A STUDY ON PERCEIVED INNOVATION CLIMATE AND INNOVATIVE BEHAVIOR OF STUDENTS AT UNIVERSITY D, FUZHOU CITY, FUJIAN PROVINCE, CHINA

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Abstract: This study aimed to explore the synergistic relationship between perceived innovation climate and innovation behavior among college students at University D in Fuzhou City, Fujian Province, China. Data were collected through questionnaires, and descriptive and differential analyses were conducted on the innovation climate—including school culture, instructor–student relationships, and peer relationships—and innovation behavior, which encompassed ways of thinking, academic exploration, life practice, and academic study, among 292 college students. The findings indicated that both the innovation climate and innovation behavior were at a moderately high level. Significant differences in innovation climate and behavior were observed among students with different background variables such as gender and household registration, whereas the influence of grade and major was relatively minor. In addition, a significant positive correlation was found between the innovation climate and innovation behavior. These results provided a theoretical basis for the implementation of innovative education in higher education institutions and offered specific suggestions for enhancing the innovation capacity of college students.

Keywords: Private Colleges Teacher, Differential Leadership Style, Deviant Behavior, Psychological Capital

Introduction

With the deepening of globalization and the rapid development of information technology, profound changes took place in the global economic structure and social systems. Innovative capabilities became a key component of national core competitiveness (Li, 2022). Particularly in the era of the knowledge economy, innovation was widely recognized as the primary driving force behind social progress and economic growth. In response to global competition, many countries increased investment in education, especially in higher education, aiming to enhance national innovation by

cultivating innovative talent.

From an international perspective, universities worldwide gradually adopted innovative education as a core development strategy. Education systems in developed countries across Europe and North America introduced the concept of the innovation ecosystem in the early 21st century, aiming to build organically integrated innovation networks within universities to foster students' innovative behaviors and capabilities (Shom Bafon et al., 2019).

In the Chinese context, universities also placed increasing emphasis on innovative education in recent years. Under national policy guidance, initiatives such as the "Double First-Class" construction and the "Mass Entrepreneurship and Innovation" education reform were implemented, promoting the reform and development of innovation education systems in higher education. However, students in Chinese universities continued to face several barriers to innovative behavior, including limited access to innovation resources, a lack of innovative cultural climate, and insufficient opportunities for interdisciplinary collaboration (Wu et al., 2024).

In summary, while the relationship between innovation climate and students' innovative behavior has received global attention, existing research has yet to fully explore the internal synergistic mechanisms. Therefore, using University D in Fujian as a case study, this research aimed to investigate this relationship from the perspective of the innovation ecosystem, providing practical references for educational management.

Research Objectives

(1) To determine the differences in the level of the perceived innovation climate among students at University D in Fuzhou City, Fujian Province, China, under different demographic background factors, namely different genders, household registrations, grades, and majors.

(2) To determine the differences in the innovative behavior performance among students at University D in Fuzhou City, Fujian Province, China, under different demographic background factors, namely different genders, household registrations, grades, and majors.

(3) To study the positive correlation between the perceived innovation climate and innovative behaviors among students at University D in Fuzhou City, Fujian Province, China.

Literature Review

Research on Innovation Climate

In the era of rapid global economic transformation and the rise of the knowledge-based economy, innovation capabilities had become a core aspect of national and regional competitiveness. Higher education played a vital role in cultivating innovative talent. This study focused on exploring the relationship between college students' innovation climate and innovation behavior from the perspective of the innovation ecosystem, aiming to examine their interaction mechanisms and provide

both theoretical and practical guidance for enhancing students' innovation capacity.

Innovation climate, defined by Schneider (1975) as employees' subjective perceptions of the innovation environment, was complex and multidimensional. Although research on the relationship between innovation climate and innovation behavior had increased, several limitations remained. There was a lack of systematic analysis regarding the components of innovation climate, and the internal mechanisms of innovation behavior—particularly among college students—had not been fully explored. Therefore, empirical research on the innovation ecosystem within Chinese universities was considered highly significant.

Universities around the world had gradually adopted innovative education as a core development strategy. Developed countries in Europe and North America, for example, widely introduced the innovation ecosystem concept in the early 21st century (Shom Bafon et al., 2019). The Massachusetts Institute of Technology (MIT) in the United States, through close cooperation with technology enterprises, had provided students with practical opportunities for innovation, significantly enhancing their capabilities (Etzkowitz et al., 2022).

Research on Innovation Behavior

In the early stages of innovation behavior research, scholars focused on individuals' creative performance within organizations. Amabile (1988) defined innovation behavior as a process of generating and applying novel ideas, involving three stages. As research progressed, the concept expanded. Scott & Bruce (1994) viewed it as the pursuit of new work methods and emphasized that a positive organizational climate could enhance it. Later studies introduced more complex definitions, highlighting characteristics such as novelty, practicality, initiative, and collaboration.

Innovation behavior was influenced by both individual and organizational factors. Personal attributes such as knowledge, skills, creativity, motivation, and attitude played key roles—especially among college graduates—in supporting innovation and contributing to economic development. As a result, many countries increasingly emphasized innovation cultivation in higher education. This study specifically examined college students' innovation behavior in the face of academic and practical challenges.

Regarding measurement, early definitions were grounded in economics and psychology. Initial studies often used single-dimensional scales, such as the one developed by Scott & Bruce. However, subsequent research supported the development of multi-dimensional instruments to capture various influencing factors. In China, researchers adapted these frameworks to the local context. The current study adopted Jiang's (2018) scale, which was validated for its structural integrity and suitability for Chinese college students.

Research on Research on the Relationship between the Innovation Climate and the Innovation Behavior

According to social learning theory, an innovation climate was conducive to generating

innovative behaviors (Shanker et al., 2017). In the research field linking innovation climate with innovative behaviors, Aryee et al. (2012) pointed out that cultivating an innovation climate required attention to various elements related to the origins of innovative behaviors, such as organizational culture and mutual support among members, which influenced individual innovative behaviors. Jønsson et al. (2021) considered innovation climate the most prominent factor in predicting individual innovative behaviors. Empirical research across different sectors supported this relationship.

In public organizations, Lopes et al. (2022) found that, despite institutional constraints, fostering an innovation-supportive climate could still encourage employees' innovative behaviors. In business management, Newman et al. (2020) discovered that an innovation-supportive climate was a key driver of employees' innovative behaviors, with the influence sometimes occurring indirectly through mediating variables. In education, Guo et al. (2024) and Soleas (2021) demonstrated that an innovation climate—characterized by open learning environments and encouragement of free exploration—significantly promoted students' innovative behaviors. For teachers, support from school leadership and a collaborative culture were crucial for promoting their innovative practices (Zeng et al., 2021).

Current Situation of University D in Fuzhou, Fujian Province, Chinas

In recent years, Chinese higher education institutions placed greater emphasis on innovative education. Guided by national policies, they promoted reforms in the innovation system. Although efforts were made to foster an innovative climate with policy support, compared to Western developed countries, they were still exploring how to establish an innovation ecosystem—particularly in stimulating students' innovative behaviors. Fujian Province took the lead in application-oriented transformation, advancing the development of innovation and entrepreneurship education. University D in Fuzhou, with its long history, strong academic traditions, and commitment to cultivating innovative talent, featured multiple disciplines, a robust faculty, active international exchange, and notable achievements in scientific research. Therefore, it was selected for this study.

Methodology

This study focused on University D students in Fuzhou City, Fujian Province, China. A convenience sampling method was used to distribute 440 questionnaires. After excluding invalid responses, a total of 292 valid questionnaires were retained, resulting in a valid response rate of 77%. The proportion of invalid questionnaires did not exceed 30%, meeting the standards for valid data in social science research and allowing the study to proceed.

The scale used in this study was based on the "Innovation Climate and Innovation Behavior Questionnaire" developed by Jiang (2018). It consisted of three parts: the first covered demographic variables such as gender, place of origin, grade, and major; the second focused on innovation climate, including three dimensions—campus culture, instructor–student relationships, and peer relationships—

with a total of 17 items (6, 4, and 7 items, respectively); the third measured innovation behavior, including four dimensions and 24 items in total. A 5-point Likert scale was applied throughout.

In terms of reliability and validity, the innovation climate scale had an overall Cronbach's α of 0.870 and a split-half reliability of 0.798. The innovation behavior scale had a Cronbach's α of 0.931 and a split-half reliability of 0.887. For construct validity, the innovation climate scale yielded a KMO value of 0.923 and a Bartlett's test approximate chi-square of 7520.949 (sig. = .000), while the innovation behavior scale showed a KMO value of 0.937 and a Bartlett's test approximate chi-square of 4081.154 (sig. = .000), indicating good reliability and validity.

Results

Demographic Analysis of Questionnaire Participants

Among the 292 valid questionnaires, Table 1 presented the demographic distribution of the sample. By gender, 44.5% (n = 130) were male and 55.5% (n = 162) were female. In terms of grade level, freshmen accounted for 24.3% (n = 71), sophomores 22.9% (n = 67), juniors 15.8% (n = 46), and seniors 37.0% (n = 108). Regarding household registration, 48.3% (n = 141) of the students were from rural areas, and 51.7% (n = 151) were from urban areas. In terms of major, 32.5% (n = 95) majored in science and engineering, 25.7% (n = 75) in humanities, 15.8% (n = 46) in economics and management, and 26.0% (n = 76) in other fields.

Table 1: Demographic Distribution of Sample

Demographic Variables	Group	n	Percentage (%)
Gender	Male	130	44.5
	Female	162	55.5
Grade	Freshman	71	24.3
	Sophomore	67	22.9
	Junior	46	15.8
	Senior	108	37.0
Residence	Rural	141	48.3
	Urban	151	51.7
Major	Science and Engineering	95	32.5
	Humanities	75	25.7
	Economics and Management	46	15.8
	Others	76	26.0
Total		292	100

Descriptive Statistics on the Levels of Perceived Innovation Climate and Innovative Behavior

A study was conducted to examine differences in perceived innovation climate among university students with different demographic backgrounds. Descriptive statistical analysis showed that students reported high levels across all dimensions and in their overall perception of the innovation climate. The total mean score was 3.71, with a standard deviation of 0.58. Among the dimensions, school culture received a relatively higher score, although its advantage was not statistically significant. These results suggested that the school's innovation climate still had room for improvement.

In the analysis of innovative behavior, students also demonstrated high levels across all dimensions and in total innovation behavior. The total mean score was 3.62, with a standard deviation of 0.59. Differences in dimension scores indicated that various student groups expressed innovative behavior in different forms and to varying degrees.

Table 2: The Levels of Perceived Innovation Climate and Innovative Behavior

Dimension	n	M	SD	Interpretation
School Culture	292	3.77	0.65	High
Peer Relationships	292	3.63	0.71	High
Teacher-Student Relationships	292	3.72	0.64	High
Innovation Climate	292	3.71	0.58	High
Ways of Thinking	292	3.67	0.60	High
Academic Exploration	292	3.57	0.69	High
Life Practice	292	3.60	0.67	High
Academic Learning	292	3.62	0.63	High
Innovative Behavior	292	3.62	0.59	High

Analysis of Differences in Perceived Innovation Climate and Innovative Behavior Across Demographic Variables

1) Testing Results of Research Hypothesis H1 and H2

Table 3 showed that significant differences were found in the peer relationship and teacher–student relationship dimensions. Female students reported higher mean scores and better performance in these dimensions, possibly due to more active interpersonal interactions. While there were significant gender-based differences in the perceived innovation climate, no significant differences were found in innovative behavior between male and female university students. Therefore, Hypothesis H1-1 was valid, whereas Hypothesis H2-1 was not.

Table 3: Independent Sample T-Test Analysis of Perceived Innovation Climate and Innovative Behavior by Gender

Dimension	Male (n=130)		Female (n=162)		t	p
	M	SD	M	SD		
School Culture	3.72	0.67	3.80	0.64	-1.06	.291
Peer Relationships	3.54	0.75	3.71	0.68	-2.09	.037
Teacher-Student Relationships	3.58	0.65	3.84	0.61	-3.50	.001
Innovation Climate	3.61	0.59	3.78	0.56	-2.55	.011
Ways of Thinking	3.61	0.62	3.72	0.57	-1.58	.619
Academic Exploration	3.47	0.71	3.64	0.66	-2.18	.403
Life Practice	3.54	0.70	3.65	0.65	-1.46	.370
Academic Learning	3.59	0.65	3.64	0.62	-0.59	.737
Innovative Behavior	3.55	0.61	3.66	0.57	-1.62	.655

Table 4 and Table 5 showed that significant differences were found in the dimensions of ways of thinking, academic exploration, and academic learning. While there were no significant grade differences in the perceived innovation climate, significant differences were observed in innovative behavior among university students of different grades. Therefore, Hypothesis H1-2 was invalid, whereas Hypothesis H2-2 was valid.

Table 4: ANOVA Analysis of Perceived Innovation Climate and Innovative Behavior by Grade

Dimension	Grade	n	M	SD	F	p
School Culture	Freshman	71	3.70	0.67	1.81	.145
	Sophomore	67	3.68	0.58		
	Junior	46	3.95	0.61		
	Senior	108	3.79	0.69		
Peer Relationships	Freshman	71	3.63	0.69	1.50	.214
	Sophomore	67	3.49	0.69		
	Junior	46	3.76	0.73		
	Senior	108	3.67	0.73		
Teacher-Student Relationships	Freshman	71	3.72	0.63	2.12	.098
	Sophomore	67	3.60	0.60		
	Junior	46	3.91	0.57		
	Senior	108	3.72	0.69		
Innovation Climate	Freshman	71	3.69	0.55	2.23	.084

Dimension	Grade	n	M	SD	F	p
Ways of Thinking	Sophomore	67	3.59	0.51	5.71	.001
	Junior	46	3.87	0.55		
	Senior	108	3.73	0.63		
	Freshman	71	3.54	0.57		
Academic Exploration	Sophomore	67	3.59	0.51	3.24	.022
	Junior	46	3.97	0.62		
	Senior	108	3.68	0.62		
	Freshman	71	3.43	0.69		
Life Practice	Sophomore	67	3.46	0.63	2.46	.063
	Junior	46	3.76	0.75		
	Senior	108	3.64	0.67		
	Freshman	71	3.54	0.68		
Academic Learning	Sophomore	67	3.47	0.55	2.98	.032
	Junior	46	3.79	0.75		
	Senior	108	3.64	0.69		
	Freshman	71	3.54	0.63		
Innovative Behavior	Sophomore	67	3.52	0.61	3.97	.008
	Junior	46	3.84	0.65		
	Senior	108	3.64	0.62		
	Freshman	71	3.51	0.59		
	Sophomore	67	3.51	0.50		
	Junior	46	3.84	0.63		
	Senior	108	3.65	0.59		

Table 5: Post-hoc Comparison of Innovative Behavior by Grade

Dimension	Post-hoc Comparison Results
Ways of Thinking	Freshman, Sophomore, or Senior < Junior
Academic Exploration	Freshman or Sophomore < Junior Freshman < Senior
Academic Learning	Freshman and Sophomore < Junior
Innovative Behavior	Freshman and Sophomore < Junior

Table 6 showed that significant differences were found in the school culture and teacher–student relationship dimensions. Rural students reported lower mean scores in these dimensions. While

there were significant differences in the perceived innovation climate based on residence, no significant differences were found in innovative behavior between rural and urban university students. Therefore, Hypothesis H1-3 was valid, whereas Hypothesis H2-3 was not.

Table 6: Independent Sample T-test Analysis of Perceived Innovation Climate and Innovative Behavior by Residence

Dimension	Rural (n=141)		Urban (n=151)		t	p
	M	SD	M	SD		
School Culture	3.66	0.67	3.87	0.62	-2.81	.005
Peer Relationships	3.56	0.67	3.70	0.74	-1.62	.107
Teacher-Student Relationships	3.60	0.62	3.84	0.64	-3.18	.002
Innovation Climate	3.61	0.60	3.80	0.56	-2.90	.004
Ways of Thinking	3.56	0.60	3.77	0.58	-3.04	.590
Academic Exploration	3.49	0.66	3.64	0.70	-1.88	.397
Life Practice	3.53	0.63	3.67	0.70	-1.80	.125
Academic Learning	3.57	0.63	3.66	0.63	-1.26	.455
Innovative Behavior	3.54	0.58	3.68	0.58	-2.18	.427

Tables 7 and 8 showed that significant differences were found in the dimension of academic exploration. While there were no significant differences in the perceived innovation climate across majors, significant differences in innovative behavior were observed among university students from different majors. Therefore, Hypothesis H1-4 was invalid, whereas Hypothesis H2-4 was valid.

Table 7: ANOVA Analysis of Perceived Innovation Climate and Innovative Behavior by Major

Dimension	Major	n	M	SD	F	p
School Culture	SE	95	3.79	0.64	2.14	.096
	Hum	75	3.70	0.67		
	E&M	46	3.62	0.64		
	Others	76	3.90	0.65		
Peer Relationships	SE	95	3.64	0.69	1.71	.164
	Hum	75	3.51	0.70		
	E&M	46	3.60	0.74		
	Others	76	3.77	0.72		
Teacher-Student Relationships	SE	95	3.75	0.54	1.97	.119

Dimension	Major	n	M	SD	F	p
	Hum	75	3.64	0.68		
	E&M	46	3.59	0.65		
	Others	76	3.84	0.70		
Innovation Climate	SE	95	3.69	0.49	2.40	.068
	Hum	75	3.59	0.63		
	E&M	46	3.87	0.59		
	Others	76	3.73	0.60		
Ways of Thinking	SE	95	3.75	0.56	2.38	.069
	Hum	75	3.55	0.68		
	E&M	46	3.58	0.57		
	Others	76	3.75	0.55		
Academic Exploration	SE	95	3.67	0.69	3.30	.021
	Hum	75	3.44	0.75		
	E&M	46	3.39	0.65		
	Others	76	3.67	0.61		
Life Practice	SE	95	3.71	0.65	2.43	.065
	Hum	75	3.49	0.75		
	E&M	46	3.46	0.59		
	Others	76	3.66	0.64		
Academic Learning	SE	95	3.70	0.57	2.10	.101
	Hum	75	3.49	0.72		
	E&M	46	3.54	0.68		
	Others	76	3.69	0.57		
Innovative Behavior	SE	95	3.70	0.54	3.07	.028
	Hum	75	3.49	0.68		
	E&M	46	3.49	0.56		
	Others	76	3.69	0.53		

Table 8: Post-hoc Comparison of Perceived Innovation Climate and Innovative Behavior by Major

Dimension	Post-hoc Comparison Results
Academic Exploration	Hum or E&M < SE
Innovative Behavior	Hum or E&M< SE
	Hum < Others

In short, when comparing differences in perceived innovation climate and innovative behaviors among university students with different demographic backgrounds, the results showed the following:

1) Significant differences were found in perceived innovation climate based on gender and residence;

2) Significant differences were found in innovative behaviors based on grade and major.

Overall, demographic background variables had varying impacts on university students' perceived innovation climate and innovative behaviors.

Correlation Analysis between Perceived Innovation Climate and Innovative Behavior

The correlation analysis between the innovation climate and innovative behaviors showed that the overall innovation climate, including school culture, peer relationships, and teacher–student relationships, was significantly positively correlated with each dimension of innovative behaviors ($p < .01$). High correlation coefficients indicated a strong connection, suggesting that these factors were closely intertwined in driving the emergence and development of innovative behaviors across all dimensions.

Table 9: Correlation Analysis of Perceived Innovation Climate and Innovative Behavior

	1	2	3	4	5	6	7	8	9
1. School Culture	1	.535**	.710**	.859**	.629**	.481**	.532**	.527**	.595**
2. Peer Relationships		1	.617**	.842**	.519**	.585**	.550**	.502**	.595**
3. Teacher-Student Relationships			1	.892**	.692**	.595**	.612**	.629**	.695**
4. Innovation Climate				1	.706**	.642**	.653**	.638**	.726**
5. Ways of Thinking					1	.742**	.762**	.802**	.906**
6. Academic Exploration						1	.748**	.744**	.895**
7. Life Practice							1	.793**	.912**
8. Academic Learning								1	.917**
9. Innovative Behavior									1

Discussion

The According to the descriptive statistics of a study on college students, both the innovation climate and innovative behaviors were at a medium-to-high level. Although certain aspects of the school's innovation climate were more prominent, there was still room for improvement. Differences in the scores of each dimension of innovative behaviors indicated that student groups varied in their forms and depth of innovative expression.

Among college students with different demographic backgrounds, significant differences were

found in the perceived innovation climate. In terms of gender, except for one specific dimension, female students performed better in teacher–student and peer relationships, likely due to more active interpersonal interactions. Grade had little influence on the perception of innovation climate. Regarding household registration, urban students generally had higher average scores, which might have been related to differences in educational environments. No significant differences were found across majors.

When examining innovative behaviors, there were no significant differences by gender or household registration. However, grade showed a significant influence, and major showed significant differences in certain dimensions. These results suggested that different demographic backgrounds had varying impacts on students' innovative behaviors.

Finally, the innovation climate—including school culture, peer relationships, and teacher–student relationships—showed a strong and significant positive correlation with each dimension of innovative behavior. These close connections indicated that such factors were interrelated and could effectively promote the development of innovative behavior across all dimensions.

Conclusions

Gender and Residential Differences in Perceived Innovation Climate

The analysis showed that students at University D perceived the innovation climate at a moderately high level. Among the three dimensions of perceived innovation climate, school culture received the highest score, though the differences among the three dimensions were relatively small.

Significant differences in perceived innovation climate were observed based on gender and residential status. Female students reported a higher perception of innovation climate than male students, while urban students had stronger perceptions than rural students.

In terms of gender, female students perceived significantly stronger teacher–student relationships, suggesting they experienced greater interaction and support from instructors. Regarding residence, urban students scored significantly higher in school culture and other dimensions of innovation climate, likely reflecting disparities in educational resources between urban and rural areas.

Grade and Major Influence on Innovative Behavior

Students at University D also reported moderately high levels of innovative behavior. Among the four dimensions, ways of thinking received the highest average score, though the differences across all dimensions were small. Significant differences in innovative behavior were found by grade and major. Specifically, students majoring in science and engineering demonstrated higher levels of innovative behavior compared to students in other disciplines.

Positive Correlation Between Innovation Climate and Innovative Behavior

There was a statistically significant positive correlation between perceived innovation climate and innovative behavior. Specifically, school culture was positively correlated with both ways of thinking and academic exploration, indicating that a strong innovation climate supported cognitive and

academic innovation. Additionally, teacher–student relationships showed a strong positive correlation with innovation behavior, suggesting that instructor support played an important role in fostering student innovation.

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