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Construction of evaluation indicator system of college students' innovation and entrepreneurship education impact based on CIPP evaluation model

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Abstract

The evaluation indicator of innovation and entrepreneurship education provides a scientific and objective basis for the development of innovation and entrepreneurship education in colleges and universities. To ensure a scientific and reasonable evaluation, it is necessary to establish a comprehensive and feasible evaluation indicator system. This evaluation indicator serves as a crucial tool in measuring the performance of innovation and entrepreneurship education, enabling colleges and universities to identify and address any shortcomings. It also aids in achieving the goals of colleges and universities and effectively managing their performance. This paper utilizes the CIPP evaluation model to construct the evaluation indicator of innovation and entrepreneurship education. The literature research method, interview, and Delphi method (expert survey method) are employed to determine the percentage and weight coefficient of each indicator through two rounds of expert consultation. Finally, based on the guidance of experts and practical experience in evaluating innovation and entrepreneurship education, the final evaluation indicators are determined, consisting of 4 primary indicators, 14 secondary indicators, and 44 tertiary indicators.

Keywords

CIPP evaluation model, innovation and entrepreneurship education, indicator system, Delphi method

1.Introduction

The evaluation system for innovation and entrepreneurship education is not only important for studying relevant theories, but also for optimizing resource allocation and assessing the outcomes of such education. Therefore, it is crucial to conduct research on the teaching process, faculty, student quality, and guiding principles of applied colleges and universities. This research should establish a comprehensive evaluation indicator system based on scientific theories. Additionally, it is important to consider and address the achievements and problems in innovation and entrepreneurship education in application-oriented universities. This includes promptly addressing any issues that arise during the teaching process.

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The National Plan for Medium- and Long-term Education Reform and Development (2010-2020) emphasizes the need for reform and innovation as driving forces for education development. It highlights the importance of institutional reform and encourages local colleges and universities to engage in bold explorations and experiments. This includes innovating in personnel training, university management systems, quality evaluation, examination and enrollment systems, teaching content, methods, and means. The goal is to establish a modern university system that prioritizes talent training, focusing on producing high-quality specialized and innovative individuals. Furthermore, colleges and universities are encouraged to contribute to knowledge innovation, technology innovation, national defense science and technology innovation, and regional innovation. This can be achieved by promoting the interaction between scientific research and teaching and strengthening the construction of key scientific research innovation bases and technological innovation platforms in universities.

The Ministry of Education's "Vigorously Promoting Innovation and Entrepreneurship Education in Colleges and Universities and Self-employment of College Students" (2010) emphasizes the importance of implementing innovation and entrepreneurship education in higher education institutions. It states that encouraging college students to start their own businesses is crucial for deepening the reform of higher education teaching and cultivating students' innovative spirit and practical abilities. This initiative aims to promote employment through entrepreneurship and ensure the full employment of college graduates. It also emphasizes the need to coordinate innovation and entrepreneurship education, establish entrepreneurship bases, and support college students in starting their own businesses.

Innovation and entrepreneurship knowledge and abilities of students are developed through both theoretical learning and practical experience. Wang et al. (2018) highlight three fundamental characteristics of innovation and entrepreneurship education: innovation, creativity, and practicality. Many colleges and universities have started to reform their teaching methods by adopting non-standard answer examinations for assessing and evaluating students. However, it is important to find an objective way to evaluate students' innovation and entrepreneurship knowledge and abilities, as well as the effectiveness of the courses they have taken. This requires breaking down each factor of innovation and entrepreneurship ability and evaluating them using a relatively objective analysis method. To effectively evaluate college students' innovation and entrepreneurship knowledge and abilities, a comprehensive evaluation system must be established.

The ultimate goal of innovation and entrepreneurship education is to benefit students. It is through the accumulation of knowledge, the development of innovative thinking, the cultivation of an innovative mindset, and the enhancement of innovative abilities that students are motivated to engage in innovation and entrepreneurship activities, leading to tangible outcomes. Therefore, the effectiveness of innovation and entrepreneurship education can be measured by the quality of the talents it produces (Yu & Lu, 2020).

In the context of the CIPP evaluation model, the evaluation of an education project encompasses four levels: background, input, process, and outcome (Stufflebeam et al., 1995). By applying these levels to the evaluation of innovation and entrepreneurship education for college students in China, it is possible to analyze the indicators that assess the level of innovation and entrepreneurship education among college students. This analysis can provide practical suggestions for the cultivation of innovative and entrepreneurial talents in Chinese colleges and universities.

1.1Objectives of the research

The primary objective of this research is to assess the extent to which innovation and entrepreneurship education has been successful in terms of its context, input, process, and product. Additionally, the research

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aims to enhance the quality of talent training by fostering students' innovative mindset, entrepreneurial skills, knowledge, awareness, and ultimately promoting employment.

1.2Research questions

① What are the key factors that stakeholders consider important in evaluating the background of innovation and entrepreneurship education?

② What are the significant factors, as perceived by management, that influence the input evaluation of college students' innovation and entrepreneurship education?

③ What are the important factors, according to supervisors, that influence the process evaluation of college students' innovation and entrepreneurship education?

④ What are the key factors, from the perspective of beneficiaries, that influence the outcome evaluation of college students' innovation and entrepreneurship education?

1.3Methodology

This study will employ a combination of qualitative and quantitative methods to collect and analyze data. The research will involve literature research, interviews with experts, and the Delphi method. The literature research will involve reviewing existing documents and literature related to innovation and entrepreneurship education. The interviews with experts will provide valuable insights and perspectives on the evaluation of innovation and entrepreneurship education. The Delphi method will be used to gather anonymous expert opinions and reach a consensus on the evaluation indicator system for innovation and entrepreneurship education. The research process will involve examining related literature, analyzing relevant literature to extract indicators, conducting interviews with experts, discussing the rationality of indicators, and selecting and designing reasonable indicators based on the CIPP framework. The results yielded from such studies can be used in curriculum design or contribute to making educational decisions (Nicolson, 1989).

Literature research

Literature review is a method of gathering data by examining existing documents. This literature can include papers, electronic sources, reports, project logs, performance review logs, funding proposals, meeting minutes, newsletters, and marketing materials.

Interview method

The interview is an oral conversation between the interviewer and interviewee to collect important information about the study.

Delphi method

The Delphi method, also known as expert investigation, was initiated and implemented by the American Rand Corporation in 1946. Its consolidation began with the Rand Project in 1950. The aim of this method is to gather expert opinions to forecast the probability, frequency, and intensity of possible events or situations (Leire & Jose, 2016). In this study, the Delphi Method is used to explore and construct the evaluation indicator system of innovation and entrepreneurship education activities based on the CIPP framework. Experts' opinions are solicited anonymously through several rounds of letter consultation and feedback. Indicators are continuously optimized, and the weight of indicator dimensions is determined. Finally, a consensus of collective judgment is formed, and an evaluation indicator system of innovation and entrepreneurship edu-

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cation effect is established.

The research process for this study consists of five steps:

① Examination of related literature.

② Analysis of relevant literature and extraction of all indicators contained in the CIPP framework.

③ Interviewing the experts.

④ Discussion of the rationality of various indicators and elimination of unreasonable indicators.

⑤ Selection and design of reasonable indicators within the CIPP framework.

1.4Analysis and Results

The CIPP model revolutionized the purpose of evaluation in education, shifting it from being a means of proving success to a tool for improvement. This marked a significant advancement in the field of educational evaluation, moving away from solely focusing on goals, results, and proof, and instead emphasizing decision-making, processes, and improvement. According to Wang (2020), the evaluation indicator system for the impact of innovation and entrepreneurship education consists of 14 items. These include leadership, innovation, opportunity recognition, interpersonal communication, teamwork, resilience, perseverance, responsibility, courage, self-awareness, self-confidence, and optimism. Yang and Wang (2020) analyzed the impact of innovation and entrepreneurship education from three perspectives. Firstly, they examined the perspective of universities, considering the management system for students, the educational philosophy of application-oriented universities, the development of teaching staff, and the curriculum system. Secondly, they explored the social perspective, focusing on how students in colleges and universities can demonstrate their knowledge of innovation and entrepreneurship, their participation in social organizations, and the degree to which their reactions are accepted by their peers during their education. Lastly, they considered the student's own perspective, evaluating the students' innovative spirit and entrepreneurial abilities, and measuring the achievements of applied innovation and entrepreneurship education in colleges and universities. Yin and Ping (2018) identified four aspects for evaluating the effectiveness of higher vocational innovation and entrepreneurship education. These aspects include knowledge, awareness, thinking, and skills related to innovation and entrepreneurship.

Zhao (2019) argues that certain developed countries, such as the United States, place significant emphasis on long-term evaluation processes when assessing the impact of innovation and entrepreneurship education. This includes evaluating whether students maintain a strong entrepreneurial mindset after entering society and the percentage of students who go on to start their own businesses. There are three approaches commonly used for evaluating the impact of innovation and entrepreneurship education abroad: control experiments, planned behavior evaluation, and comprehensive evaluation of entrepreneurial imagery. Essy and Isti (2017) suggest that evaluation itself can be divided into four components: Context, Input, Process, and Product. Context evaluation involves assessing the needs, problems, and resources involved in program creation. Input evaluation focuses on the strategies, planning, and budgeting of the program. Process evaluation involves monitoring and checking if the program is being executed according to plan, through activities such as document checking and activity monitoring. Finally, product evaluation is conducted after the program concludes to determine if the program's goals have been achieved. One tool commonly used in this evaluation process is the pretest-posttest method.

A modified Delphi process was utilized to identify appropriate evaluation indicators for innovation and entrepreneurship education. This process consisted of two stages: (1) the initial set of evaluation indicators was generated through a literature review, behavioral observation of students, and interviews with teachers

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involved in innovation and entrepreneurship education; (2) a 2-round, web-based Delphi survey was conducted with education experts who were selected based on their expertise in the field. This survey aimed to prioritize and achieve consensus on the most effective indicators for evaluating innovation and entrepreneurship education.

Based on a comprehensive analysis of the aforementioned content and referencing various Chinese and English literature, this study developed an evaluation indicator system for the impact of innovative entrepreneurship education based on the CIPP model. The system consists of four primary indicators, fourteen secondary indicators, and forty tertiary indicators. The research methodology involves administering questionnaires and conducting interviews with teachers and staff members. Additionally, relevant information will be consulted and data will be collected.

2.Participants

A list of eligible experts was initially compiled, taking into consideration their educational background, professional education, and practical experience, in order to ensure representation of potential differences. The experts were selected based on the following criteria: (1) working as researchers or administrative leaders in the education department, (2) having a minimum of 5 years of experience in universities, (3) possessing knowledge about innovation and entrepreneurship education, and (4) representing various majors within Chinese universities. The participants were then invited to participate in the study, and their willingness to take part was assessed. As suggested in previous studies, a sample size of at least fifteen experts was recommended, with the inclusion of more participants increasing the diversity of expertise (McMillan SS, 2016).

Delphi questionnaire

The 14 indicators were formatted into a Delphi questionnaire, where experts were asked to rate the importance and feasibility of practical application on a 1-5 Likert scale (1=not important; 5=very important). Additionally, experts were given the opportunity to provide comments or recommend new indicators to be included. The data was collected through an online questionnaire survey using the modified Delphi method, and expert consensus was achieved in September and October 2023.

Obtaining consensus

There are no definite consensus criteria for the Delphi study (Diamond IR et al.， 2014). We selected 17 Delphi experts from different professional fields. In this study a consensus was reached based on two selection criteria: median score greater than three on a five-point scale and at least 80% of panel ratings in the top level (4-5) for importance.

2.1Statistical analysis

Descriptive analysis was conducted to describe the characteristics of the participants and the results. Continuous variables were reported as means with standard deviations (SD), while categorical variables were reported as frequencies (%). Data management and analysis were performed using the Statistical Package for Social Sciences (SPSS.21.0)

2.2Survey results

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All 17 experts participated in two rounds of the Delphi survey. Among them, 4 experts were from the field of Pedagogy, 3 experts each were from Management and Economics, 4 experts were from Engineering, and the remaining 3 experts were from Arts, Sciences, and Physics. The panel consisted of more female participants (52.94%). In terms of age distribution, 47.06% of the experts were aged 31-40, while 41.18% were aged 41-50. The mean age of the experts was 39.7 years, with a standard deviation of 3.8 years. All participants were teachers or researchers specializing in innovation and entrepreneurship education in universities. On average, the experts had 10.9 years of education practice experience, with 76.5% of them having worked in this field for over 10 years. Furthermore, 88.24% of the experts held a master's degree, 11.76% held a PhD degree, and 17.6% held a senior-grade title (Table 1).

Panel characteristics in Delphi survey

Table 1: Panel characteristics of the Delphi process (n=17)

Characteristics	Frequency	Percentage (%)
Gender		
Male	8	47.06
Female	9	52.94
Age (years)		
21-30	1	5.88
31-40	8	47.06
41-50	7	41.18
51-60	1	5.88
Working years		
<10	4	23.53
≥ 10	13	76.47
Highest degree		
Bachelor	0	0
Master	15	88.24
PhD	2	11.76
Professional field		
Pedagogy	4	23.53
Management	3	17.65
Economics	3	17.65
Art	1	5.88
Engineering	4	23.53
Science	1	5.88
Physics	1	5.88
Professional title		
Junior grade title	1	5.88
Middle grade title	13	76.47
Associate senior grade title	2	11.76
Senior grade title	1	5.88

Noted: The professional titles of the teachers include junior grade, middle grade, associate senior grade, and senior grade titles, which are based on work experience and research achievements.

This study examined the level of authority of consulting experts through self-evaluation. The degree of expert authority is typically determined by two factors: the basis for experts to make judgments on indicators (Ca) and their familiarity with indicators (Cs). The coefficient of expert authority (Cr) is calculated as the average of the coefficient of judgment basis and familiarity, i.e., Cr = (Ca + Cs) / 2 (Wu Yang, 2018). The quantization of Ca and Cs is presented in Table 2 and Table 3, respectively. The statistical results indi-

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cate that the coefficient of authority degree for 3 experts is Cr ≥ 0.9, for 10 experts it falls between 0.8 and 0.9, for 4 experts it ranges from 0.7 to 0.8, and the overall coefficient of authority for all 17 experts is 0.84. It is generally accepted that Cr ≥ 0.7 is considered acceptable. The coefficient of variation (Cv) is 0.22, and Cv < 0.25 is generally regarded as indicating good indicator consistency. Therefore, the expert team in this study meets the research requirements of the Delphi method.

Table 2 Quantitative Table of expert judgment basis

Judgment	Degree of influence of judgment basis on expert (Ca)		
	Maximum	Medium	Minimum
Theoretical analysis	0.3	0.2	0.1
Practical experience	0.5	0.4	0.3
Peers understand	0.1	0.1	0.1
Expert intuition	0.1	0.1	0.1

Source: reference Wu Yang, 2018

Table 3 Quantitative Table of expert familiarity

Degree of familiarity	Cs
Very familiar	1.0
Familiar	0.8
General	0.5
Not very familiar	0.2
Not familiar	0.0

Source: reference Wu Yang, 2018

2.2.1First round

In the first round, consensus was reached for all 14 second-level indicators (100%). For the third-level indicators, consensus was achieved for 33 out of 40 (82.5%) and for the original indicators, consensus was reached for 47 out of 54 (87%). The median score for importance ranged from 4.00 to 5.00, with the percentage of panel ratings in the top category (4-5) for importance ranging from 80% to 100%. However, there were 7 indicators that did not achieve 80.0% agreement in terms of importance, suggesting that some modifications and optimizations are needed. Based on the integration of expert revision opinions, the main issues identified are as follows (Table 4-5):

In the management system of innovation and entrepreneurship education, the term "student assessment" should be changed to "credit recognition" and "financial support" should be added.

The score for "full-time teachers" in "Innovation and entrepreneurship Education teacher construction" was below 80%. After discussions with experts, the importance of full-time teachers was emphasized and it is hoped that this item can be recognized by experts.

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The score for "lectures" in "Organizational Form of Innovation and Entrepreneurship education and Teaching" was below 80%. It was suggested to retain this indicator as a form of teaching, while experts recommended deleting "community activities" and transferring "The establishment of science park" to the item "Base construction".

Although the score for "enterprise management" in "Innovation and entrepreneurship education knowledge inclusion" was 82.35%, experts suggested updating "corporate governance" to align with current trends and changing "industrial and commercial tax" and "insurance" to "financial management" and "marketing", while adding "risk management".

The indicator "incubation achievements" in "Infrastructure" was transferred to the category of Scientific Research Achievements in "Achievements", and the "number of Scientific Research achievements" was increased.

In the second level of the indicator "social evaluation", the third-level indicators "enterprise survival number" and "employers' evaluation for students work" were added.

Table 4: Results of the Delphi process

Table 5: Results of the Delphi process

	Second level indicators	Importance		
		Median (4 – 5)	Agreement	
Context	Management System	4	94.12%	Notes:Experts rated the importance of Second level indicators on a 1–5 Likert scale (1=not important and 5=very important). The median is in 4-5, and all the agreement are above 90%.
	Training Objective	4	94.12%	
	Educational Philosophy	4	94.12%	
Input	Infrastructure	4	94.12%	
	Talent Introduction	4	100%	
	Capital Budget	5	100%	
Process	Model of Instruction	4	94.11%	
	Practical Method	4	100%	
	Industry University Research synergy	4	100%	
Product	Teaching Results	4	100%	
	Scientific Research Achievement	4	100%	
	Students' development	4	100%	
	Achievement in Entrepreneurship	4	100%	
	Social assessment	4	94.11%	

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	Round 1		
	Third level indicators	Importance Percentage (%)	Status
Context	1. Management System		
	1.1 Incentive measures	88.24	Included
	1.2 Teachers evaluation	88.24	Included
	1.3 Students evaluation	76.47	Deleted
	2. Training Objective		
	2.1 Theoretical knowledge	82.35	Included
	2.2 Career Consciousness	100	Included
	2.3 Entrepreneurial intention	88.24	Included
	2.4 Enterprising spirit	82.35	Included
	2.5 Innovative thinking	88.24	Included
Input	3. Infrastructure		
	3.1 Fund investment	94.12	Included
	3.2 Supporting facility	100	Included
	3.3 Incubation results	82.35	Modified
	4 Talent Introduction		
	4.1 Full-time teachers	76.47	Modified
	4.2 Practice teachers	88.24	Included
	4.3 Faculty adviser	94.12	Included
Process	5. Model of Instruction		
	5.1 Classroom Teaching	88.24	Included
	5.2 Lectures	76.47	Modified
	5.3 Practical teaching	94.12	Included
	5.4 Organize competitions	82.35	Included
	5.5 Community activity	35.29	Deleted
	5.6 Establishment of science park	70.59	Modified
	5.7 Build a team	82.35	Included
	6 Practical Method		
	6.1 Curriculum provision	94.12	Included
	6.2 Content of courses	100	Included
	6.3 Teaching objectives	100	Included
	6.4 Teaching method	94.12	Included
	6.5 Teaching skill	100	Included
	6.6 Evaluation mode	88.24	Included
	6.7 Scientific research guide	100	Included
Product	7 Teaching Results		
	7.1 Business management	82.35	Modified
	7.2 Laws and regulations	82.35	Included
	7.3 Industry field	88.24	Included
	7.4 Entrepreneurship policy	88.24	Included
	7.5 Industrial and commercial tax	70.59	Deleted
	7.6 Insurance	64.71	Deleted
	8 Students' development		
	8.1 Problem identification	88.24	Included
	8.2 Crisis management	82.35	Included
	8.3 Learning capacity	94.12	Included
	8.4 Decision-making ability	94.12	Included
	8.5 Ability to communicate	94.12	Included
	8.6 Leadership	82.35	Included

Notes: Indicators with a percentage below 80% will be removed, while some indicators with a percentage over 80% will still be revised according to expert suggestions.

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2.2.2Second round

At this stage, a total of 44 third-level indicators were evaluated, including indicators that were retained, modified, and newly added. In the second round, there was a high level of agreement among panel ratings, ranging from 80% to 100%. Consequently, a strong consensus was achieved for all indicators in terms of their importance. Descriptive statistics, such as the median and percentage agreement for each indicator, are presented in Table 6.

By the end of the Delphi process, a total of 58 indicators obtained consensus in the second round, distributed across four domains: Context: University management layer (including 3 second-level indicators and 9 third-level indicators), Input: University resource layer (3 second-level indicators and 6 third-level indicators), Process: University teaching level (3 second-level indicators and 12 third-level indicators), and Product: University development layer (5 second-level indicators and 17 third-level indicators). Please refer to Table 7 for further details.

Table 6: Results of the Delphi process

	Round 2		
Third level indicators	Importance Percentage (%)	Third level indicators	Importance Percentage (%)
Context			
1.1 Incentive measures	88.24	6.2 Content of courses	100
1.2 Teachers evaluation	88.24	6.3 Teaching objectives	100
1.3 Credit authentication	94.12	6.4 Teaching method	94.12
1.4 Funding support	100	6.5 Teaching skill	100
2. Training Objective		6.6 Evaluation mode	88.24
2.1 Theoretical knowledge	82.35	6.7 Scientific research guide	100
2.2 Career Consciousness	100	**Product**	
2.3 Entrepreneurial intention	88.24	7 Teaching Results	
2.4 Enterprising spirit	82.35	7.1 Corporate governance	82.35
2.5 Innovative thinking	88.24	7.2 Laws and regulations	82.35
Input		7.3 Industry field	88.24
3. Infrastructure		7.4 Entrepreneurship policy	88.24
3.1 Fund investment	94.12	7.5 Financial management	94.12
3.2 Supporting facility	100	7.6 Marketing	94.12
3.3 Establishment of science park	88.24	7.7 Risk management	88.24
4. Talent Introduction		8 Students' development	
4.1 Full-time teachers	88.24	8.1 Problem identification	88.24
4.2 Practice teachers	88.24	8.2 Crisis management	82.35
4.3 Faculty adviser	94.12	8.3 Learning capacity	94.12
Process		8.4 Decision-making ability	94.12
5. Model of Instruction		8.5 Ability to communicate	94.12
5.1 Classroom Teaching	88.24	8.6 Leadership	82.35
5.2 Lectures	82.35	9.Scientific Research Achievement	
5.3 Practical teaching	94.12	9.1 Incubation results	82.35
5.4 Organize competitions	82.35	9.2 Number of research project	88.24
5.5 Build a team	82.35	10 Social assessment	
6 Practical Method		10.1 Enterprise survival rate	94.12
6.1 Curriculum provision	94.12	10.2 Employer's evaluation	82.35

Note: Experts were asked to rate the importance of each indicator on a 1–5 Likert scale, with 1 indicating "not important" and 5 indicating "very important". Four indicators were removed in the first round and they

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did not achieve 80.0% agreement in terms of importance. Based on experts' recommendations, new items were added in the second round and some indicators were modified in the first round.

Table 7 Final evaluation indicator system in innovation and entrepreneurship education

Evaluation	Indicator System		
Domains	I	II	III
Context	University Management layer	Management System	Incentive measures
		Training Objective	Teachers' evaluation
		Educational Philosophy	Credit authentication
			Funding support
			Theoretical knowledge
			Career Consciousness
			Entrepreneurial intention
			Enterprising spirit
			Innovative thinking
Input	University Resource layer	Infrastructure	Fund investment
		Talent Introduction	Supporting facility
		Capital Budget	Establishment of science park
			Full-time teachers
			Practice teachers
			Faculty adviser
Process	University Teaching level	Model of Instruction	Classroom Teaching
		Practical Method	Lectures
		Industry University Research synergy	Practical teaching
			Organize competitions
			Build a team
			Curriculum provision
			Content of courses
			Teaching objectives
			Teaching method
			Teaching skills
			Evaluation mode
			Scientific research guide

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3.Discussion

This study employed a rigorous and comprehensive approach to identify and evaluate indicators for innovation and entrepreneurship education in universities. The methodology included a literature review, field observation, and expert interviews, followed by a modified Delphi survey with 17 education experts. The final consensus set consisted of 58 indicators, categorized into four evaluation domains (CIPP).

The evaluation criteria and contents of innovation and entrepreneurship education vary, and it can be assessed from different perspectives. In this study, the evaluation was conducted based on the CIPP framework, which includes background, input, process, and result. Additionally, the evaluation factors were divided into university management level, university resource level, university teaching level, and university development level. Starting with the background evaluation, the study identified three second-level indicators and nine third-level indicators to assess the management system, training objectives, and educational philosophy of innovation and entrepreneurship education in universities. These indicators were deemed highly important, with an overall importance rating of 94.12% and a weight of 24.2%. In the input evaluation, three second-level indicators and six third-level indicators were established to evaluate the resources available at the university level. These indicators focused on infrastructure, talent introduction, and capital budget. The importance rating for these indicators was 98.03%, with a weight of 25.2%. For the process evaluation, three second-level indicators and twelve third-level indicators were identified to assess the teaching level of the university. These indicators encompassed teaching modes, practice methods, and industry-university collaboration. The importance rating for these indicators was 98.03%, with a weight of 25.2%. Lastly, the achievement evaluation focused on the development level of the university and included five second-level indicators and seventeen third-level indicators. These indicators covered teaching achievements, scientific research achievements, student development, innovation and entrepreneurship achievements, and social evaluation. The importance rating for these indicators was 98.82%, with a weight of 25.4%.

Overall, this study provides a comprehensive and systematic framework for evaluating innovation and entrepreneurship education in universities. The identified indicators cover various aspects of the education process and can serve as a valuable tool for assessing and improving the effectiveness of such programs.

Although university innovation and entrepreneurship education have made significant progress in theory and practice over the past three decades, there is still a need for further improvement. While the university innovation and entrepreneurship system has become more refined and students' participation in innovative entrepreneurship competitions has been fruitful, there is still a lack of entrepreneurial passion and ability among college students after undergoing innovation and entrepreneurship education and practice. It is crucial for colleges and universities to not only establish and enhance the practice system of innovation and entrepreneurship education but also conduct quality monitoring and performance evaluation of the process and outcomes of such education. This will help identify any issues in the teaching and practice of innovation and entrepreneurship and facilitate continuous optimization of innovation and entrepreneurship education in colleges and universities (Lu & Zhou, 2021).

Currently, most scholars focus on process evaluation and outcome evaluation in education evaluation, emphasizing the analysis of objectives, elements, and the essence of innovation and entrepreneurship education evaluation (Zhang & Li, 2021). Furthermore, practice-based learning plays a crucial role in enhancing students' innovation and entrepreneurship abilities, as it provides relevant evidence and knowledge that reflects real-world circumstances (Moore & Pennington, 2003). In the context of China's innovation

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and entrepreneurship education model for student training, the indicators mentioned above were identified as 37 items based on literature review and expert consensus. Dong Ying (2017) suggests that background assessment involves evaluating the specific environment's needs, problems, resources, and opportunities. This includes identifying the necessary elements to achieve the purpose, identifying the challenges to be overcome, assessing available resources, and recognizing opportunities to address relevant problems. Input evaluation assesses the conditions, resources, and relative advantages of each selected program based on the background evaluation. Essentially, it evaluates the feasibility and usefulness of the program and demonstrates and evaluates alternative programs. Process evaluation involves continuous supervision, inspection, and feedback during program implementation, aiming to identify problems and make timely adjustments or improvements based on the obtained information. Outcome evaluation assesses the achievement of goals, including measuring, judging, explaining program achievements, and confirming the extent to which people's needs are met.

4.Strengths and limitations

The quality of panel experts and their opinions on given topics is considered a key factor in the Delphi technique (Powell, 2003). In this study, the expert panel consisted of professionals from different fields, with an average length of education practice experience of 10.9 years. The gender distribution of the experts also closely reflected the ratio of experts with innovation and entrepreneurship education in actual practice. These factors suggest that our expert panel was diverse and experienced. Furthermore, the 100% response rate in both rounds of the Delphi process indicates a high level of interest and active participation from the experts. This is a positive outcome, as response rate can sometimes be a challenge in Delphi studies.

However, there are limitations to this study. Firstly, although the experts in our study represented different disciplines, their views may not fully capture the perspectives of students from all fields of discipline. Secondly, the improvement of students' abilities in innovation and entrepreneurship also involves practical skills, which may require further insights from theory, experience, and communication. This aspect should be considered in future studies. Additionally, the Delphi process relies on the perceptions of experts, and further evidence from implementation in real practice settings may be necessary to validate the findings (McGinn, 2012). Therefore, future research should focus on applying the CIPP model and confirming the validity and reliability of the identified indicators. Overall, while this study provides valuable insights into the evaluation of innovation and entrepreneurship education, further research is needed to address the limitations and ensure the robustness of the findings.

5.Conclusion

This study has developed a CIPP evaluation model for innovation and entrepreneurship education in universities. The model provides a comprehensive framework for evaluating the effectiveness of innovation and entrepreneurship education, taking into account the perspectives of stakeholders, management, supervisors, and beneficiaries. The final set of evaluation indicators can be used to measure the performance and quality of innovation and entrepreneurship education in colleges and universities. By identifying areas for improvement, institutions can better achieve their teaching goals and effectively manage their performance. However, further research is needed to validate and refine the CIPP model and its indicators. Additionally, future studies should focus on evaluating the perspectives of relevant stakeholders and improving the management and system construction of innovation and entrepreneurship education. It is also important to incorporate off-campus resources to enhance the effectiveness of innovation and entrepreneurship education. Overall, this research contributes to the evaluation of innovation and entrepreneurship education projects and provides a foundation for further exploration in this field.

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In this paper, we have introduced the CIPP evaluation indicator to assess the effectiveness of innovation and entrepreneurship education. We have constructed an indicator system for this evaluation, taking into account the perspectives of stakeholders, management, supervisors, and beneficiaries in colleges and universities. The final evaluation indicators consist of 4 first-level indicators, 14 second-level indicators, and 44 third-level indicators. We have emphasized the importance of data validity and rationality, addressing the issue of relying on a single evaluation method and the limited application of evaluation results in the past. This approach establishes a mechanism for continuous improvement in the quality and effectiveness of innovation and entrepreneurship education. The evaluation indicator system also helps colleges and universities measure their performance in innovation and entrepreneurship education. By identifying and addressing performance deficiencies, institutions can better achieve their teaching goals and improve their overall performance management. Moving forward, our future research will focus on evaluating the perspectives of relevant stakeholders and optimizing the management and system construction of the innovation and entrepreneurship process. We aim to develop a comprehensive research framework for evaluation indicators and contribute to the evaluation of innovation and entrepreneurship education projects. Additionally, we propose the introduction of more off-campus resources to support innovation and entrepreneurship education, further enhancing its effectiveness and impact.

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