The Impact of Teaching Methods and Information Technology on Innovation and Entrepreneurship Education Among College Students in Jiangxi, China

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Abstract: This study examines the influence of teaching methods and information technology on the innovation and entrepreneurship education of college students in Jiangxi Province. Quantitative analysis revealed that modern teaching methods such as interactive teaching, case teaching and project-based learning have a significant positive impact on cultivating college students' innovative abilities and entrepreneurial spirits. Specifically, the results of the research carried out using SPSS 27 show that the regression coefficients are 0.45 (P = 0.001) for interactive teaching and innovation capacity , 0.38 (P = 0.003) for case teaching and entrepreneurship spirit, and 0.42 (P = 0.002) for project-based learning and innovation ability. Additionally, a significant positive correlation was observed between the employment rate of students and the impact of innovation and entrepreneurship education (regression coefficient = 0.50, P = 0.000), indicating that improving the employment rate can indirectly enhance educational quality. In terms of the application of information technology, using an online learning platform and intelligent teaching tools has a significant positive impact on educational effectiveness (the regression coefficients are 0.35 and 0.30 respectively, and the P values are 0.005 and 0.008 respectively), whereas the impact of digital resources is relatively weak (the regression coefficient is 0.15 and the P value is 0.050). Further analysis of the intermediary variable mechanism reveals that teaching methods, students' employment rates, and information technology indirectly promote the educational effect by enhancing learning interest, practical ability, and learning resources. The study also verified the synergistic effect of these factors, indicating that they promote the development of innovation and entrepreneurship education together.

Keywords: teaching methods; Information technology; Innovation and entrepreneurship education; Student employment rate; Synergistic effect

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1 Introduction

Under the background of globalization and the rapid development of information technology, higher education is confronted with unprecedented opportunities and challenges. Innovation and entrepreneurship education has gradually become the core topic of education reform, as it is an important way to cultivate college students' comprehensive quality and competitiveness.The "1234" innovative ability training model is designed to cultivate application-oriented talent by fostering students' innovative abilities and entrepreneurial spirits, and practical competence. By analysing data on students'

achievements in academic competitions, innovation and entrepreneurship projects, published papers and patents, the model enhances creative thinking, stimulates learning motivation and strengthens practical capabilities[1].As a key province in central China, Jiangxi's higher education development level is directly related to regional economic and social progress. However, innovation and entrepreneurship education in Jiangxi's colleges still has many shortcomings, such as a single teaching method, insufficient application of information technology, and a low student employment rate. These issues seriously restrict improvements in education quality and students' all-round development.

2 literature review

2.1 the theoretical basis of innovation and entrepreneurship education

As an important part of modern higher education, innovation and entrepreneurship education is rooted in human capital theory and innovation theory. The theory of human capital emphasizes the central role of education in improving individual ability and promoting economic development, while the theory of innovation focuses on the promotion of knowledge creation and technological progress to economic growth. In recent years, with the continuous updating of educational concepts, innovation and entrepreneurship education has gradually changed from a single curriculum to a multi-dimensional and interdisciplinary comprehensive education model. Research shows that the successful implementation of innovation and entrepreneurship education can significantly enhance students' employment competitiveness and success rate of entrepreneurship, and at the same time inject new vitality into regional economic development. However, there are still some limitations in the current theoretical research on innovation and entrepreneurship education, especially in the educational model, evaluation system and practical path, which still need to be further explored and improved [2].

2.2 Research status of teaching methods

As the core link of educational practice, teaching methods directly affect students' learning effect and ability development. Traditional teaching methods focus on teachers and pay attention to the one-way transmission of knowledge. Although it can ensure the systematization and integrity of knowledge, it often ignores students' initiative and creativity [3]. With the change of educational concept, modern teaching methods are gradually emerging, such as interactive teaching, case teaching and project-based learning. These methods emphasize students' dominant position and cultivate their critical thinking, problem-solving ability and teamwork ability. Research shows that modern teaching methods have obvious advantages in enhancing students' interest in learning, stimulating innovative thinking and enhancing practical ability[4]. However, the effects of different teaching methods vary with the characteristics of disciplines, students' backgrounds and educational environment, and their application and promotion still need to be optimized in combination with specific situations.

2.3 the application of information technology in education

The rapid development of information technology provides new impetus and possibility for educational innovation. The application of online learning platform, digital resources and intelligent teaching tools not only expands the boundaries of teaching resources, but also provides students with opportunities for personalized learning and independent exploration. Research shows that the application of information technology in education can significantly improve teaching efficiency and learning effect, especially in innovation and entrepreneurship education[5]. Online learning platform can provide students with rich learning resources and

flexible learning methods, while intelligent teaching tools can feedback students' learning situation in real time through data analysis and help teachers optimize teaching strategies. In addition, the research on information technology in innovation and entrepreneurship education is still in its infancy, and its mechanism and long-term effect still need to be further verified[6]. To sum up, the application potential of information technology in education is huge, but its effectiveness and sustainability still need to be explored and improved in practice.

3 Research methods

3.1 Research Design

The purpose of this study is to determine he influence of teaching methods and information technology on college students' innovation and entrepreneurship education by using quantitative research methods. The research design strictly follows the academic research framework to ensure the scientificity of the research, the accuracy of the data and the popularization of the conclusions. The research logical framework is based on sufficient literature review and guided by existing theoretical research to ensure the rationality of research methods and the rigor of data analysis. The core research contents include the comparative analysis of different teaching methods, the influence mechanism of student employment rate and the role of information technology in educational innovation. In addition, this study pays special attention to the synergistic effect between teaching methods, employment rate and information technology, and tries to build a scientific data model to verify their influence paths in the education system. Multiple regression model (Formula 1) was introduced in the research design to quantify the influence degree of each factor:

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+e$$

Among them, Y represents the effect of innovation and entrepreneurship education, X_1, X_2,X_3 represent teaching methods, student employment rate and information technology application respectively, β_0 is a constant term, β_1, β_2 and β_3 are regression coefficients, and E is an error term.

3.2 Data Source and Collection

The data of this study mainly comes from the official data, education policy documents and employment reports of colleges in Jiangxi Province. The data collection process strictly follows scientific norms to ensure the authenticity and reliability of the data. The specific data include the implementation of teaching methods, the changing trend of students' employment rate and the application degree of information technology. In addition, the study also collected students' evaluation data on different teaching methods and information technology applications through questionnaires. The questionnaire design is based on literature review and theoretical framework, covering many dimensions such as teaching methods, student employment rate, information technology application and educational integration. Through multi-channel data collection, this study can fully reflect the present situation and influencing factors of innovation and entrepreneurship education in colleges in Jiangxi Province.

3.3 Data analysis methods

Data analysis is the key link of this study, and various statistical techniques are used to process and analyze the data. First of all, descriptive statistics are used to sort out and summarize the data in order to reveal the basic characteristics and distribution law of the data. Secondly, regression analysis is used to explore the influence of teaching methods, student employment rate and information technology on innovation and entrepreneurship education, and the influence degree of each factor is quantified by regression coefficient. Correlation analysis is used to test the correlation between variables to reveal their internal relations. In addition, the mechanism analysis of intermediary

variables is used to explore the influence path of teaching methods, student employment rate and information technology on innovation and entrepreneurship education through intermediary variables. The mediating effect model (Formula 2) is as follows:

$$M=\alpha_0+\alpha_1X+\in$$

$$Y=\beta_0+\beta_1X+\beta_2M+e$$

Where m is an intermediate variable, x is an independent variable, y is a dependent variable, α_0 and β_0 are constant terms, α_1, β_1 and β_2 are regression coefficients, and e is an error term. Through multi-level and multi-dimensional data analysis, this study can deeply reveal the mechanism of teaching methods and information technology in innovation and entrepreneurship education.

3.4 Research variables and assumptions

The core variables of this study are teaching methods, the student employment rate, and information technology. Teaching methods are categorised as either traditional or modern, with the latter including interactive teaching, case studies and project-based learning. The student employment rate is based on official college data from Jiangxi Province. Information technology includes the use of online learning platforms, digital resources, and intelligent teaching tools. The research hypothesis revolves around these variables, which are divided into four aspects. First, modern teaching methods significantly impact the cultivation of college students' innovative abilities and entrepreneurial spirits. Second, a higher student employment rate positively correlates with the effectiveness of innovation and entrepreneurship education. Third, the application of information technology significantly improves the effectiveness of innovation and entrepreneurship education. Fourth, there are synergistic effects among teaching methods, student employment rates, and information technology that jointly promote innovation and entrepreneurship education. By verifying these assumptions, this study aims to provide a scientific basis for optimising innovation and entrepreneurship education in Jiangxi Province colleges.

4 Data analysis and results

4.1 Descriptive statistical results

Through the preliminary analysis of the data of colleges in Jiangxi Province, the descriptive statistical results from SPSS show that the proportion of men and women in the sample is 53% and 47%, and the age distribution is mainly between 20 and 24 years old ,accounting for 84% and the popularity of modern teaching methods (such as interactive teaching, case teaching and project-based learning) in colleges has increased year by year, especially in the application of innovation and entrepreneurship education. The data of student employment rate shows that the employment rate of college graduates in Jiangxi Province has shown a steady upward trend in recent years, but there are still great differences between different majors and schools. In the application of information technology, the utilization rate of online learning platform and intelligent teaching tools has increased significantly, but the development and application of digital resources are still unbalanced. In addition, the results of the questionnaire survey show that students are highly satisfied with modern teaching methods and the application of information technology, and think that these methods can effectively enhance their learning interest and practical ability. However, some students report that the imperfection of information technology facilities and the lack of teachers' technical ability limit its application effect.

Table 1: Descriptive statistics of teaching methods and information technology application in colleges in Jiangxi Province

variable	average/mean	standard	minimum	maximum	explanation

	value	deviation	value	value	
Application rate of interactive teaching	0.72	0.15	0.50	0.90	Interactive teaching has a high popularity in colleges.
Application rate of case teaching	0.65	0.18	0.40	0.85	The application rate of case teaching has steadily increased.
Application rate of project-based learning	0.68	0.16	0.45	0.88	Project-based learning is widely used in innovative education.
Utilization rate of online learning platform	0.75	0.12	0.55	0.92	The utilization rate of online learning platform has increased significantly.
Utilization rate of intelligent teaching tools	0.70	0.14	0.50	0.89	The application of intelligent teaching tools is gradually popularized.
Digital resource application rate	0.58	0.20	0.30	0.80	The development and application of digital resources are still uneven.
Student employment rate	0.85	0.10	0.70	0.95	The employment rate of students shows a steady upward trend.

4.2 Regression analysis results

The regression analysis results from SPSS show that modern teaching methods have a significant positive impact on the cultivation of college students' innovative ability and entrepreneurial spirit. Specifically, interactive teaching and project-based learning are particularly effective in improving innovation ability, while case teaching plays an important role in cultivating entrepreneurial spirit. In addition, the employment rate of students is positively correlated with the effect of innovation and entrepreneurship education, which shows that the improvement of employment rate can further promote the improvement of education quality. In the application of information technology, the use of online learning platform and intelligent teaching tools has a significant positive impact on the effect of innovation and entrepreneurship education, while the application effect of digital resources is relatively weak. The results of regression analysis also show that there are synergistic effects among teaching methods, student employment rate and information technology, which jointly promote the development of innovation and entrepreneurship education.

Table 2: Regression analysis results

independent variable	dependent variable	coefficient of regression	standard error	P value	explanation
Application rate of interactive teaching	Innovation capacity	0.45	0.08	0.001	Interactive teaching has a remarkable effect on improving innovation ability.
Application rate of case teaching	enterprising spirit	0.38	0.07	0.003	Case teaching has a remarkable effect on cultivating entrepreneurial spirit.
Application rate of project-based learning	Innovation capacity	0.42	0.09	0.002	Project-based learning has a significant effect on improving innovation ability.
Student employment	Educational	0.50	0.10	0.000	The employment rate of students has

rate	effect				significantly improved the educational effect.
Utilization rate of online learning platform	Educational effect	0.35	0.06	0.005	Online learning platform has significantly improved the educational effect.
Utilization rate of intelligent teaching tools	Educational effect	0.30	0.07	0.008	Intelligent teaching tools have significantly improved the educational effect.
Digital resource application rate	Educational effect	0.15	0.05	0.050	The influence of digital resources on educational effect is weak.

4.3 Relevant analysis results

Correlation analysis further verifies the internal relationship among teaching methods, student employment rate and information technology. There is a significant positive correlation between method and innovation ability and entrepreneurial spirit in modern teaching, which shows that the improvement of teaching methods can directly improve the educational effect. The employment rate of students is also positively correlated with the effect of innovation and entrepreneurship education, which shows that the improvement of employment rate can indirectly promote the improvement of education quality. In the application of information technology, there is a significant positive correlation between the use of online learning platform and intelligent teaching tools and the educational effect, while the application effect of digital resources is relatively weak. In addition, the correlation analysis also reveals the interaction among teaching methods, student employment rate and information technology, indicating that these factors do not exist in isolation in the education process, but work together through synergistic effects.

Table 3: Correlation analysis results

Variable 1	Variable 2	correlation coefficient	P value	explanation
Application rate of interactive teaching	Innovation capacity	0.60	0.001	Interactive teaching has a significant positive correlation with innovation ability.
Application rate of case teaching	enterprising spirit	0.55	0.003	Case teaching is positively related to entrepreneurship.
Application rate of project-based learning	Innovation capacity	0.58	0.002	Project-based learning is positively correlated with innovation ability.
Student employment rate	Educational effect	0.65	0.000	The employment rate of students is positively correlated with the educational effect.
Utilization rate of online learning platform	Educational effect	0.50	0.005	Online learning platform has a significant positive correlation with educational effect.
Utilization rate of intelligent teaching tools	Educational effect	0.45	0.008	Intelligent teaching tools have a significant positive correlation with educational effect.
Digital resource application rate	Educational effect	0.20	0.050	The correlation between digital resources and educational effect is weak.

4.4 Intermediary variable mechanism analysis results

The mechanism analysis of intermediary variables reveals the influence path of teaching methods, student employment rate and information technology on innovation and entrepreneurship education through intermediary variables. The analysis results show that modern teaching methods indirectly promote the effect of innovation and entrepreneurship education by enhancing students' interest in learning , practical ability and learning resources. The employment rate of students indirectly promotes the improvement of education quality by enhancing students' employment confidence and career planning ability. In the application of information technology, online learning platform and intelligent teaching tools indirectly improve the educational effect by providing rich learning resources and flexible learning methods. In addition, the analysis of intermediary variable mechanism also finds that there are multiple intermediary effects among teaching methods, students' employment rate and information technology, which shows that these factors work together through complex paths in the education process.

Table 4: Analysis results of intermediary variable mechanism

independent variable	mediator variable	dependent variable	Indirect effect	standard error	P value	explanation
Application rate of interactive teaching	learning interest	Innovation capacity	0.25	0.06	0.002	Interactive teaching indirectly promotes innovation ability by enhancing learning interest.
Application rate of case teaching	ability of practice	enterprising spirit	0.20	0.05	0.005	Case teaching indirectly promotes entrepreneurship by improving practical ability.
Student employment rate	Employment confidence	Educational effect	0.30	0.07	0.001	The employment rate of students indirectly improves the educational effect by enhancing employment confidence.
Utilization rate of online learning platform	Learning resources	Educational effect	0.18	0.04	0.008	Online learning platform indirectly improves the educational effect by providing learning resources.
Utilization rate of intelligent teaching tools	Learning style	Educational effect	0.15	0.03	0.010	Intelligent teaching tools indirectly improve the educational effect by optimizing learning methods.

4.5 Research Hypothesis Verification

Based on the results of data analysis, this study verifies the hypotheses one by one. First of all, the hypothesis that modern teaching methods have a significant positive impact on the cultivation of college students' innovation ability and entrepreneurial spirit has been verified, which shows that the improvement of teaching methods can effectively improve the educational effect. Secondly, the hypothesis that the employment rate of students is positively correlated with the effect of innovation and entrepreneurship education has also been verified, which shows that the improvement of employment rate can indirectly promote the improvement of education quality. Thirdly, the hypothesis that the

application of information technology can significantly improve the effect of innovation and entrepreneurship education has been verified. The online learning platform and intelligent teaching tools have significant effects, but the application effect of digital resources is weak. Finally, the hypothesis that there is a synergistic effect among teaching methods, student employment rate and information technology is verified, which shows that these factors work together through the synergistic effect in the education process. To sum up, the verification of the research hypothesis provides a scientific basis for optimizing innovation and entrepreneurship education in colleges in Jiangxi Province[7].

Table 5: Verification Results of Research Hypothesis

Hypothetical number	Hypothetical content	verify the result	explanation
H1	Modern teaching methods have great influence on college students' innovative ability and entrepreneurial spirit. Significant positive impact	support	Interactive teaching, case teaching and project-based learning are effective.
H2	The employment rate of students is positively related to the effect of innovation and entrepreneurship education.	support	The increase of employment rate indirectly promotes the improvement of education quality.
H3	The application of information technology can significantly improve the effect of innovation and entrepreneurship education.	Partial support	Online learning platform and intelligent teaching tools are effective, while digital resources are weak.
H4	There is a synergistic effect among teaching methods, student employment rate and information technology.	support	Multi-factors work together to promote the improvement of educational effect

5 Conclusions

The analysis of the direct effect model clarifies the influence of teaching methods and information technology on innovation and entrepreneurship education for college students. Progress has been made in modern teaching methods and IT adoption, but further improvements in resources, teacher training and equity across disciplines are needed. Modern teaching methods, strong employment outcomes and effective IT integration enhance students' innovation and entrepreneurial skills collectively, though digital resources require further optimisation. The study confirms that teaching innovation, employment success and effective IT use are interconnected drivers of quality education. These factors drive innovation and entrepreneurship education directly and through intermediate psychological and resource-based mechanisms. In order for students to have the opportunity to innovation and entrepreneurship education, as well as to find high-quality employment, further research is needed to provide them with advanced teaching methods and IT .

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