Construction of Innovation and Entrepreneurship Education (IEE) System in Applied Universities: A Study Based on Practical Opportunities and University-Enterprise Collaboration

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ABSTRACT

Aim. This study aims to construct a systematic Innovation and Entrepreneurship Education (IEE) system to enhance the comprehensive capabilities of applied universities in this area.

Methods. The study employs surveys of students, teachers, and corporate representatives, along with in-depth interviews and case analyses, to investigate the key factors influencing the construction of such a system. A structural equation model is used to quantify the relationships between various factors, and the quantitative findings are supplemented and validated through case analysis.

Results. The results indicate that increasing practical opportunities, deepening university-enterprise collaboration, and optimising course content are the core factors for improving the outcomes of IEE. Among these, practical opportunities have the most significant impact on enhancing students' entrepreneurial abilities.

Conclusion. This study not only provides theoretical support for constructing an IEE system in applied universities but also offers actionable and practical recommendations tailored to the Chinese context to promote the sustainable development of such education.

Keywords: applied universities, innovation and entrepreneurship education(iee), education system construction, practical opportunities, university-enterprise collaboration

Introduction

With the constant changes in the global economy and the rapid development of technology, innovation and entrepreneurship have become the core driving forces of socio-economic progress (Coulibaly et al., 2018). Higher education, as a key sector for cultivating high-quality talent, is increasingly recognised for its role in IEE (Mazzarol & Reboud, 2019). Especially applied universities, with their practice-oriented approach and focus on serving regional economies, have unique potential in cultivating innovation and entrepreneurship talent (Guo, 2021). Through an effective Innovation and Entrepreneurship Education (IEE) system, applied universities can provide students with professional knowledge, helping them develop creative thinking and entrepreneurial skills to meet rapidly changing market demands (Wang, 2023).

At present, many applied universities still face numerous challenges in constructing their IEE systems. First, the lack of systematic and actionable teaching models makes it difficult to achieve the desired outcomes in implementing IEE (Wu, 2024). Second, insufficient faculty strength and limited teaching resources have led to a disconnect between educational content and societal needs (Zhao & Zhang, 2024). Furthermore, limited university-enterprise collaboration and practical opportunities further constrain students' ability to gain entrepreneurial experience in real-world contexts (Wang, 2023). These issues hinder the efforts of universities to cultivate interdisciplinary talent with innovation and entrepreneurship capabilities (Guo, 2021).

Based on the above background, the objective of this study is to explore how to enhance the comprehensive capabilities of applied universities in IEE by constructing a systematic education system. By reviewing and analysing relevant research findings both domestically and internationally, this paper aims to propose a construction plan for an IEE system that aligns with the characteristics of applied universities. The study will focus on the unique needs of applied universities and their role in serving regional economies, with the goal of providing actionable recommendations to promote the sustainable development of IEE.

Literature Review

In recent years, research on IEE has gradually gained attention both domestically and internationally, especially in the field of higher education, where substantial theoretical and empirical research has been conducted on constructing IEE systems for applied universities (Guo, 2021). Foreign scholars were early proponents of the concept of an entrepreneurial education ecosystem, arguing that entrepreneurship education requires comprehensive consideration from multiple aspects and levels, including curriculum

design, teaching models, and social support (Wang, 2023). In Western countries, the IEE system is relatively well-developed, and the close ties between universities, society, and enterprises enhance the practicality and applicability of entrepreneurship courses (Ling, 2023).

IEE in China started relatively late, but in recent years, with strong policy support, it has gradually achieved significant progress (Zhou & Han, 2021). Applied universities should focus on integrating practical teaching with theoretical learning in IEE to cultivate students' innovation awareness and practical abilities (Fu, 2018). Research highlights the importance of university-enterprise collaboration in IEE for applied universities, suggesting that establishing close ties with local enterprises can effectively enhance students' entrepreneurial practice skills (Wang & Tang, 2020).

However, some common issues in domestic and international research should also be given attention. For instance, many applied universities in China lack systematic theoretical guidance in IEE, resulting in a disconnect between educational content and practical needs (Zhang & Chen, 2023). By contrast, foreign IEE systems place greater emphasis on interdisciplinary collaboration and the construction of entrepreneurial ecosystems, highlighting students' entrepreneurial experiences in real-world contexts (Tan, 2017).

Additionally, some scholars have proposed specific pathways for constructing an IEE system. For example, some scholars suggest incorporating project-driven and problem-based teaching methods into the curriculum to enhance students' hands-on abilities and innovative thinking (Zhang et al., 2023). The crucial role of teachers in IEE is emphasised, arguing that teachers should not only possess professional knowledge but also entrepreneurial experience to better guide students in entrepreneurial practices (Zhong, 2024).

In summary, the literature review indicates that applied universities, when constructing IEE systems, need to align with their own characteristics and the demands of regional economies, drawing on successful domestic and international experiences, particularly in areas such as curriculum design, teacher training, university-enterprise collaboration, and the development of practical platforms. Based on these existing research findings, this study will further explore strategies for constructing IEE systems suitable for applied universities in China.

Material and Methods

This study employs multiple methods to systematically analyse and construct the IEE system of applied universities. The research methods include surveys, in-depth interviews, and case analyses, combining quantitative and qualitative approaches to ensure the comprehensiveness and reliability of the findings.

Surveys were used to gather perspectives and needs from students, teachers, and corporate representatives regarding the current state of IEE in applied universities.

The questionnaire design covered multiple dimensions, including the content of innovation and entrepreneurship courses, teaching methods, the extent of university-enterprise collaboration, and practical opportunities. The survey respondents included students and teachers from various applied universities across the country, as well as corporate representatives collaborating with universities. A total of 500 questionnaires were distributed, with 480 valid responses collected. The data analysis was performed using SPSS statistical software.

A selection of teachers, students, and corporate partners were chosen for in-depth interviews to gain a deeper understanding of the issues and needs encountered during the implementation of IEE. The interview questions focused primarily on the construction of the education system, the design of course content, the needs for teacher training, and the effectiveness of university-enterprise collaboration. Through the interviews, detailed information not fully captured by the survey was obtained, providing supplementary and corroborative data for the analysis.

Using case analysis, five applied universities with outstanding performance in IEE were selected as research cases. These universities' IEE systems, university-enterprise collaboration models, and teacher training programs were analysed in detail, and their successful experiences were summarised and adopted as references. The data for the case analyses were derived from publicly available materials of the schools, interview records of relevant personnel within the universities, and literature sources.

In terms of data analysis, a structural equation model (SEM) was used to analyse the survey data, exploring the relationships between various factors and their impact on the effectiveness of IEE. Additionally, by summarising the results of the interviews and case analyses, the conclusions of the quantitative analysis were further validated and supplemented, providing theoretical support for the construction strategies of the IEE system proposed in this study.

Results Analysis

This section provides a detailed analysis of the survey and interview results to reveal the key factors influencing the construction of IEE systems in applied universities. The following table presents the main data and findings of this study.

Data Description and Statistical Analysis

The following provides data descriptions and statistical results on aspects such as innovation and entrepreneurship course design, university-enterprise collaboration, and practical opportunities.

Table 1

Descriptive Statistics and Impact Coefficients of Each Variable

Variable Name	Mean	Standard Deviation	Impact Coefficient (β)	Significance (p-value)
Innovation and Entrepreneurship Course Content	4.21	0.89	0.35	0.002
Depth of University-Enterprise Collaboration	3.87	0.95	0.28	0.015
Practical Opportunities	4.05	0.91	0.41	0.001
Faculty Strength	3.73	1.02	0.25	0.03

Source. Own research.

From Table 1, it can be seen that practical opportunities have the greatest impact on the effectiveness of IEE, with an impact coefficient of 0.41 and high significance ($p < 0.01$), followed by the content of innovation and entrepreneurship courses and the depth of university-enterprise collaboration, while the impact of faculty strength is relatively smaller but still significant ($p < 0.05$). This indicates that in constructing an IEE system, particular attention should be given to increasing practical opportunities and deepening university-enterprise collaboration.

Structural Equation Modeling (SEM) Analysis

To further explore the relationships between various factors, this study employed structural equation modelling (SEM) to analyse the survey data. The path coefficients from the SEM analysis are shown in the table below.

Table 2

Path Coefficient Analysis of the Structural Equation Model

Path	Path Coefficient (β)	Standard Error	t-value	Significance (p-value)
Innovation and Entrepreneurship Courses → Educational Effectiveness	0.32	0.08	4	0
University-Enterprise Collaboration → Educational Effectiveness	0.27	0.07	3.86	0.001
Practical Opportunities → Educational Effectiveness	0.45	0.06	7.5	0
Faculty Strength → Educational Effectiveness	0.21	0.09	2.33	0.02

Source. Own research.

From Table 2, it can be observed that practical opportunities have the largest path coefficient for educational effectiveness, at 0.45, indicating their critical role in enhancing

the effectiveness of IEE. Additionally, the path coefficients for innovation and entrepreneurship course content and university-enterprise collaboration are also relatively high, at 0.32 and 0.27, respectively, indicating their significant impact on improving educational effectiveness.

Results of In-Depth Interviews and Case Analysis

In-depth interviews and case analysis further supplemented and supported the quantitative data. The interview results show that 75% of teachers and corporate representatives believe that increasing practical opportunities is a key factor in enhancing the effectiveness of IEE, which aligns with the high path coefficient for practical opportunities (β=0.45) in the SEM analysis. Additionally, 65% of respondents emphasised the importance of university-enterprise collaboration in IEE, noting that collaborating with enterprises on practical projects can effectively enhance students' practical skills and market adaptability. This is also consistent with the path coefficient for university-enterprise collaboration (β=0.27) in Table 2.

Table 3

Results of In-Depth Interviews and Case Analysis

Survey Content	Support Ratio(%)
Consider Increased Practical Opportunities as a Key Factor	75
Emphasise the Importance of University-Enterprise Collaboration	65
Entrepreneurship Success Rate of Students in University A	12
National Average Entrepreneurship Success Rate	5
Proportion of Students Engaged in Self-Employment in University B	15

Source. Own research.

In the case analysis, University A and University B are two applied universities that have excelled in IEE. University A established long-term cooperative relationships with local enterprises, providing students with abundant practical project opportunities, resulting in a student entrepreneurship success rate of 12%, significantly higher than the national average of 5%. University B focuses on project-driven curriculum design, with students planning and implementing multiple entrepreneurial projects during the courses, leading to 15% of its graduates choosing self-employment. These cases further demonstrate the importance of practical opportunities and university-enterprise collaboration in enhancing the effectiveness of IEE.

In summary, the results of the in-depth interviews and case analyses are highly consistent with the quantitative data, indicating that increasing practical opportunities, deepening university-enterprise collaboration, and optimising course content are key approaches to enhancing the effectiveness of IEE in applied universities. These factors interact with each other, collectively influencing the quality of IEE and students' entrepreneurial abilities.

Discussion

The results of this study indicate that practical opportunities, university-enterprise collaboration, and course content optimisation are key factors influencing the effectiveness of IEE in applied universities. Compared with existing domestic and international research, the findings of this study share similarities but also present unique innovative points.

This study aligns with Maksim Belitski and Keith Heron's (2017) and Chengyun Zheng's and Jinbo Zhou's (2021) concept of the entrepreneurial education ecosystem, also emphasising the importance of multi-level support in entrepreneurship education, particularly the increase in practical opportunities. However, the data from this study further clarifies the central role of practical opportunities in enhancing the effectiveness of IEE, with a path coefficient (β=0.45) significantly higher than other factors, providing more specific quantitative support compared to the qualitative descriptions of previous studies.

Leena Kunttu (2017) and Koichi Nakagawa et al. (2017) pointed out that the entrepreneurial education systems in Western countries are relatively mature, especially the close connections between universities and enterprises, which are crucial for improving educational outcomes. The findings of this study also support this view, with a path coefficient of 0.27 for university-enterprise collaboration, indicating its significant role in IEE, particularly in providing students with practical entrepreneurial experience and market adaptability. The in-depth interview results also show that 65% of respondents believe university-enterprise collaboration has a direct positive impact on educational outcomes.

Compared to the research of some domestic scholars (Cao, 2020), this study further quantifies the relationships between various factors through a structural equation model. This enables the study to not only validate the importance of innovation and entrepreneurship course content and faculty strength but also reveal their interactions with practical opportunities and university-enterprise collaboration. For example, Lu Zhang & Yan Ma (2023) suggested incorporating project-driven and problem-based teaching methods into courses, and the data in this study also shows that such course designs enhance students' innovation abilities, with an impact coefficient of 0.32 and statistical significance ($p < 0.01$).

Compared with the study by Mark P. Rice et al. (2014) and Christina Theodoraki et al. (2018), this research further elaborates, through case analysis, on how to implement the construction of entrepreneurial ecosystems in applied universities, particularly in the Chinese context. The successful cases of University A and University B demonstrate that strengthening university-enterprise collaboration and project-driven teaching design can effectively enhance students' entrepreneurship success rates and self-employment intentions. These findings provide empirical support for how applied universities in China can integrate regional economies and practical resources to construct IEE systems.

The uniqueness of this study lies in its combination of quantitative and qualitative analysis methods, quantifying the relative importance of influencing factors through

structural equation modelling and providing rich practical details through in-depth interviews and case analyses. This comprehensive approach not only validates existing theories but also provides specific implementation pathways and policy recommendations for constructing IEE systems in applied universities.

Conclusion

This study systematically explored the key factors influencing the construction of IEE systems in applied universities through surveys, in-depth interviews, and case analyses, and proposed corresponding countermeasures. The study indicates that practical opportunities, university-enterprise collaboration, and course content optimisation are the three core factors for improving the effectiveness of IEE.

The increase in practical opportunities has been proven to be the most critical factor in the construction of IEE systems, playing an irreplaceable role in enhancing students' entrepreneurial abilities and practical experience. This conclusion is supported not only by the quantitative analysis (path coefficient $\beta=0.45$) but also by the recognition of teachers and corporate representatives in the in-depth interviews.

University-enterprise collaboration plays a significant role in enhancing the effectiveness of IEE. By establishing close partnerships with enterprises, universities can provide students with more practical projects and entrepreneurial opportunities, thereby enhancing their market adaptability and hands-on experience. The research findings indicate that university-enterprise collaboration has an impact coefficient of 0.27 on educational effectiveness, demonstrating its significant role in improving the outcomes of IEE.

Optimising course content is also a crucial aspect of building an effective IEE system. Project-driven and problem-based teaching methods help enhance students' creative thinking and problem-solving abilities, as validated by both the quantitative analysis and case studies in this research.

Although this study has yielded some meaningful findings, there are still certain limitations. The data for this study primarily comes from domestic applied universities, which may pose issues regarding sample representativeness. The study employed surveys and interviews, which, although capable of providing detailed information, may still be influenced by the subjective factors of respondents.

Future research could consider expanding the sample scope, especially by conducting comparative studies on different types of universities. In addition, more experimental research methods could be incorporated to explore various construction pathways and their effects within IEE systems. Overall, this study provides theoretical and practical references for effectively constructing and optimising IEE systems in applied universities, as well as empirical evidence for promoting the sustainable development of such education.

Contributorship Statement

Xianchao Zhou and Yanbo Cheng, as co-first authors, were jointly responsible for the research design, experimental execution, and manuscript preparation. The authors declare no competing interests.

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