorship is widely acknowledged as a critical factor, existing literature often overlooks the challenges of implementing effective mentorship programs in vocational settings. For example, the availability of qualified mentors and the alignment of mentorship content with students' specific entrepreneurial contexts are rarely discussed. Addressing these gaps could significantly enhance the effectiveness of mentorship in boosting PBC.

However, there are contingent factors, such as social caution against self-employment and economic uncertainty, that can decrease students' perceived behavioral control, thereby affecting their entrepreneurial intentions (Dong, Fang, & Ye, 2024; Tahir & Kutpudeen, 2023). Although Tahir and Kutpudeen (2023) and Dong et al. (2024) identify these barriers, they do not provide actionable strategies to mitigate their impact. For instance, integrating resilience training or risk management modules into entrepreneurship education could help students better navigate these challenges, but such interventions are rarely explored in the literature. This omission underscores the need for more practical solutions to address the external factors that hinder perceived behavioral control (PBC).

Moreover, the other studies reveal that the PBC of students is enhanced through entrepreneurship education. This beneficial transformation occurs because of the impact of entrepreneurship education that upgrades the skills, knowledge, and resources of students to boost their self-efficacy in entrepreneurship (Shi et al., 2020). The literature notes that the further development of PBC with the help of specific training contributes to the subsequent increase in the level of PBC that predetermines intentions of the students to start a business enterprise (Firdaus, Suryokumoro, & Hamidah, 2023).

Nevertheless, such studies tend to ignore the influence of cultural and institutional factors on determining the effectiveness of entrepreneurship education. E.g., in such areas as Hebei Province, where the cultural perception of entrepreneurship is not as positive, the effects of education on PBC may be minimal unless it is accompanied by a wider shift in the cultural perception of business. This emphasizes the need to contextualize the teaching of entrepreneurship to suit the local context in terms of culture and the economy.

2.4. Theoretical Framework

In this theoretical framework, the two theories applied are: the Theory of Planned Behaviour (TPB) and Dewey's Learning by Doing theory. The theories serve as guidelines within which the researchers can conceptualize the relationship between the provision of entrepreneurship education and the development of entrepreneurial intentions in students, focusing on constructs such as attitude formation, perceived behavioral control, and experiential learning. In some aspects, these theories briefly explain the impact of education on students' entrepreneurial disposition and behavior.

The theory of planned behavior, which was developed by Icek Ajzen, believes that any intention or behavior will be determined by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). Within this theory, emphasis is placed on the perceived attitude towards the entrepreneurial trajectory, perceived behavioral control over actions related to entrepreneurship, and norms concerning the undertaking of entrepreneurship (Ajzen, 2020). This theory is useful in explaining the impact of entrepreneurship education as it sheds light on the influence of education on students' behavior in terms of attitude and perceived control over business ventures. Therefore, with attitude and perceived control as its main constructs, TPB offers a constructive model to study the influence of education on intentions to become an entrepreneur.

The theory of John Dewey, labeled as Learning by Doing, revealed that practice is the most effective method of learning, which implied that individuals learn in the best manner when they practice in real-life situations (Li, 2023). Dewey stated that learning occurs through various transactions with the environment that involve critical reflection of ideas (Tu & Zhu, 2023). Thus, the study of Dewey's theory is important for examining the effects and benefits of promoting interactive approaches to teaching entrepreneurship in schools, as well as increasing students' acceptance of new enterprise activities. This theory is useful for understanding and demonstrating the real-world practical application of entrepreneurial knowledge, as well as its process and outcome on students' entrepreneurial competence and self-employment aspirations.

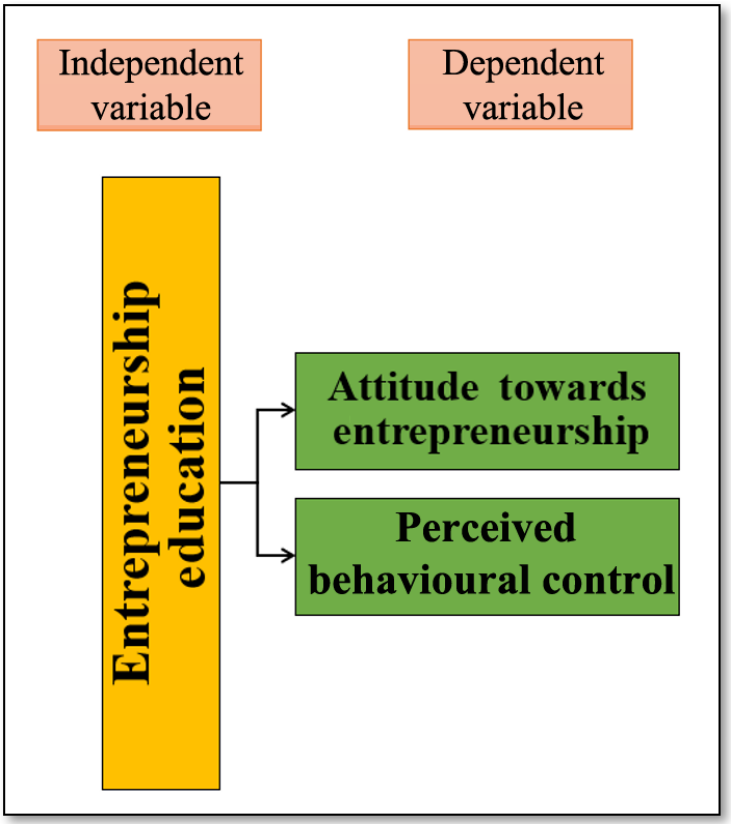

Figure 1. Conceptual framework.

2.5. Conceptual Framework

The conceptual framework depicted in the picture illustrates the linkage between the independent variable, Entrepreneurship Education, and two dependent variables: Attitude Towards Entrepreneurship and Perceived Behavioral Control (Figure 1). Entrepreneurship education as the main independent variable indicates that this variable functions as a predictor in shaping students' perceptions of entrepreneurial attitudes and perceived behavioral control. The arrows drawn from entrepreneurship education to attitudes and perceived behavioral control illustrate the direction of influence. This aligns with the Theory of Planned Behavior (TPB), where perceived attitudes and perceived behavioral control are considered primary antecedents to the intention to engage in entrepreneurial activities. Additionally, it supports John Dewey's concept of "Learning by Doing," which posits that knowledge acquired solely through theoretical means lacks the practical impact achieved through experiential learning. This approach fosters a culture of practical application among student-entrepreneurs. The proposed framework is straightforward but does not account for interaction or moderating factors such as individual personality attributes or socio-economic conditions, which may also influence entrepreneurial intentions. Although it demonstrates a clear cause-and-effect relationship, the absence of an exploratory framework could limit its applicability in different contexts.

3. METHODOLOGY

3.1. Research Design

This study uses a cross-sectional research design, which involves the collection of data at two different points in time pre- and post-entrepreneurship education courses. It is beneficial in assessing the changes in students' attitudes and perceived behavioral control resulting from the educational intervention (Cvetkovic-Vega, Maguiña, Soto, Lama-Valdivia, & Correa López, 2021). The evaluation of data collected from the same group of students at two different time points allows us to determine any differences that occurred in the subject due to the introduction of the entrepreneurship education curriculum. It also enables one to compare and gain an idea of the initial impression of the participants with respect to the program. In addition, the quantitative methodology of research is employed because it concerns the gathering of survey data that can be statistically processed (Thomas & Zubkov, 2023). This research should be quantitative since it will enable the research to measure attitude and perceived behavioral control of the students, which will guarantee that the research will yield quality data on the result of the entrepreneurship education program. The method is rather significant since it reduces the degree of bias and introduces the measurable change, which is in line with the aim of the research to identify how entrepreneurship education affects the intentions of entrepreneurship.

3.2. Application of the ADDIE Model in Evaluating Entrepreneurship Education

One of the most frequently used models for the development of instruction is ADDIE, which includes five processes: Analysis, Design, Development, Implementation, and Evaluation. It provides a scientific approach to developing programs utilized in the dissemination of information. This model was particularly helpful in this study, as it assisted in structuring the design of the curriculum evaluation of entrepreneurship education, as well as assessing students' intentions, attitudes, and perceived behavioral control. The use of the ADDIE model in this research will help determine the needs of students related to entrepreneurship education, the delivery of the program, and the most appropriate outcomes. The five phases are explained as follows:

3.2.1. Analysis Phase

In the analysis phase, the initial objective was to gain basic information about the current status of the students' entrepreneurial intentions, their attitudes, and perceived behavioral control. Self-completed questionnaires were used as a tool to measure the students' initial levels of intention for entrepreneurship before enrolling in the curriculum.

This was useful in creating a baseline that could be used to compare the findings of the study in advanced stages. It also enabled an evaluation of areas in which students may still require support or further improvement regarding the entrepreneurial aspects, which constituted the underlying ideas of the curriculum and goals to be attained.

3.2.2. Design Phase

The Design Phase involved curriculum development that adhered to the Theory of Planned Behavior (TPB) as well as John Dewey's Learning by Doing approach, where the learning process was planned in a manner that it became progressive at every stage of the learning process in relation to the level of education of the students. At the first level, the students provided an overview of business and the basic information and skills required to undertake entrepreneurship activity. In this stage of the study, the curriculum included general knowledge contents such as language skills, applied chemistry, applied physics, and applied mathematics. At Level 1, emphasis was placed on the fundamentals of communication and training students for real-life situations in entrepreneurship. Thus, showing and demonstrating as per Dewey's "Learning by Doing" approach, the concepts of entrepreneurship in relation to the automotive manufacturing industry were introduced to the students through small group projects. At Level 2, development moved towards a more formal and official business environment. They consolidated the acquired knowledge from Level 1 to advanced practice, majoring in functional areas such as financial control, sales, and project development related to the automotive industry. To enhance their spirit of entrepreneurship, their knowledge of business and math concepts was applied to practical problems. Level 2 activity plan sought to have students engage in more rigorous projects that aimed to illustrate samples of business activities they needed to undertake, as well as socialize entrepreneurship in the context of the automotive manufacturing industry.

3.2.3. Development Phase

In the Development Phase, the content was transformed and developed into instructional materials and lessons to address the developmental stages of the students. As for the third level, students were exposed to independent entrepreneurial-oriented actions. They used knowledge and skills learned in Level 1 and Level 2 to engage in higher-level activities, including market research, product testing, as well as resource management. This phase aimed to provide observations and freedom concerning giving students the chance to solve problems typical for business, especially automotive manufacturing. In the Development Phase, students are provided with simulations, case studies, and assignments with groups that intend to foster the acquisition of entrepreneurial skills pertinent to the automotive sector. Gradually, in Level 3, the students were involved in the design of business models, identified market opportunities, and assessed risks. They also gained practical exposure to first-generation automotive startups and engaged with entrepreneurial role models to deepen their learning. Thus, it was evident that Level 3 enabled students to learn the process of entrepreneurship by applying theoretical knowledge alongside practicing practical activities in line with Dewey's experiential learning theory.

3.2.4. Implementation Phase

In the implementation phase, the newly developed curriculum was implemented for students pursuing vocational studies majoring in automotive manufacturing technology. Throughout the three-month study period, classroom instruction was complemented by demonstrations of skills in field activities. The projects at Level 4 were expected to be conducted by students with an entrepreneurial spirit, requiring them to demonstrate extensive knowledge of business functions and the automotive manufacturing industry. The aim was for students to perform larger, more complex activities, including creating business plans, marketing initiatives, and financial models aligned with automotive entrepreneurship. At Level 4, students engaged in group assignments related to team management and leadership within the automotive industry. They were expected to assume leadership roles, work on real business tasks, and develop business solutions for real-life issues, applying lessons learned in entrepreneurship. Additionally,

students at this level led discussions, conducted workshops, and coordinated with industry professionals to enhance their entrepreneurial skills. During industrial tours, group discussions, and case study analyses, students practiced leadership skills and gained the ability to develop their own automotive-related businesses. At the highest level of this curriculum, Level 5, students demonstrated full independence in creating and implementing new business opportunities within the automobile market. The curriculum aimed to foster innovative thinking, with students leading teams and managing larger projects in automotive ventures. Participants utilized their acquired knowledge and competencies in establishing and managing automotive-related startups, addressing high-level decision-making, negotiation, leadership, and other entrepreneurial activities. Level 5 students were expected to be fully accountable for managing their business ventures and to exhibit the necessary entrepreneurial capabilities and acumen for successful deployment.

3.2.5. Evaluation Phase

The last process of the ADDIE model was the evaluation process, where questionnaires were conducted at the end of the course to measure any changes that could have occurred in the students' entrepreneurial intentions, attitudes, and perceived behavioral control. These assessments were useful in establishing the extent to which the curriculum met its goals and in the process made recommendations on the areas that needed adjustments. To obtain data about the potential improvements to be applied to the next groups of students and instructors, the latter were interviewed. In this phase, it was possible to assess the program and gather information that could be very useful in further improving the program.

Using the ADDIE model for the five steps in the development of an entrepreneurship education curriculum made it possible to design, implement, and evaluate the program, which can effectively measure the impact on students' intentions to become entrepreneurs.

Table 1. Distribution of participants across coded institutions.

Coded institution	No. of participants	Province	Institution type	Programme enrolled
University A	33	Hebei	Public vocational college	Automotive manufacturing technology
University B	32	Hebei	Public vocational college	Automotive manufacturing technology
University C	33	Hebei	Public vocational college	Automotive manufacturing technology
University D	32	Hebei	Public vocational college	Automotive manufacturing technology
University E	33	Hebei	Public vocational college	Automotive manufacturing technology
University F	32	Hebei	Public vocational college	Automotive manufacturing technology
University G	33	Hebei	Public vocational college	Automotive manufacturing technology
University H	32	Hebei	Public vocational college	Automotive manufacturing technology
Total	**260**			

3.3. Research Participants and Sampling

The participants of the present study were 260 vocational college students studying in eight universities in Hebei Province and taking Automotive Manufacturing Technology courses (Table 1). To preserve institutional anonymity, the eight participating vocational colleges are referred to as Universities A-H. This coding maintains confidentiality as demanded by the administrators but still reflects the magnitude of the sample in Hebei Province. This particular vocational category was selected as it is most relevant to the overall concept of vocational education, which aims to

improve students' skills through practical and technical training necessary for the automotive field. The students selected for this study are majoring in Automotive Manufacturing Technology because this field is highly relevant to the concept of vocational education, emphasizing practical and technical skill development. The automotive industry, being dynamic and technology-driven, offers numerous opportunities for entrepreneurial ventures, making it an ideal context to assess the impact of entrepreneurship education (Rotjanakorn, Sadangharn, & Na-Nan, 2020).

By focusing on this major, the study can examine how entrepreneurship education enhances students' abilities to apply their technical skills in real-world business settings, particularly in automotive manufacturing. This targeted approach ensures the research aligns with both industry needs and educational objectives. By age, 92 students were 22 years old, 87 students aged between 20-21 years old, and 81 students aged between 18-19 years old. Concerning the gender distribution of the participants, more females responded to the survey than males, with 135 female participants compared to 125 males. The participants selected consist of learners from the first year up to the last semester of their respective vocation-oriented programs. Such a variety of ages and academic levels means that students of various ages and progress in vocational education are included in the study, and thus a wider view of the influence of entrepreneurship education on students is received. In this case, the sampling technique used was simple random sampling for this study's participants. This reduces selection bias and makes everyone equally likely to be selected, making it the best method of selecting the sample size (Noor, Tajik, & Golzar, 2022). This approach was adopted since it did not involve any predisposing factors, and the sample thus obtained can be assumed to be a true reflection of vocational students within the specified region. This study was targeted at generating dependable and general conclusions about the effects of entrepreneurship education on students in the automotive manufacturing technology field by using a sample drawn at random. This method is effective for the selection process because it does not allow the researcher's bias to influence the selection from the large and diverse student population.

3.4. Data Collection and Research Instruments

As for the data collection, the approach to the choice of participants was considered to be strategic to attract more students. The structured questionnaires were administered through popular Chinese social and digital media platforms such as WeChat, Weibo, QQ, Zhihu, Douyin, and Baidu Tieba. These social platforms are very popular with the Chinese population and even more with college students, which ensures a large sampling of the target audience and a broad cross-section of respondents. The participation of students on these platforms ensures a high response rate as well as the representation of diverse demographics (Zhang et al., 2021; Zhu, 2019). This allowed the choice of platforms that would cover the greatest variety of students and create a diverse sample, which was beneficial in terms of the efficiency of data collection.

According to the type of research and the target population, the most suitable and effective tool for data collection in this research was the survey questionnaire. This study employed an online-based questionnaire where the participants were asked two types of questions: demographic questions and main questions. Demographic questions included question four, which asked about the age of the respondent, gender, student level, and exposure to entrepreneurship through past participation in any entrepreneurship program. These demographic questions laid the foundation for understanding the context of the participants and for categorizing the data based on factors such as the level of academic education and previous familiarity with the subject of entrepreneurship. The main survey questionnaire consisted of three sections, reflecting the three variables of research interest: Entrepreneurship Education, Attitude Towards Entrepreneurship, and Perceived Behavioral Control. Six questions were included in the Entrepreneurship Education section, six in the Attitude Towards Entrepreneurship section, and six in the Perceived Behavioral Control section. This resulted in a total of 18 questions in the main survey. The Likert scale was employed across all three sections, with each statement answered on a five-point scale: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree.

Among the benefits of the Likert scale, one can distinguish that it allows determining the degree of agreement or disagreement with the statements provided by the participants, which meets the qualitative analysis of their attitudes and perceptions (Jebb, Ng, & Tay, 2021). This scale was also a reliable and valid method of responding and perceiving the differences in how the participants approached attitudes toward entrepreneurship education and intentions. The reliability coefficient of the survey instrument was determined using Cronbach's alpha, which is equal to 0.913.

Research shows that a coefficient of 0.7 and above is acceptable in research; therefore, we can ascertain that the items in the survey are consistent and reliable (Izah, Sylva, & Hait, 2023). This is an acceptable reliability score of 0.913, indicating a high level of reliability of the survey since it demonstrates that the survey accurately measures the intended constructs with minimal error. This internal reliability also supports the survey instrument, implying that it can be used to accurately capture students' attitudes, perceived behavioral control, and their intentions towards entrepreneurship. Additionally, the same survey questionnaire was used before the implementation of the analysis phase and at the end of the evaluation phase to establish their attitudes towards entrepreneurship before and after receiving entrepreneurial knowledge. This was made possible due to the consistency of the instrument, facilitating data comparison and ruling out any chances of fluctuations in students' entrepreneurial intentions caused by inconsistency in the measurement tool. This strategy proved useful in establishing the credibility of the study and the ability to determine whether the education program in leadership was effective in enhancing entrepreneurship among the participants.

3.5. Validity and Reliability

To ensure the validity of the research instrument, a pilot study was conducted prior to the main data collection. The pilot study involved 30 participants, who were selected from a vocational college in Hebei Province, similar to the target population. The primary objective was to assess the clarity and effectiveness of the survey questions and identify any potential issues in the questionnaire design. Participants completed the survey and provided feedback on the comprehensibility of the questions and the appropriateness of the Likert scale. Based on the feedback, no changes were required, as the participants found the questions clear and the scale appropriate. Therefore, the main questionnaire remained the same for the full study. The pilot study confirmed the validity and reliability of the instrument, demonstrating a Cronbach's alpha of 0.913, indicating that the survey tool accurately measured the variables of entrepreneurial attitude, perceived behavioral control, and intentions.

3.6. Data Analysis

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 26.0 to assist in drawing conclusions and interpreting the findings. Initially, a descriptive analysis was performed to assess the general characteristics of the participants, including their age, gender, and academic year. This provided a clear understanding of the sample's composition as identified and acknowledged in the study. Regarding inferential statistics, an independent t-test was utilized to analyze the participants' perceived attitudes and perceived behavioral control as students of vocational colleges in Hebei Province, before and after implementing the entrepreneurship education curriculum. This test facilitated the detection of any changes that might have resulted from the intervention. Additionally, the participants' attitudes towards entrepreneurship and perceived behavioral control were examined using linear regression analysis to evaluate the impact of the entrepreneurship education curriculum. These regression models helped determine the extent to which the curriculum influenced these variables and provided insights into how the educational intervention affected entrepreneurial intentions and perceived ability to regulate these behaviors.

3.7. Ethical Consideration

Conducting any research entails some level of ethical consideration, and this study has not been exceptional in this regard. First, to ensure that none of the participants in the research were identified or their identities revealed, all the students completed the survey voluntarily, and individual information and characteristics of the students were not collected. The participants were asked to willingly give their consent to partake in the research, with emphasis made on the fact that the views expressed would be used exclusively for research purposes. Each participant was told that they could refuse to participate at any time without any deleterious effects (Nii Laryeafio & Ogbewe, 2023). The questions developed for the survey did not intrude on the respondents' personal lives and work but rather were aimed only at the low-ambition entrepreneurship education goals. Moreover, the research made it a point that there were no risks to participants, as they did not include physical, psychological, or emotional risks in the study. Regarding data, it was safely kept and kept away from individuals who are not researchers (Vemuri, Thaneeru, & Tatikonda, 2023). Ethical practice was maintained throughout the study to ensure that all results were reported accurately, without influence from the researcher or other biases, thereby preserving integrity. Furthermore, the study was approved by the required institutional review board to meet ethical standards in conducting the research.

Table 2. Demographic data of participants.

Factor	Attribute	Frequency	Percent %	Mean	Standard deviation
Age	18-19 years old	81	31.2	2.04	0.82
	20-21 years old	87	33.5		
	22 years old	92	35.4		
	Total	260	100.0		
Gender	Male	125	48.1	1.52	0.50
	Female	135	51.9		
	Total	260	100.0		
Academic year	First Year	66	25.4	2.41	1.05
	2nd Year	68	26.2		
	3rd Year	80	30.8		
	Final Year	46	17.7		
	Total	260	100.0		
Entrepreneurship program participation	Yes	118	45.4	1.55	0.50
	No	142	54.6		
	Total	260	100.0		

4. FINDINGS

4.1. Demographic Data

The data Table 2 presents both a demographic breakdown and responses from a survey involving 260 participants. In terms of age distribution, the majority of participants are 22 years old, accounting for 35.4% (92 participants) of the sample. This is followed by those aged 20-21, who constitute 33.5% (87 participants), while the 18-19 age group represents 31.2% (81 participants). The average response score for the 18-19 age group is 2.04, with a standard deviation of 0.82, indicating moderate variability in responses. Regarding gender distribution, females comprise a slightly larger proportion of the survey population at 51.9% (135 participants), compared to males at 48.1% (125 participants).

On average, males have a response score of 1.52 with a standard deviation of 0.50, suggesting relatively consistent responses within this group. In terms of academic year, 3rd-year students form the largest proportion at 30.8% (80 participants), followed closely by 2nd-year students at 26.2% (68 participants) and 1st-year students at 25.4% (66 participants). Final-year students constitute the smallest group, accounting for 17.7% (46 participants). The average response score for 1st-year students is 2.41, with a standard deviation of 1.05, indicating a relatively higher spread in responses within this group. Additionally, participation in the entrepreneurship program is nearly balanced, with 45.4% (118 participants) having taken part, while 54.6% (142 participants) have not. Those who participated in the

program have an average response score of 1.55 and a standard deviation of 0.50, suggesting a narrow range of responses within this category.

4.2. Hypotheses Testing

Hypothesis 1: There is a significant difference in the attitudes and perceived behavioral control of students in vocational colleges in Hebei Province before and after participating in the entrepreneurship education curriculum.

To test the above hypothesis, an independent sample t-test was conducted to compare the attitudes and perceived behavioral control of students before and after the entrepreneurship education intervention.

Table 3. Mean comparison of attitudes and perceived behavioral control before and after entrepreneurship education.

Variables	Pre-test		Post-test		t	df	p	Cohen's d
	M	SD	M	SD				
Perceived behavioral control	1.94	0.43	3.46	0.38	-42.87	518	<.001	4.044
Attitude towards entrepreneurship	1.96	0.44	3.45	0.41	-40.24	518	<.001	3.660

Note: M = Mean, SD = Standard deviation.

Table 3 reveals significant mean differences in both perceived behavioral control and attitudes toward entrepreneurship among students before and after participating in the entrepreneurship education curriculum. For perceived behavioral control, students reported a post-test mean of 3.46 (SD = 0.38) compared to a pre-test mean of 1.94 (SD = 0.43), resulting in a very large effect size (Cohen's d = 3.76). The t-test yielded a value of -42.87 (df = 518, $p < .001$), indicating a statistically significant increase. Similarly, attitudes toward entrepreneurship showed a substantial increase from the pre-test mean of 1.96 (SD = 0.44) to the post-test mean of 3.45 (SD = 0.41). The t-value of -40.24 (df = 518, $p < .001$) and Cohen's d of 3.50 suggest a very large effect size, corroborating the significant impact of the entrepreneurship education curriculum. These results strongly support Hypothesis 1, indicating that the entrepreneurship education curriculum significantly enhanced both the attitudes and perceived behavioral control of students, reflecting its effectiveness in fostering entrepreneurial capabilities.

Hypothesis 2: The entrepreneurship education curriculum has a significant positive impact on the entrepreneurial attitude of students in vocational colleges in Hebei Province.

To examine this hypothesis, a simple linear regression analysis was conducted to assess the impact of the entrepreneurship education curriculum on students' entrepreneurial attitudes.

Table 4. Regression analysis of entrepreneurship education impact on entrepreneurial attitude.

Variables	B (Unstandardized)	Beta (Standardized)	SE	t	p	95% CI
Constant	3.967	-	0.244	16.247	0.000	[3.486, 4.448]
Entrepreneurship education	-0.148	-0.131	0.070	-2.127	0.034	[-0.285, -0.011]

The regression output (Table 4) indicates that entrepreneurship education has a statistically significant impact on entrepreneurial attitude among students, with an unstandardized coefficient B=−0.148 and a standardized coefficient β=−0.131, p=.034. The negative coefficients suggest a decrease rather than an expected increase in entrepreneurial attitude, indicating an inverse relationship. The model explained a very small portion of the variance in entrepreneurial attitude (Adjusted R^2 = .013), suggesting that other factors might play a more substantial role in shaping these attitudes.

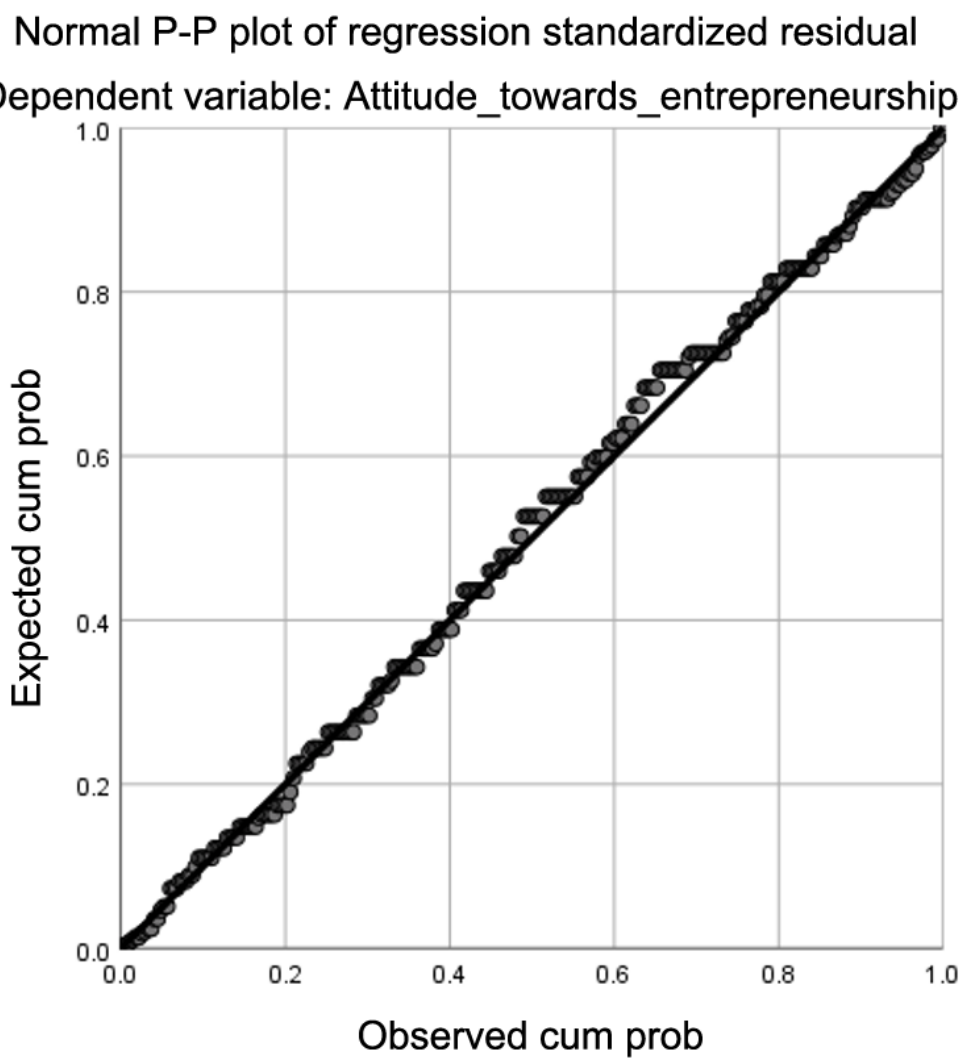

Figure 2. Normal P-P plot of regression standardized residual for entrepreneurial attitude.

In the Normal P-P Plot of Regression Standardized Residuals (Figure 2), the alignment between the observed cumulative probabilities and the expected values indicates a normal distribution of residuals, underscoring the appropriateness of the regression model for evaluating the effects of entrepreneurship education on entrepreneurial attitudes. The normal distribution of residuals confirms that the model's assumptions are adequately met, offering further credibility to the findings.

Hypothesis 3: The entrepreneurship education curriculum significantly enhances students' perceived behavioral control in vocational colleges in Hebei Province.

To investigate this hypothesis, a simple linear regression was used to assess the impact of the entrepreneurship education curriculum on perceived behavioral control among students.

Table 5. Regression analysis of entrepreneurship education impact on perceived behavioral control.

Variables	B (Unstandardized)	Beta (Standardized)	SE	t	p	95% CI
Constant	3.612	-	0.226	15.954	0.000	[3.166, 4.058]
Entrepreneurship education	-0.046	-0.044	0.065	-0.707	0.480	[-0.173, 0.082]

The results from the regression analysis (Table 5) show that the entrepreneurship education curriculum does not have a statistically significant impact on perceived behavioral control, as indicated by the unstandardized coefficient B=−0.046 and the standardized coefficient β=−0.044, with a p-value of .480. Despite expectations, the coefficients

suggest a negative influence, although this is not statistically significant. The Adjusted R^2 value of -0.002 implies that the model does not effectively explain the variance in perceived behavioral control, pointing to the need for considering additional factors or variables in further studies.

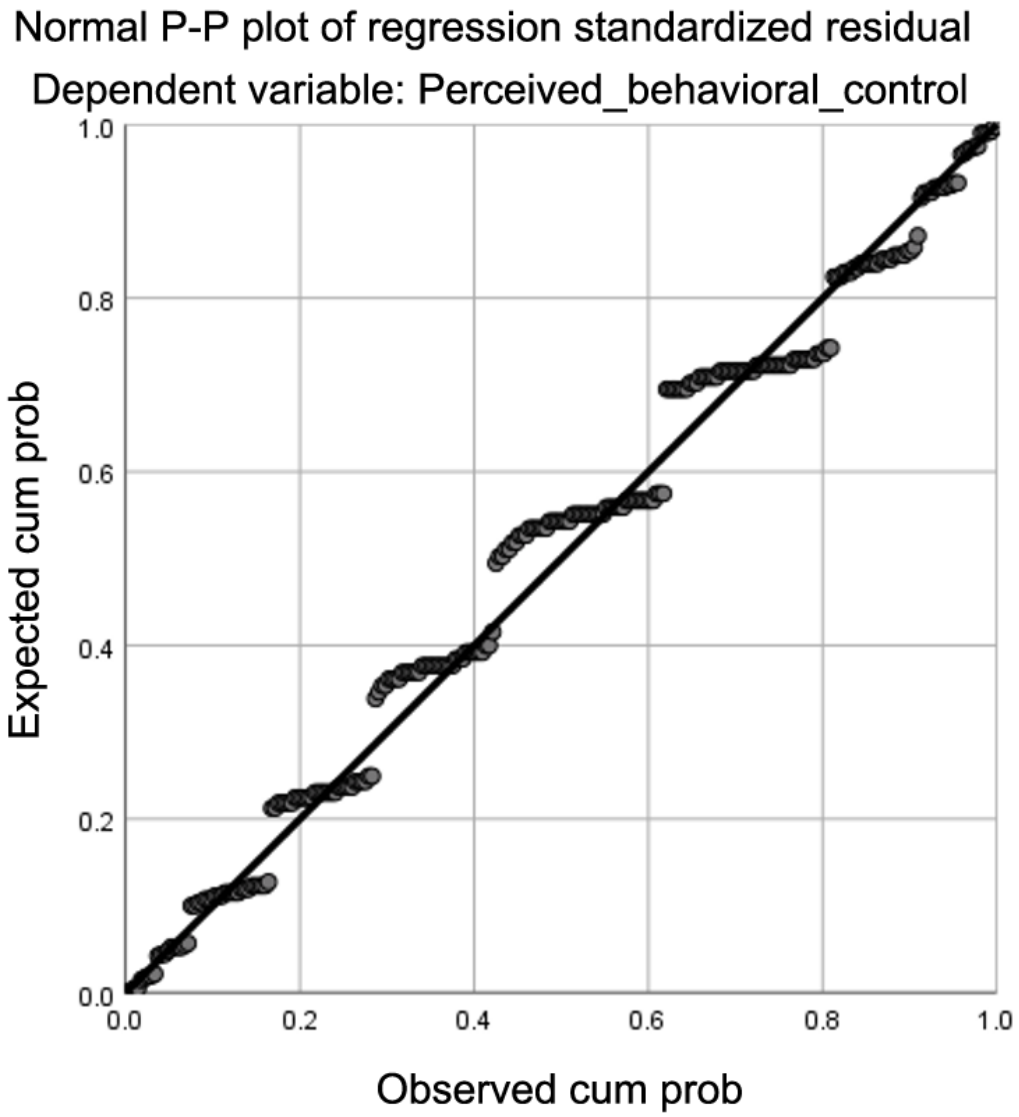

Figure 3. Normal P-P plot of regression standardized residual for perceived behavioral control.

In the Normal P-P Plot of Regression Standardized Residuals (Figure 3), the close alignment of the observed and expected cumulative probabilities confirms that the residuals from the regression model are normally distributed. This normal distribution of residuals reinforces the model's reliability, although the regression results did not show a significant effect of the entrepreneurship education curriculum on perceived behavioral control.

5. DISCUSSION

5.1. Comparison of Student Attitudes and Perceived Behavioral Control Before and After Entrepreneurship Education

This work revealed that participation in an entrepreneurship education curriculum enhanced students' attitudes toward entrepreneurship and perceived self-efficacy in entrepreneurship, which supports other studies that experimented with entrepreneurship education in a vocational context. These changes are deemed necessary when it comes to nurturing the developing spirit of an entrepreneur in young learners. In this regard, the following research studies provide support for the postulated conclusions, particularly the part on the effectiveness of entrepreneurship education in relation to students' attitudes and perceived behavioral control. For instance, Duong (2022) econometric

analysis showed that perceived behavioral control and attitudes towards self-employment moderated the relationship between entrepreneurial education and the students' entrepreneurial intention. This view echoes the study's conclusion stating that entrepreneurship education is not only a process of acquiring new information but also of changing attitudes and beliefs as well as increasing self-confidence. In line with the above understanding, Ojo and Okwilagwe (2024) explain that educational experiences may improve students' knowledge and strengthen their behavioral intentions towards entrepreneurship, thereby supporting the understanding that entrepreneurship education plays an important role in behavior change.

Analyzing these outcomes from a theoretical point of view, TPB can be considered a useful model. According to TPB, perceived behavioral control, perceived attitude, and subjective norm are the best predictors of intended behavior (Suryadi & Anggraeni, 2023). In this study, the enhancement of attitudes and perceived control can be considered as the critical antecedents of entrepreneurial intentions. Hasyim, Hasan, Supatminingsih, Ma'ruf, and Nuraisyiah (2022) show that enhanced attitudes play a very strong role in predicting entrepreneurial intentions, meaning that if education is to foster greater levels of entrepreneurial industry among students, educational practices aimed at modifying these elements and those affected by them may be of great help. Moreover, based on John Dewey's learning-by-doing theory, there is another way of analyzing these results. According to Dewey, one has to experience something to fully understand and be able to reproduce what he or she has learned (Lackéus, 2020). The observations made from the study therefore point to the view that the applied aspects in the process of entrepreneurship education play a crucial role in attitude change and perceived behavioral control. This is supported by the findings made by Boldureanu, Ionescu, Bercu, Bedrule-Grigoruţă, and Boldureanu (2020) where the use of the experiential approach in the course enhances the knowledge of students and their intentions and attitudes towards being an entrepreneur. Therefore, the change in students' attitudes and perceived behavioral control from this study confirms previous studies that support the importance of entrepreneurship education. The findings, as a result of applying the theory of planned behavior and the Deweyan approach to learning, stress the high value of concrete educational activities for fostering the spirit of entrepreneurs.

5.2. Effect of Entrepreneurship Education on Entrepreneurial Attitudes

The analysis of the findings of this study showed that there was a statistical significance of the entrepreneurship education curriculum to the vocational college students' entrepreneurial attitudes. However, the regression analysis depicted the results in a negative turn, meaning that there was a decrement instead of an increment in the positive personal business attitudes. These results are in line with current studies conducted on the subject by researchers. For instance, Wu and Tian (2022) noted that while there is literature that shows that entrepreneurship education affects students in many ways, the change is not necessarily positive in attitude. They alleged that even though certain characteristics might be effective in increasing awareness of some issues, they could also influence whether and how educational programs make a difference, which implies that program outcomes are probabilistic. In a similar study, Lestari, Aryawinata, and Windson (2024) noted that the positive influence of the entrepreneurship curriculum can depend on the achievements of entrepreneurial behaviors, since these depend on how the curriculum influences students' motivation and external factors.

TPB can be used to explain the negative correlation established in this research. According to TPB, attitudes, perceived behavioral control, and subjective norms are the key factors affecting the intentions to become an entrepreneur (Huang et al., 2022). The negative results indicate that the disinclination that the students might have adopted after the completion of the curriculum might have been influenced by other factors, which include personal and social beliefs. This is supported by Dong et al. (2024), where the study reveals that perceived behavioral control has a broader effect than attitude on the intention of an entrepreneur, thereby negating conventional thinking that attitude should be the central zone of intervention. Secondly, the failure of entrepreneurship education could be explained from within the 'Learning by Doing' theory written by John Dewey. Therefore, according to Dewey,

education cannot be effective if it does not afford experiences that involve learning and provide a platform for practicing what has been learned. On other occasions, if there are breaks in the implementation of the curriculum with few elements of experience, students could not relate their knowledge to practice; thus, they might lose faith in entrepreneurship. This was in line with the assertion by Noor et al. (2021), who emphasized that active learning enhances positive outcomes among entrepreneurs. Structural and personal factors also influence students' entrepreneurial disposition. Consistent with the study of Tahir and Kutpudeen (2023), there are practical implications that indicate that the level of perceived support from the external environment, especially the government and industry, has an impact on the success of entrepreneurship education. When the community has a positive view of the program, the content being taught in school is also positive, making the program better. Otherwise, it can reduce the effects, thus adding more layers to the efforts made to link educational practices to students' entrepreneurial orientation. Hence, the implication of the negative posture of the study on the students' attitude means that program organizers need to evaluate the effectiveness of their methods more carefully. Thus, by adopting the proposals mentioned above based on the two aforementioned theories of Dewey and TPB, the educational actors can deliver curricula that positively influence the attitudes and intentions of students toward entrepreneurship.

5.3. Effects of Entrepreneurship Education on Perceived Behavioral Control

The analysis of the study revealed that the curriculum in entrepreneurship education failed to enhance the perceived behavioral control among the students of vocational colleges, an indication that curriculum development may not encompass the crucial factors of analyzing students' self-efficacies for vocational colleges. Empirical evidence is available in the literature and underlines obstacles that are inherent in the education of entrepreneurship. According to Su et al. (2021), various factors shape students' readiness to become entrepreneurs, and merely supplying knowledge does not increase perceived behavioral control. It supports the approach based on practical experiences with informational experiences, reinforcing the concept that attending entrepreneurship courses directly improves students' self-employability. Handayati, Wulandari, Soetjipto, Wibowo, and Narmaditya (2020) stated that since the purpose of entrepreneurship education is to foster entrepreneurs' mindsets in the students, the results are going to depend on the incorporation of practicality in the programs. They point out that a theoretically based curriculum may hinder the development of other skills such as confidence and decision-making abilities, which are crucial in entrepreneurship. This can be attributed to the fact that a balanced approach incorporating theoretical and practical aspects of the course is desirable and recommendable to enhance students' preparation for their future professions. The current empirical study of Huang et al. (2022) underscored that the outcomes of the exertion indicated that the effectiveness of entrepreneurship education increases if students are taught through practical examples. They claimed that the curriculum should focus on skills relevant to real life and adapt to students to enhance their satisfaction and perceived behavioral control. This supports the notion that the utilization of experiential learning encourages the level of confidence needed for entrepreneurship. Wang, Shi, and Jiang (2024) contributed to this debate by urging the improvement of the ideas of entrepreneurial learning, especially when it comes to the COVID-19 crisis. They found out that educators need to adapt to the changing paradigm in terms of how they teach students because providing the students with both the knowledge and the practical skills is important in changing the way students perceive themselves in business situations.

According to the theory of planned behavior, the curriculum was found to have not empowered perceived behavioral control. In line with the TPB, attitudes and perceived behavioral control are postulated to predict a person's behavioral intention to perform a certain act (Raj, Jasrotia, & Rai, 2024). The lack of significant change in perceived behavioral control in the present study implies that the students may not consider entrepreneurship as an option or goal, which might be due to the following reasons: economic risk or lack of social capital networks. In a recent study by Li and Islam (2021), the authors established that learners in vocational education encounter various challenges that may erode their self-confidence regarding their entrepreneurship skills. John Dewey's "Learning by

Doing" theory also supports the idea that the entrepreneurship curriculum might not have delivered these outcomes. Dewey emphasized the importance of practical activities where students apply knowledge in practice to enhance their skills and confidence. (Alias et al., 2021). Although the program was more theoretical since it only offered a few practical experiences, students might have felt very inadequately equipped to deal with entrepreneurial challenges. This resonates with other studies that assert that innovations and entrepreneurship knowledge delivery must provide relativity and real-life mimicking foundations to support the development of the required student entrepreneur skills. Hence, other social factors like the expectations from the family and the socio-cultural environment should also be brought into the equation. Ekawarna, Putri, and Denmar (2022) have stipulated that though introduction to entrepreneurship may bring about interest in the business, restrictions in the family or other societies may reduce the perceived control. This helps to support the idea that any educational program should take into account family and community requirements in case the program is to succeed. Consequently, since this study indicated that the perceived behavioral control of students who underwent the entrepreneurship education curriculum did not receive a boost, it implies that efforts used to teach this subject should be reconsidered. If external factors are met through a broader perspective teaching and learning method, the students may be in a better position to develop confidence in entrepreneurship.

6. CONCLUSION

6.1. Key Findings

The conclusion of this study shows that the subject of entrepreneurship education is crucial in shaping students' perceptions of business initiatives. There was a notable increase in the confidence students had in the entrepreneurship vocation and their appreciation of opportunities for the same after completing the curriculum. The most significant aspect of the education program was the improved attitude towards entrepreneurship, which highlights the potential of structured learning in this field to positively influence entrepreneurial perceptions. However, the research indicates that while the curriculum helped change students' attitudes, it did not significantly influence perceived behavioral control as expected. The study further acknowledges that external factors or individual differences might have a more substantial impact on strengthening the sense of personal control over entrepreneurial outcomes, as predicted when students undergo structured education. Moreover, the analysis of the role of entrepreneurship education in shaping students' attitudes revealed several unexpected outcomes, emphasizing that multiple factors influence these perceptions. This analysis suggests that although the curriculum has a positive direct impact on students' attitudes towards entrepreneurship, its effect on their self-efficacy in handling challenges requires further investigation. These research findings imply that the complexity of entrepreneurship education cannot be solely attributed to structured programs; motivation and positive attitudes can be fostered, but personal experience, environment, and exposure are critical factors in developing human capital. It also revealed that entrepreneurship education increases interest in entrepreneurship, calling for more avenues to be explored in designing strategies to build confidence in entrepreneurship.

6.2. Limitation of This Research

This study aimed to gather information on the effect of entrepreneurship education on students' entrepreneurial willingness, perception, and self-efficacy. However, several limitations must be acknowledged. First, the cross-sectional design limits the ability to infer causality of the observed effects. Despite collecting data before and after the intervention, the study does not establish a cause-and-effect relationship between the curriculum taught and the changes in students' entrepreneurial disposition. The next limitation concerns the sample. It should be noted that the questionnaire survey involved 260 students from eight different universities; however, all participants belonged to a single vocational field, automobile manufacturing technology. This may restrict the applicability of the results to students in other vocational areas or fields of study. Additionally, there is a risk of self-report bias, as data was

collected through surveys where respondents could provide socially desirable answers. Nonetheless, some level of bias is unavoidable in any research, even when efforts are made to minimize it through anonymizing participants. Furthermore, the study's short duration of three months may have limited the development of students' entrepreneurial skills, which could partly explain the observed changes in their intentions and attitudes.

6.3. Future Recommendation

The following recommendations could be useful for future research and improvement of the application of entrepreneurship education. Firstly, based on the limitations such as the cross-sectional study design, it is recommended that future studies adopt a longitudinal research design. This would make it possible to monitor over a longer period the students' intentions, attitudes, and perceived behavioral control knowledge accumulated as a result of the introduction of entrepreneurship education. For that reason, gathering longitudinal data would help in developing other conclusive causal links between educational initiatives and entrepreneurial impacts. Secondly, the growth of student samples with different vocational training areas would increase the results' external validity. Future studies can include a wider variety of fields, including engineering, hospitality, and healthcare, and thus, could offer a more significant perspective on the students' changes after the introduction of entrepreneurship education. This would also increase the sample size so that one would be able to compare the results for different fields to see if some disciplines are more receptive to the concepts of entrepreneurship than others. Furthermore, to reduce common bias affecting self-respondent studies, data collection for future research should employ both qualitative and quantitative approaches. Interviews, focus groups, or case studies could be employed to enrich survey data by adding more detail about students' experiences with entrepreneurship education and overcompensate any social desirability bias that may appear in self-administered surveys. Concerning policy implications, the best direction would be to further enhance the connection between entrepreneurship education and vocational training. The government should ensure that entrepreneurship is offered as a standard course throughout vocational training institutions of all courses that fall under trades with a high potential of encouraging the subject, such as automotive manufacturing technology. Therefore, there is a need to incorporate practice-based learning models of academics such as internships, business incubation, and partnerships with business organizations to ensure that there is a strong link between the knowledge produced and applied by academics and the real business world. Other suggestions that may also promote these programs' effectiveness include donating funds to train instructors in effective twenty-first-century teaching methods and providing funds to work with industries.

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Institutional Review Board Statement: The Ethical Committee of the University College Sedaya International, Malaysia has granted approval for this study on 19 June 2024 (Ref. No. UCSI-REC-2024-75).
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
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