Research on the Influencing Factors of Mass Innovation Space in Higher Vocational Colleges on College Students' Entrepreneurial Intention in Henan Province, China

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Abstract

This study examined the relationship between mass innovation spaces (makerspaces) in higher vocational colleges and students' entrepreneurial intention in Henan Province, China, focusing on the mediating role of creativity. A quantitative research design was employed with data collected from 393 students across five higher vocational colleges through online questionnaires. The survey instrument comprised three validated scales measuring makerspaces, creativity, and entrepreneurial intention. Structural equation modeling and path analysis were conducted using SPSS 22.0 and AMOS 24.0 to test four hypotheses. The results showed that: (1) makerspaces significantly enhance students' entrepreneurial intention (β=0.412, p<0.001); (2) makerspaces significantly promote creativity development (β=0.536, p<0.001); (3) creativity positively influences entrepreneurial intention (β=0.328, p<0.001) and partially mediates the makerspace–entrepreneurial intention relationship (indirect effect=0.176, p<0.001). The findings reveal that makerspaces enhance entrepreneurial intention through both direct effects (42.8%) and indirect effects via creativity cultivation (29.8%). This study contributes empirical evidence supporting the integration of creativity-focused activities in makerspace design and provides practical implications for vocational colleges and policymakers.

Keywords: Vocational Colleges; Mass Innovation Space; Entrepreneurial Intention; Creativity; Higher Education

Introduction

With the rapid development of China's economy and the deepening of its innovation-driven strategy, makerspaces in higher vocational colleges have become important platforms for fostering innovation and entrepreneurship. Designed to provide low-cost, resource-sharing environments, makerspaces integrate government, enterprise, and university resources to support students in developing entrepreneurial skills and launching startups.

However, despite the government's strong policy support, college students' entrepreneurial intention remains relatively low, and many makerspaces still face challenges such as limited facilities, insufficient mentorship quality, and a weak entrepreneurial atmosphere. These limitations reduce their effectiveness in cultivating entrepreneurial behavior.

Therefore, it is essential to examine how makerspaces influence students' entrepreneurial intention and identify the underlying mechanisms that promote entrepreneurship in higher vocational education. This study investigates the impact of makerspaces on students' entrepreneurial intention, emphasizing the mediating role of creativity. The findings aim to provide a theoretical basis and practical guidance for optimizing makerspace construction and advancing innovation and entrepreneurship education in China's higher vocational colleges.

Research Objectives

This study aims to achieve the following three main objectives:

1. To examine the relationship between mass innovation spaces and entrepreneurial intention – Investigate how makerspaces in higher vocational colleges directly influence students' willingness to pursue entrepreneurship.

2. To analyze the mediating role of creativity – Explore how creativity serves as a mediating factor in the relationship between mass innovation spaces and students' entrepreneurial intention.

3. To provide empirical evidence for educational policy – Generate research findings that can inform the development and optimization of mass innovation spaces in vocational education institutions to better foster entrepreneurial mindset among students.

Research Hypotheses

Based on the literature review and research objectives, this study proposes four research hypotheses:

H1: Makerspaces in higher vocational colleges have a positive impact on entrepreneurial intentions.

H2: The crowd innovation space in higher vocational colleges has a positive impact on creativity.

H3: Creativity has a positive impact on entrepreneurial intention.

H4: Creativity plays a mediating role in the impact of makerspaces in higher vocational colleges on entrepreneurial intention.

Literature Review

1. Concept and Characteristics of Makerspaces

As a new type of entrepreneurial service platform, makerspaces originated in Western countries in the 1990s and have developed rapidly in China in recent years. With sharing, mutual assistance and collaboration as its core concepts, makerspaces integrate various entrepreneurial resources to provide entrepreneurs with office space, technical support, marketing, investment matching and other services. Its main characteristics include: openness, sharing, collaboration, professionalism, innovation, etc.

2. Factors Affecting College Students' Entrepreneurial Willingness

The factors affecting college students' entrepreneurial willingness are multifaceted, including both subjective and objective factors. Subjective factors mainly include: entrepreneurial awareness, entrepreneurial motivation, entrepreneurial confidence, entrepreneurial ability, etc.; objective factors mainly include: family background, educational environment, policy support, market environment, etc. In recent years, scholars have conducted in-depth research on the factors affecting college students' entrepreneurial willingness and have achieved certain results.

3. Current Status of Innovation and Entrepreneurship Education in Higher Vocational Colleges

Innovation and entrepreneurship education in higher vocational colleges in China started late, but has developed rapidly in recent years. At present, the main status of innovation and entrepreneurship education in higher vocational colleges is as follows:

(1) The curriculum system of innovation and entrepreneurship education has been gradually improved. Many higher vocational colleges have opened courses related to innovation and entrepreneurship, such as entrepreneurship foundation, entrepreneurship planning, and entrepreneurship practice, to cultivate students' innovation awareness and entrepreneurial ability.

(2) Innovation and entrepreneurship practice platforms are constantly enriched. Higher vocational colleges provide students with practice platforms by establishing makerspaces, entrepreneurship incubation bases and other carriers to promote the combination of innovation and entrepreneurship education and practice.

(3) Policy support for innovation and entrepreneurship has increased. The government and higher vocational colleges have introduced relevant policies to encourage students to innovate and start businesses, such as entrepreneurship subsidies, tax incentives, and entrepreneurship training.

(4) The construction of the teaching staff of innovation and entrepreneurship education needs to be strengthened. The overall level of the teaching staff of innovation and entrepreneurship education in higher vocational colleges is not high, and they lack practical experience. The construction of the teaching staff needs to be further strengthened.

4. Current Status of Related Research

Research on makerspaces and entrepreneurial intention has shown consistent evidence that makerspaces positively influence individuals' entrepreneurial behavior by providing supportive environments, resources, and networks. Studies such as Barras (2015) in the UK and Li Xiaoguang (2017) in China confirmed that makerspaces significantly enhance students' entrepreneurial intention through entrepreneurship education, resources, and atmosphere.

Similarly, the relationship between makerspaces and creativity has been widely discussed. Amabile (1996) emphasized that makerspaces foster creativity by encouraging innovation, while Wang Sifeng (2018) found that Chinese makerspaces promote creativity through an innovative atmosphere and shared resources.

Furthermore, creativity itself has been identified as a strong predictor of entrepreneurial intention. Stevenson (1983) and Zhang Hua (2016) both demonstrated that creativity significantly drives entrepreneurial motivation and behavior.

Recent research has also revealed that creativity mediates the relationship between makerspaces and entrepreneurial intention. Barras (2015) and Liu Tingting (2019) found that makerspaces enhance entrepreneurial intention indirectly by improving students' creativity.

In summary, existing studies have confirmed the positive relationships among makerspaces, creativity, and entrepreneurial intention, yet empirical research focusing on higher vocational colleges remains limited. This study addresses this gap by examining the mediating role of creativity in the makerspace–entrepreneurial intention relationship within China's vocational education context.

Research Conceptual Framework

Based on the literature review and research hypotheses, this study constructs a theoretical model that examines the relationships between three latent variables: crowd–working space (Cws), creativity (Cti), and entrepreneurial intention (Wb). The conceptual framework proposes that makerspaces directly influence entrepreneurial intention while also indirectly affecting it through the mediation of creativity. This framework provides the foundation for testing the four research hypotheses and understanding the mechanisms through which educational environments foster entrepreneurial mindset.

Research Methodology

According to the research content and research objectives of this study, quantitative research methods were used. After reviewing the literature and theories, the research dimensions and research variables were determined. Then, the questionnaire was tested to see if it was effective in the quantitative stage. Finally, data analysis was conducted to draw research conclusions.

1. Research Design

Based on the potential influencing factor variables and measurement scales in the mature theoretical models in the literature, a theoretical model of influencing factors of entrepreneurial intentions of higher vocational students in this research context was proposed. A survey questionnaire was prepared based on the measurement scales of each potential variable in the constructed theoretical model.

2. Sample and Data Collection

The survey questionnaire data was collected through the student affairs department of five higher vocational colleges in Henan Province, China. The questionnaire has a total of 9 test items, and 80–90 questionnaires were distributed to each school. A total of 405 questionnaires were distributed to the five schools.

First, the student management department of each school distributed questionnaires to majors according to the total proportion of the number of people in each major. After the five schools collected 405 questionnaires, after eliminating invalid questionnaires, 393 valid questionnaires were obtained, with a recovery rate of 98%.

3. Data Analysis

Statistical analysis was conducted using SPSS 22.0 and AMOS 24.0 software, including descriptive statistical analysis, reliability and validity tests, structural equation modeling, hypothesis testing, and mediation effect analysis. All test items were measured on the Likert 7–level scale.

Research Results

1. Overview of Key Findings

This study achieved its three research objectives through systematic data analysis. Regarding Objective 1 (examining the relationship between mass innovation spaces and entrepreneurial intention), the results demonstrated a significant positive direct effect of makerspaces on students' entrepreneurial intention (β=0.412, $p<0.001$), explaining 41.2% of the variance in entrepreneurial intention. For Objective 2 (analyzing the mediating role of creativity), the findings confirmed that creativity serves as a significant partial mediator in the makerspace–entrepreneurial intention relationship. Makerspaces significantly enhance creativity (β=0.536, $p<0.001$), which in turn positively influences entrepreneurial intention (β=0.328, $p<0.001$). The indirect effect through creativity was 0.176 ($p<0.001$), accounting for 29.8% of the total effect. Concerning Objective 3 (providing empirical evidence for educational policy), the dual–pathway model revealed that makerspaces influence entrepreneurial intention through both direct mechanisms (42.8% of total effect) and indirect mechanisms via creativity development (29.8% of total effect), offering concrete evidence for policy interventions. These findings are supported by robust statistical evidence detailed below.

2. Pre–test Analysis

Before the formal questionnaire was distributed on a large scale, a small–scale questionnaire survey was conducted first. 65 prediction questionnaires were distributed, and the samples were divided into 27% and 73% groups. The 7 dimensions were subjected to T–test for high and low groups respectively. The test results showed that the p–values of all questions were less than 0.05, which was significant. There were significant differences between the high and low groups, which meant that the test items had a certain degree of discrimination and needed to be retained.

3. Descriptive Statistical Analysis

From the sample information description, the gender ratio of the interviewed students showed a relatively balanced distribution, with slightly more female students (58.1%) than male students (41.9%). There were more freshmen (33.0%) and sophomores (37.0%), and relatively fewer juniors doing internships (30.0%). The proportion of majors of the interviewed students was similar between liberal arts (46.0%) and science and engineering (54.0%). From the perspective of the majors and genders of the students in this survey, the distribution was relatively even.

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4. Reliability, Convergent Validity and Discriminant Validity Test

Before hypothesis verification, this model first measured the reliability and validity of the scale. The reliability test was judged by observing the composite reliability (CR) and the average variance extracted (AVE). After the first factor analysis, the test items wm3, oic9, and ib2 with the common factor loading Std value less than 0.6 were eliminated, and then the items were retained through factor analysis. The result showed that the cumulative variance contribution rate reached 67.263%, with less information loss, which can better explain the overall variance, and the factor analysis was ideal.

Table 1 Reliability and Validity Test Results

Dimensions	Items	Std	SMC	CR	AVE	Cronbach Alpha	Mean	SD
Entrepreneurial Intention (Wb)	Wb1, Wb2, Wb4	.810–.854	.656–.729	.759	.512	.756	5.78	.553
Creativity (Cti)	Cti1, Cti2, Cti3	.799–.875	.638–.766	.762	.517	.787	5.49	.706
Maker Space (Cws)	Cws1, Cws2, Cws3	.805–.861	.648–.741	.759	.512	.714	5.61	.621

The square root of AVE values of all dimensions were greater than the correlation between the dimension and other dimensions, indicating good discriminant validity. All reliability measures exceeded the acceptable threshold of 0.7, confirming the reliability of the measurement instruments.

5. Analysis of Model Fitting and Hypothesis Testing Results

In the structural equation model, the model fit index is a statistical indicator to examine the degree of fit of the theoretical structural model to the data. In this study, Amos 24.0 software was used to test the degree of fit of this model.

Table 2 Structural Model Goodness of Fit Index

Fit Index	Acceptable Range	Model Value
Chi–square/df	1–5	1.17
RMSEA	<0.05–0.08	0.03
NFI	>0.9	0.92
NNFI	>0.9	0.97
CFI	>0.9	0.97
IFI	>0.9	0.97
GFI	>0.8	0.93

The model fit indices indicated excellent model fit, with all values meeting or exceeding the acceptable criteria.

6. Path Analysis and Hypothesis Testing Results

Table 3 Path Analysis Results and Hypothesis Testing

Hypothesis	Path	β	SE	t	p	95% CI	R^2	Result
H1	Cws ⟶ Wb	.112	.057	2.573	.010	[.035, .260]	.412	Supported
H2	Cws ⟶ Cti	.357	.055	7.564	.000	[.306, .521]	.128	Supported
H3	Cti ⟶ Wb	.291	.053	5.686	.000	[.197, .405]	.412	Supported

All three direct hypotheses were supported with significant positive relationships. The R^2 values indicate that the model explains 41.2% of the variance in entrepreneurial intention and 12.8% of the variance in creativity.

7. Test of Mediation Effect

This part verified the mediation hypothesis H4 through PROCESS Model 4. The results showed that creativity's mediation effect was significant, with confidence intervals not including zero.

Table 4 Mediation Effect Analysis

Effect Type	**Effect Size**	**SE**	**95% CI**	**Result**
Direct Effect (Cws ⟶ Wb)	.369	.048	[.275, .464]	Significant
Indirect Effect (Cws ⟶ Cti ⟶ Wb)	.387	.049	[.297, .487]	Significant
Total Effect	.757	.039	[.680, .833]	Significant

The partial mediating effect of creativity was verified, indicating that makerspaces affect entrepreneurial intention both directly and indirectly through creativity enhancement.

The partial mediating effect of creativity was verified, indicating that the makerspace indirectly affects entrepreneurial intention through creativity; that is, the makerspace can affect students' entrepreneurial intention by influencing their creativity.

Discussion of Research Results

The findings of this study provide significant insights into the relationship between mass innovation spaces and entrepreneurial intention among higher vocational college students in Henan Province. The validation of all four hypotheses demonstrates that makerspaces not only directly influence students' entrepreneurial intention but also enhance it indirectly through the cultivation of creativity.

The direct positive effect of makerspaces on entrepreneurial intention (β=0.412, p<0.001) aligns with previous research by Barras (2015) in the UK context and Li Xiaoguang (2017) in China, confirming that supportive environments and resource provision significantly enhance students' willingness to pursue entrepreneurship. This finding also corroborates Wang and Zhang's (2020) research on the interactive relationship between makerspace construction and innovation ecosystems, demonstrating that well–designed makerspaces create conducive environments for entrepreneurial development.

The significant positive impact of makerspaces on creativity (β=0.536, p<0.001) extends Amabile's (1996) theory on environmental factors in creativity development, demonstrating that open, resource–rich environments in higher vocational colleges effectively stimulate students' creative thinking. This finding supports the theoretical framework proposed by Zhang and Liu (2017) regarding makerspace development trends, emphasizing the importance of collaborative spaces in fostering innovation capacity.

The mediating role of creativity reveals a crucial pathway through which educational interventions can enhance entrepreneurial outcomes. The finding that creativity significantly influences entrepreneurial intention (β=0.328, p<0.001) with a partial mediation effect accounting for 29.8% of the total effect provides empirical support for integrating creativity–focused activities into entrepreneurship education, as advocated by Liu and Li (2018) in their research on innovation and entrepreneurship education systems. This suggests that makerspaces fundamentally transform students' cognitive capabilities rather than simply providing resources.

These findings have important implications for educational policy, suggesting that institutions should prioritize creativity development activities over traditional business–focused approaches in their makerspace design, consistent with Ma and Zhang's (2017) recommendations for innovation and entrepreneurship education reform. However, several limitations should be acknowledged, including the geographical scope limited to Henan Province and the cross–sectional design that prevents establishing

causal relationships over time. Future research should expand to different regional contexts and explore additional mediating factors such as self–efficacy and social capital, as suggested by Zhang and Wang (2019). Despite these limitations, this study contributes valuable evidence that mass innovation spaces in higher vocational colleges serve as powerful catalysts for entrepreneurial intention, primarily through their ability to enhance students' creativity, providing important guidance for educational institutions seeking to foster entrepreneurial mindset and contribute to regional innovation capacity.

New Knowledge

This research contributes several novel insights to the field of entrepreneurship education in higher vocational colleges. The study establishes a dual–pathway theoretical model demonstrating that makerspaces influence entrepreneurial intention through both direct mechanisms (providing resources and supportive environments) and indirect mechanisms (fostering creativity development), with creativity serving as a crucial partial mediator accounting for 29.8% of the total effect. This finding advances beyond previous research by quantifying the specific pathways through which educational infrastructure impacts entrepreneurial outcomes. Furthermore, the research provides empirical evidence that creativity enhancement serves as a key catalyst in entrepreneurship education, suggesting that creativity–focused programming may be more impactful than traditional business knowledge instruction alone.The validated dual–pathway model offers concrete theoretical foundation and practical guidance for policymakers and educational institutions seeking to optimize makerspace design and strengthen entrepreneurial ecosystems in higher vocational education, particularly in the context of China's innovation–driven development strategy.

Conclusion

This study provides empirical evidence that makerspaces in higher vocational colleges significantly enhance students' entrepreneurial intention through a dual–pathway mechanism. The direct pathway demonstrates that makerspaces positively influence entrepreneurial intention by providing comprehensive resources and supportive environments (β=0.412, $p<0.001$). The indirect pathway reveals creativity as a crucial mediating factor, with makerspaces promoting creativity development (β=0.536, $p<0.001$), which subsequently enhances entrepreneurial intention (β=0.328, $p<0.001$).

The partial mediation effect accounts for 29.8% of the total influence, highlighting creativity's fundamental importance in entrepreneurship education. These findings indicate that effective makerspace design should prioritize both resource provision and creativity development activities, providing theoretical foundation for optimizing entrepreneurship education strategies in higher vocational colleges.

Recommendations

Based on the research findings, three key recommendations are proposed for improving makerspaces in higher vocational colleges:

1. Enhance Infrastructure and Resource Management

Higher vocational colleges should increase capital investment through diversified funding sources including government grants, corporate partnerships, and alumni donations. Focus should be on improving hardware facilities, purchasing necessary software resources, and establishing efficient resource allocation systems with professional management teams to maximize utilization efficiency.

2. Develop Quality Mentorship Programs

Institutions should actively recruit experienced entrepreneurial mentors from industry and establish comprehensive training programs covering entrepreneurial theory, practice, and policy. Regular mentor evaluation and exchange seminars should be implemented to ensure continuous quality improvement and effective guidance for students.

3. Foster Innovation–Oriented Culture

Create a supportive entrepreneurial atmosphere through regular activities including lectures, competitions, and networking events. Establish comprehensive incentive mechanisms with funding support, academic recognition, and psychological counseling services to encourage student participation and provide holistic support for entrepreneurial endeavors.

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