

Study on the Internal Relationship and Influence Mechanism Between Big Five Personality Traits and Creativity of College Students

Lihong Huang

School of Economics and Management, Jiangxi Normal University, Nanchang 330022, China

Abstract: *In the context of digital transformation in education, cultivating creativity among college students serves as both a crucial mission for higher education reform and a vital cornerstone for implementing innovation-driven development strategies and building an innovative nation. However, current talent cultivation approaches often focus on knowledge transmission and skill training while neglecting students' non-cognitive competencies. Building on this foundation, our study employs trait activation theory and creativity component theory as theoretical frameworks, introducing creative self-efficacy and innovative climate as mediating variables to explore how the Big Five personality traits influence student creativity. Using structural equation modeling, hierarchical regression, and Bootstrap methods, we analyzed data from 463 university students. The findings reveal that Big Five personality traits significantly positively impact creativity, with creative self-efficacy partially mediating this relationship between personality traits and creativity. Simultaneously, innovative climate positively moderates the effect of Big Five personality traits on creative self-efficacy. Finally, we propose that universities should develop customized talent cultivation programs from the perspective of individual capabilities and environmental interactions, fostering a dynamic innovative atmosphere to advance educational reform and enhance talent development quality.*

Keywords: Big Five personality traits; Creativity; Creative self-efficacy; Innovative climate.

1. Introduction

With the rapid development of artificial intelligence technology, the creativity cultivation of college students has received increasing attention from the global education community (Chun et al. 2025). At a time when AI is profoundly transforming the world, creativity is becoming a key competency that future professionals require, characterized by the ability to generate new ideas, innovations, and discoveries (Khalid et al. 2020; Ismayilova and Laksov 2023; Xu 2024). Creativity relies on human intuition, imagination, and abstract thinking, it is a form of human intelligence that AI has not yet been able to successfully replicate.

Adolescents in higher education are in a critical period of creative development, during which they can think abstractly, solve complex problems, and synthesize different areas of knowledge, which is crucial for creativity (Daneshfar and Moharami 2018). Contemporary college students are the talent pool of the future society, and their creative potential may significantly impact national development. As institutions responsible for nurturing talent, universities must prioritize creativity cultivation. This

involves fostering interdisciplinary education and engaging students in technological innovation to optimize their creative development (Yu and Wang 2025). Therefore exploring strategies to enhance creativity among university students is a key concern for universities.

Currently, creativity, as a higher-order thinking ability, has been incorporated into the 21st-century core competency frameworks by numerous countries and international organizations. It is noteworthy that students' creativity is influenced by individual factors as well as the educational environment (Conradty and Bogner 2020). Educators need to be aware of the personal characteristics that influence creativity, such as intrinsic motivation, personality traits, cognitive abilities, etc., and at the same time should not ignore the hidden "black box" in the development of individual abilities, namely non-cognitive abilities (Heckman, Stixrud, and Urzua 2006), which are essential for the lifelong development of students. Non-cognitive ability is a necessary quality for the lifelong development of students, which refers to the ability that cannot be measured by intelligence tests or academic performance but can be measured by personality traits. Psychology usually adopts personality traits, emotional intelligence, or non-intellectual factors to express non-cognitive ability, and non-cognitive ability is understood to be a kind more stable way of thinking, feeling, and behavior (Roberts et al. 2007). Consequently, the cultivation of individual creativity can be extended to the study of the influence of non-cognitive ability.

However, college students' creativity is not only influenced by individual factors but also depends on the educational environment. According to the trait activation theory (Tett and Burnett 2003), there is a mutual influence between personality traits and situations, and individual behaviors are mainly generated through the interaction of personality traits and situations, although in the process of exploring the formation mechanism, academics have begun to pay attention to the relationship between individual traits (e.g., creative personality, psychological capital, and innovative self-efficacy, etc.) and environmental factors (e.g., time pressure, organizational innovative climate, leadership feedback, etc.) on innovative behavior, few studies have systematically explored their interaction (Zhou et al. 2020). Scholars generally tend to believe that traits influence behavior, but practical studies have shown that the two are not simply directly linked, but may be influenced by other factors as "moderating variables". In the creative context, the moderating effect of innovative climate is further examined, i.e., the influence of personality traits on creative behavior is further strengthened under a high level of innovative climate. Not only that, individuals can get encouragement in presenting themselves, but they will also be more eager to notice and explore situations that are closely related to their traits (Liu et al. 2020). Based on the trait activation model, further research found that the influence of personality traits on individual creativity is realized through psychological processes (self-efficacy). The mediating role of creative self-efficacy is explored in the specific context of creative activity.

In summary, based on the Trait Activation Theory of organizational behavior, ("situation-personality trait-individual behavior"), this study constructs a theoretical model of "innovative climate-non-cognitive ability-creative behaviors", and explores the mediating role of creative self-efficacy and the moderating role of innovative climate. The possible theoretical contributions of this study are: first, revealing the real-life problems that students may face in cultivating creativity and exploring the cultivation mechanism of students' creativity in terms of the interaction between individual traits and the environment. Second, based on the Trait Activation Theory, the mechanism of non-cognitive ability's influence on creativity is verified from the perspective of individual ability, emphasizing the mediating role of creative self-efficacy between non-cognitive ability and creativity. Third, exploring the moderating role of innovative climate between non-cognitive ability and creativity, constructing a moderated mediation model, increases the influence path of non-cognitive ability on creativity.

2. Theoretical Background

2.1 Trait Activation Theory

Trait activation theory investigates the mechanisms and processes by which personality traits operate in the work environment (Tett and Guterman 2000; Tett and Burnett 2003). From the unique perspective of interaction psychology, it explores the organic link between external contexts and intrinsic traits within individuals and the predictive role of this organic link on individual behavior.

Trait activation theory suggests that personality traits and situations are mutually influential and that individual behavior is mainly generated through the interaction of personality traits and situations (Tett and Burnett 2003). Creativity is the result of a complex interaction between individuals and situations, where personality traits and a supportive creative climate interact to promote creative behavior in students. Trait activation theory suggests that context plays a fundamental role in the activation of personality traits. The moderating role of the innovative climate is further examined by introducing the innovative climate of colleges and universities in the creative context. Trait Process Model (Choi 2004) states that the influence of personality traits on individual creativity is realized through psychological processes (self-efficacy). The mediating role of creative self-efficacy is further examined in the specific context of creative activity. Therefore, this paper utilizes trait activation theory to explore the influence of non-cognitive abilities on creativity and argues that the moderating role of innovative climate and the mediating role of creative self-efficacy can further reveal the mechanism of its influence.

2.2 Component Theory of Creativity

According to the creativity component theory of Amabile(1988), creativity-related skills (cognitive style, personality, etc.), domain-related skills (knowledge, competence, etc.), and intrinsic motivation (self-efficacy, psychological capital, etc.) within an individual, as well as work situations outside an individual, are the important factors that influence creativity and innovation. In the process of developing students' creativity, the influences on creativity are categorized into internal and external factors. External factors refer to the objective conditions of creativity, i.e. the creative environment. Internal factors refer to students' psychological structure, i.e. creative thinking and creative personality. Creative thinking is novel, unique, and meaningful intellectual factors, and creative personality is an innovative spirit centered on non-intellectual factors. The psychological structure of creative personality is endogenous, is the basis for change, and is an individual variable. Creative environment variables are external factors, the conditions for change, and external and internal factors interact with each other. Without environment and culture, even great geniuses cannot achieve anything. External factors work through internal factors to promote the growth and development of creative talents.

In the study of the development of creative talents, researchers have attempted to develop a series of studies centered on the individual's intelligence, thinking, motivation, and personality traits, and the creative personality is an important factor affecting the individual's creativity. The creativity component theory provides theoretical support in this study to provide suggestions for enhancing creativity, i.e., enhancing creativity should be considered both internally and externally, and suggestions should be made accordingly.

3. Conceptual Framework and Research Hypotheses

The study applies trait activation theory to investigate (a) how college students' Big Five personality traits influence creativity, (b) the mediating role of creative self-efficacy, and (c) the moderating role of the school's innovative climate. The research model is shown in Figure 1.

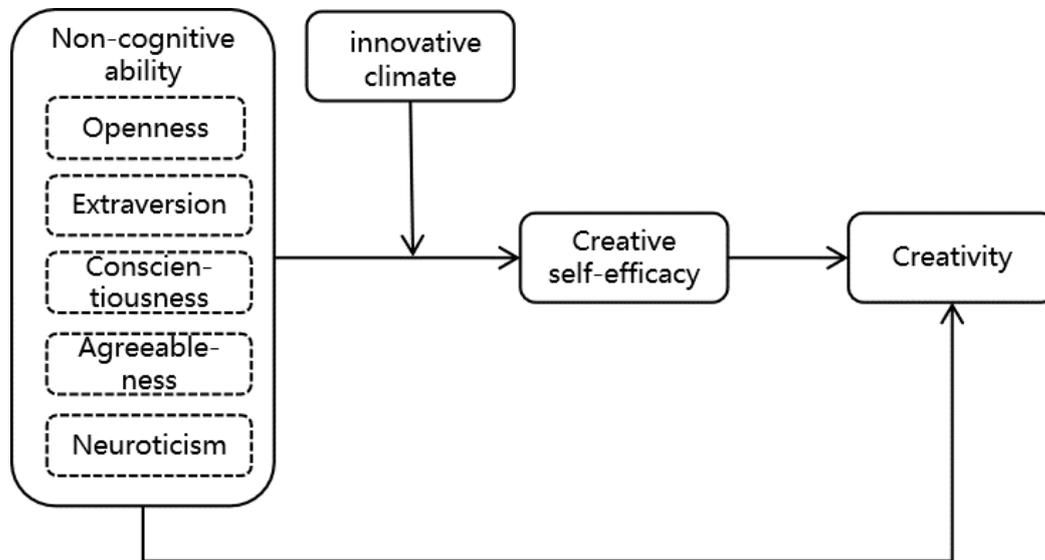


Figure 1: Research model.

3.1 Non-cognitive Ability and Creativity

In psychology, non-cognitive abilities are conceptualized as personality traits that enhance adaptation to uncertainty-related negative shocks (Schröder and Gilboa 2020). Research data suggests that the Big Five Model, which consists of openness, extraversion, conscientiousness, agreeableness, and neuroticism, measures roughly 75% of an individual's non-cognitive ability (Heineck and Anger 2010). Creativity refers to create, produce, and make. Creativity belongs to a special category of abilities, which is the ability of an individual to produce novel and socially or personally valuable ideas and products in combination with personality traits in a given activity. Personality explains up to 20% of the variation in creativity and is a source of character that produces creativity (Sternberg and Lubart 1995). Therefore, personality traits undoubtedly play an important role in the context of developing creativity in students, and different personality dimensions have different associations with creativity.

Openness is the personality trait most associated with creativity in the Big Five personality and can be a stable predictor of creativity performance. Previous studies have found that openness is the most fundamental core trait of creativity. One study measured creativity using six methods, including multi-purpose tasks and an innovation behavior scale, and examined the relationship between various personality traits and creativity as measured by these six methods. The results showed that openness was most closely related to creativity (Puryear, Kettler, and Rinn 2019). Traits such as acceptance of new ideas and imaginative capacity covered by the openness dimension enable individuals to break out of traditional thinking and are key dimensions in predicting individual creativity performance. People with extraversion traits are usually enthusiastic, optimistic, and confident, and creativity usually requires repeated validation and is risky and challenging, extroverts are bold and confident just enough to positively influence their creativity.

Research findings on the relationship between due conscientiousness and creativity are inconsistent and may be due to the nature of different tasks (Taggar 2021). Due diligence is a good predictor of creativity scores in creative intelligence, and creative imagination tasks (Hernandez et al. 2020). Individuals with a high sense of responsibility feel a strong sense of obligation to change the status quo and future

development of the organization, voluntarily invest more resources to create value for the organization and face problems and challenges head-on in innovative activities (Babalola et al. 2021). Agreeableness describes an individual's attitudes and thoughts that encompass being approachable, empathetic, and trusting. This trait of being good at communicating with people also promotes creativity to some extent. For neuroticism, some scholars believe that personal emotional and attitudinal disorders can affect creativity (Bühler, Sharma, and Stein 2020), Neuroticism mainly highlights the tendency and fluctuation of individuals' negative emotions. They have too much illogical thinking and find it difficult to regulate their emotions and thinking. Therefore, neuroticism hinders students' creativity. Thus, we propose:

H1a: Openness is positively related to student creativity;

H1b: Extraversion is positively related to student creativity;

H1c: Conscientiousness is positively related to student creativity;

H1d: Agreeableness is positively related to student creativity;

H1e: Neuroticism is negatively related to student creativity.

3.2 Mediating Role of Creative Self-efficacy

The present study further explored the mechanisms by which personality traits influence creativity. According to the Trait Process Model (Choi 2004), the influence of personality traits on individual creativity is mediated by psychological processes (self-efficacy). On this basis, Tierney and Farmer integrated Amabile's theory of creativity and proposed the concept of "creative self-efficacy" (Tierney and Farmer 2002), which refers to an individual's confidence in being able to obtain creative products or perform creative behaviors in a specific situation, i.e., performing creative activities. It refers to the degree of confidence an individual has in being able to obtain a creative product or perform a creative behavior in a given situation, i.e., in performing creative activities. Their study showed a significant positive correlation between creative self-efficacy and creativity. In addition, the study did prove that creative self-efficacy is a good predictor of creativity. According to Bandura, a high level of efficacy is a necessary prerequisite for discovering new knowledge and producing creative results. The positive relationship between self-efficacy and creativity has been supported by empirical findings (Prabhu, Sutton, and Sauser 2008). Moreover, as an important part of the human ability generation system, self-efficacy usually mediates between personality traits and individual behavioral performance (Caprara, Alessandri, and Eisenberg 2012). In creative activities, studies by different scholars have proved that creative self-efficacy plays an indirect role in different factors affecting creativity (Tierney and Farmer 2004). Thus, this study considers self-efficacy as an internal psychological variable between students' personality traits and creativity and further examines the mediating role of creative self-efficacy in the specific context of creative activities. Thus, we propose:

H2a: Creative self-efficacy mediates the relationship between openness and student creativity;

H2b: Creative self-efficacy mediates the relationship between extroversion and student creativity;

H2c: Creative self-efficacy mediates the relationship between conscientiousness and student creativity;

H2d: Creative self-efficacy mediates the relationship between agreeableness and student creativity;

H2e: Creative self-efficacy mediates the relationship between neuroticism and student creativity.

3.3 The Moderating Role of Innovative Climate

According to the trait activation theory, a suitable external environment can stimulate an individual's internal traits, thus influencing the individual's external behavior. Component theory of creativity also emphasizes that the external working context of individuals is an important factor affecting creativity and innovation, and individual creative behavior is the result of the interaction between the

environment and individual factors, so it is assumed that a positive external environment can promote the cultivation of students' creativity. The influence of the environment on human beings is potential and long-lasting, and the role of the school's innovative climate cannot be ignored when cultivating students' creativity in the school environment. Innovative climate refers to a psychological perception of an individual about whether the team or organizational environment supports their innovation (Amabile 1997). Trait activation theory points out that the individual's perception of a specific situation plays a moderating role in the process of the individual trait's influence on the implementation of his or her behavior. Therefore, an innovative climate can promote individual creativity by positively moderating creative self-efficacy. Thus, we propose:

H3a: Innovative climate positively regulates the influence of personality traits on creative self-efficacy;

H3b: Innovative climate positively regulates the mediating role of creative self-efficacy between personality traits and creativity.

4. Methods

4.1 Sample and Procedure

The data were mainly collected through an online questionnaire survey, and the research subjects were all college students, by the "Questionnaire Star" research platform, teachers and counselors to explain the situation and distribute the questionnaires in the class group. In order to ensure the authenticity and validity of the questionnaire, all questionnaires were filled in anonymously.

The research time was about two months, and a total of 586 questionnaires were collected. After eliminating invalid data such as too short response time, consistent selection of reverse question items, and selection of the same option, 463 questionnaires were finally obtained after processing, and the validity rate of the questionnaires was 79.01%, which was in line with the requirements of the study in terms of sample size. The sample characteristics are shown in Table 1.

Table 1: Sample demographic(n=463)

		N	Percentage
<i>Gender</i>	Male	265	57.24
	Female	198	42.76
<i>Grade</i>	Freshman year	94	20.30
	Sophomore year	107	23.11
	Junior year	143	30.89
	Senior year	119	25.70
<i>Major</i>	Science and Engineering	215	46.44
	Literature and History	177	38.23
	Economics and Management	44	9.50
	Else	27	5.83
<i>Student leader</i>	Yes	218	47.08
	No	245	52.92
<i>Creative competition</i>	Yes	178	38.44
	No	285	61.56
<i>Comprehensive score ranking</i>	Top 10%	129	27.86
	10%~50%	286	61.77
	else	48	10.36

4.2 Measures

The items in the survey were adapted from well-established and validated scales in international high-level journals. The survey items were measured on a 5-point Likert scale, (ranging from 1 = 'strongly

disagree' to 5 = 'strongly agree'). Respondents were asked to choose the scale that was closest to their actual situation.

4.2.1 Non-cognitive ability

Non-cognitive ability was measured based on the "Big Five personality" scale. The short version of the Big Five personality scale developed by Donnellan (2006), consists of five dimensions: openness, extraversion, conscientiousness, agreeableness, and neuroticism, with five questions for each dimension, and a total of 20 items, such as "I have a vivid imagination", "I am the soul of the party", and so on.

4.2.2 Creativity

The Creative Behavior Scale was developed by Scott (1994). and adapted to the Chinese context is mainly used to measure the generation and implementation of students' creative behaviors, according to Zhu (2024). which indicates students' creativity, with a total of 6 items. There are six items, such as "I will try new techniques and methods in learning" and "I will generate creative ideas in the learning process".

4.2.3 Creative self-efficacy

The Creative Self-Efficacy Scale was developed by Tierney and Farmer (2011), referring to Gong(2009). The scale consists of 4 items reflecting the self-efficacy of individuals in innovative and creative tasks. For example, "I am confident in my ability to solve problems creatively", "I feel that I am good at coming up with new and innovative ideas", and so on.

4.2.4 Innovative Climate

Adopting the innovative climate scale of Liu and Shi (2009), referring to the study of Jiang (2018). The scale is context-specific and consists of three dimensions: school culture, teacher-student relationship, and peer relationship, with a total of 12 items, such as "The school emphasizes the cultivation of innovative talents", "Teachers encourage students to engage in creative activities", and "I feel good at coming up with novel ideas". Encourage students to engage in creative activities", "Students can support and help each other in their studies", and so on.

4.2.5 Control Variables

The main variables include cognitive ability variables and demographic variables, in which cognitive ability refers to the cognitive ability usually refer to basic skills of reading, writing, and arithmetic, as well as the ability to acquire knowledge, memorize knowledge, reason, and reflect and apply knowledge to solve problems (Huang 2022), which is expressed through the students' comprehensive achievement in this study. Demographic variables included students' gender (1=male, 0=female), grade level (1=freshman, 2=sophomore, 3=junior, 4=senior), major (1=science and engineering, 2=literature and history, 3=economics and management, and 0=else), whether or not they were student leaders and whether or not they participated in creative competitions.

5. Data Analysis and Results

5.1 Measurement Model

We tested the measurement model by analyzing the reliability and validity of the scales, and the test results are shown in Table 2. Cronbach's alpha coefficients were all greater than 0.8, and the scales passed the consistency test, which indicated the high reliability and internal consistency of the scales. In terms of structural validity, the KMO values of the scale items are all greater than .80, indicating that the structural validity of each variable is good. Meanwhile, the minimum value of the combined reliability CR of each variable was .825, which was above the threshold of .70, and the average variance extracted (AVE) ranged from .543 to .630, which also exceeded the criterion of .50, indicating that the clustering validity of each variable was good.

The four variables of non-cognitive ability, creativity, creative self-efficacy, and innovative climate were subjected to confirmatory factor analysis. The four-factor to one-factor models were tested respectively, and the results are shown in Table 3. Among them, the four-factor model has the best fitting effect ($X^2/df=1.597$, $RMSEA=.036$, $CFI=.989$, $IFI=.989$), and the values of the parameters have reached the high fitting standard, and are significantly better than the fitting results of the other factor models, which indicates that there is a good discriminative validity among the four variables.

The means, standard deviations, and correlation coefficients of the variables in this study, as shown in Table 4, test the discriminant validity of the measurements. Openness, extroversion, conscientiousness, and agreeableness were significantly and positively correlated with creativity, creative self-efficacy, and innovative climate; neuroticism was significantly and negatively correlated with creativity ($r = -.58$, $p<.01$), creative self-efficacy ($r = -.54$, $p<.01$), and innovative climate ($r = -.53$, $p<.01$); creative self-efficacy was significantly positively correlated with innovative climate ($r = .78$, $p<.01$) and creativity ($r = .86$, $p<.01$); and innovative climate was significantly positively correlated with creativity ($r = .79$, $p<.01$). It indicates that the main variables in the model are significantly related, providing a preliminary basis for subsequent hypothesis testing.

Table 2: Reliability and validity test

Variables	Cronbach's α	KMO	CR	AVE	
No-cognitive ability	Openness	.854	.820	.855	.595
	Extraversion	.848	.860	.848	.583
	Conscientiousness	.822	.810	.825	.543
	Agreeableness	.837	.816	.837	.562
	Neuroticism	.853	.813	.854	.593
Creativity	-	.889	.970	.889	.571
Creative-self-efficacy	-	.858	.828	.858	.610
Innovative climate	School Culture	.872	.831	.871	.629
	Teacher-student relationship	.872	.833	.872	.630
	Student-student relationship	.861	.825	.862	.690

Table 3: Validation factor analysis

Model	X^2	df	X^2/df	RMSEA	CFI	IFI
Four-factor model (NA, C, CS, IC)	206.000	129	1.597	.036	.989	.989
Three-factor model (NA, C, CS+IC)	426.001	132	3.227	.069	.956	.957
Two-factor model (NA+C,CS+IC)	917.562	134	6.847	.113	.884	.884
One-way model (NA+C+CS+IC)	118.097	135	8.741	.129	.845	.846

Note: + indicates that two factors were combined into one. NA = non-cognitive ability, C = creativity, CS = creative self-efficacy, IC = innovative climate.

Table 4: Means, standard deviation, and correlation.

Means	1	2	3	4	5	6	7	8
Openness	1							
Extroversion	.74**	1						
Conscientiousness	.76**	.73**	1					
Agreeableness	.78**	.74**	.80**	1				
Neuroticism	-.67**	-.76**	-.72**	-.71**	1			

Creativity	.67**	.66**	.62**	.67**	-.58**	1		
Creative-self-efficacy	.64**	.62**	.59**	.64**	-.54**	.86**	1	
Innovative climate	.62**	.59**	.66**	.64**	-.53**	.79**	.78**	1
Average value	3.83	3.67	3.82	3.88	2.30	3.68	3.66	3.78
Standard deviation	.93	.99	.90	.88	.96	.83	.86	.83

Note: *p<.05(two-tailed);**p<.01 (two-tailed)

5.2 Main Effect Test

The results of the main effect test of non-cognitive ability on creativity are shown in Table 5, and since personality traits contain multiple dimensions, the effects of five dimensions on creativity were examined simultaneously in the hypothesis testing process, corresponding to the H1a, H1b, H1c, H1d, and H1e hypotheses. Model 1 is the baseline model, which puts the control variables into the regression to verify their correlation with creativity, and Models 2, 3, 4, 5, and 6 are the main effect models, which are the regression tests of the five dimensions of personality traits and creativity, respectively.

From model 2, openness positively affects creativity ($\beta=.59$, $p<.001$), and hypothesis H1a is verified; From model 3, extraversion positively affects creativity ($\beta=.54$ $p<.001$), hypothesis H1b is tested; From model 3, conscientiousness positively affects creativity ($\beta=.57$ $p<.001$) and hypothesis H1c is tested; From model 4, agreeableness positively affects creativity ($\beta=.63$ $p<.001$) and hypothesis H1d is verified; From model 5, neuroticism negatively affects creativity ($\beta=-.49$ $p<.001$), and hypothesis H1e is tested.

Table 5: Main effects analysis

Variant	Creativity					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Gender	.01	-.01	.014	-.01	.03	.05
Grade	-.02	.01	.01	-.01	.01	.00
Major	.12*	.05	.02	.06	.08*	.04
Student leader	.09	.10	.12	.15*	.12	.05
Creative Competition	.28**	.13*	.11	.14*	.16*	.20**
Comprehensive score	-.05	.03	-.03	.05	.01	-.05
Openness		.59***	-	-	-	-
Extraversion			.54***	-	-	-
Conscientiousness				.57**	-	-
Agreeableness					.63**	-
Neuroticism						-.49**
R ²	.05	.47	.44	.41	.48	.35
F	4.27***	57.99***	51.96***	45.73***	59.91***	35.39***

Note: *** p<.001(two-tailed);** p<.001(two-tailed); * p<.05(two-tailed).

5.3 Indirect Effect Test

Based on the regression results of the main effect, the influence of the dimensions of non-cognitive ability on creative self-efficacy was tested, and the specific test results are shown in Table 6. Since personality traits contain multiple dimensions, the effects of five dimensions on creative self-efficacy are examined simultaneously during the hypothesis testing process.

From Model 7, openness has a significant positive effect on creativity ($\beta=.64$, $p<.001$); From Model 8, extraversion has a significant positive effect on creativity ($\beta=.61$, $p<.001$); From model 9, conscientiousness has a significant positive effect on creativity ($\beta=.59$, $p<.001$); From model 10, agreeableness has a significant positive effect on creativity ($\beta=.63$, $p<.001$); and From model 11, neuroticism has a significant negative effect on creativity ($\beta=-.55$, $p<.001$). The fit of the model was good, providing a basis for the subsequent mediation effect test.

Table 6: Indirect effect analysis

Variant	Creative self-efficacy				
	Model 7	Model 8	Model 9	Model 1	Model 11
Gender	.01	.02	.01	.03	.05
Grade	.03	.04	.01	.04	.08
Major	-.02	-.05	-.01	.01	-.12
Student leader	.03	.04	.06	.04	-.02
Creative Competition	.09*	.08*	.10*	.12**	.14
Comprehensive score	.06	.01	.08*	.05	-.07
Openness	.64***	-	-	-	--
Extraversion		.61***	-	-	--
Conscientiousness			.59***	-	-
Agreeableness				.63***	--
Neuroticism					-.55***
R ²	.43	.39	.38	.43	.33
F	49.10***	42.31***	39.59***	49.77***	8.76***

Note: *** p<.001(two-tailed);** p<.01(two-tailed);* p<.05(two-tailed).

5.4 Mediation Effect Test

The joint effect of the dimensions of non-cognitive ability and creative self-efficacy on creativity was further tested, and the test results are shown in Table 7.

Model 12 shows that creative self-efficacy has a significant positive effect on creativity ($\beta=.85$, $p<.001$). On this basis, model 13 added the openness and creative self-efficacy variables to regress creativity, and the results showed that the effect of openness on creativity was enhanced ($\beta=.12$, $p<.001$), while creative self-efficacy still had a significant positive effect on creativity ($\beta=.72$, $p<.001$), so creative self-efficacy had a significant positive effect on the openness and student creativity has a mediating role, and hypothesis H2a was tested.

Model 14 added extraversion and creative self-efficacy variables to regress creativity, and the results showed that extroversion had an enhanced effect on creativity ($\beta=.20$, $p<.001$), while creative self-efficacy still had a significant positive effect on creativity ($\beta=.73$, $p<.001$), so creative self-efficacy has a mediating role between extroversion and student creativity has a mediating role between extroversion and student creativity, and hypothesis H2b was tested.

Model 15 added conscientiousness and creative self-efficacy variables to regress creativity, and the results showed that due diligence had an enhanced effect on creativity ($\beta=.17$, $p<.001$), while creative self-efficacy still had a significant positive effect on creativity ($\beta=.75$, $p<.001$), thus creative self-efficacy had a mediating role between due diligence and student creativity has a mediating role between due diligence and student creativity, and hypothesis H2c was tested.

Model 16 added agreeableness and creative self-efficacy to regress creativity, and the results showed that desirability had an enhanced effect on creativity ($\beta=.21$, $p<.001$), while creative self-efficacy still had a significant positive effect on creativity ($\beta=.72$, $p<.001$), so creative self-efficacy has a mediating effect between desirability and student creativity mediating role between pleasantness and creativity, and hypothesis H2d was tested.

Model 17 added neuroticism and creative self-efficacy variables to regress creativity, and the results showed that the effect of neuroticism on creativity was weakened ($\beta=-.16$, $p<.001$), while creative self-efficacy still had a significant positive effect on creativity ($\beta=.76$, $p<.001$), so creative self-efficacy has a

mediating effect between neuroticism and student creativity has a mediating effect between neuroticism and creativity, and hypothesis H2e was tested.

Table 7: Analysis of mediating effects

Variant	Creativity					
	Model 12	Model 13	Model 14	Model 15	Model 16	Model 17
Gender	-.01	-.01	-.01	-.01	-.01	-.04
Grade	-.02	-.14	-.01	-.02	-.01	-.03
Major	.07**	.06*	.05*	.06*	.07**	.08
Student leader	.03	.04	.04	.05	.04	-.01
Creative Competition	.01	.01	.00	.01	.01	.02
Comprehensive score	-.04	-.02	-.04	-.02	-.03	-.05
Creative self-efficacy	.85***	.72***	.73***	.75***	.72***	.76***
Openness		.20***	-	-	--	--
Extraversion			.20***	-	-	--
Conscientiousness				.17***	-	-
Agreeableness					.21***	--
Neuroticism						-.16**
R ²	.75	.77	.77	.76	.77	.75
F	190.12***	187.80***	187.80***	182.09***	189.64***	47.03***

Note: *** p<.001(two-tailed),** p<.01(two-tailed),* p<.05(two-tailed).

In order to further verify the robustness of the above results, the mediating effect of creative self-efficacy was tested using the Bootstrap method, setting the sample size to 5 and the confidence interval to 95%, and the detailed results are shown in Table 8. The regression coefficient is within the interval and the confidence interval does not include, indicating that the mediating effect of creative self-efficacy is established, and the regression results have a certain degree of robustness.

Table 8: Bootstrap mediation effect test

Variant	Path	RC	SE	95% CI	
				LLCI	ULCI
Openness	Total	.61	.03	.54	.67
	Direct	.19	.03	.13	.24
	Indirect	.42	.03	.37	.47
Extraversion	Total	.55	.03	.49	.61
	Direct	.17	.02	.12	.22
	Indirect	.38	.03	.33	.44
Conscientiousness	Total	.57	.03	.51	.64
	Direct	.16	.03	.10	.21
	Indirect	.42	.03	.36	.48
Agreeableness	Total	.64	.03	.57	.70
	Direct	.20	.03	.14	.25
	Indirect	.44	.03	.38	.50
Neuroticism	Total	-.57	.07	-.71	-.43
	Direct	-.18	.05	-.28	-.07
	Indirect	-.40	.06	-.52	-.27

Abbreviations: RC=regression coefficient; SD=standard error.

5.5 Moderating Effect Test

Regarding the moderating effect of innovative climate, the personality traits and innovative climate after data processing were first multiplied to form the interaction term, then the control variables, independent variables, and moderating variables were introduced one by one, and finally, the interaction term was introduced for regression analysis, and the final test results are shown in Table 9. As shown in Model 21, the interaction term of personality traits and innovative climate has a significant effect on creativity ($\beta=.08$, $p<.01$), which indicates that innovative climate has a significant positive moderating effect between personality traits and creative self-efficacy. Hypothesis H3a was verified.

To further test the moderating effect of innovative climate, the present study, based on Cohen (2013). Used a simple slope test with a mean plus or minus one standard deviation to divide the samples into two groups to depict the differences in the effects of non-cognitive abilities on creative self-efficacy in contexts with different levels of innovative climate, and the results are shown in Figure 2. The slope of the straight line is greater for a high innovative climate, indicating that the influence of non-cognitive ability on creative self-efficacy is enhanced when the innovative climate is higher, and hypothesis H3a is further verified.

Table 9: Moderating effects test

Variant	Creative self-efficacy			
	Model 18	Model 19	Model 20	Model 21
Gender	.02	.02	.02	.02
Grade	.00	.03	.00	.00
Major	.04	-.03	-.01	-.02
Student leader	.03	.04	-.01	-.01
Creative Competition	.18***	.08*	.09**	.08*
Comprehensive score	.00	.05	.06*	.05
Personality traits		.68***	.28***	.32***
Innovative Climate			.58***	.62***
Personality traits x innovative climate.				.08**
R ²	.04	.48	.67	.67
F	3.11**	59.96***	112.97***	11.52***

Note: *** p<.001(two-tailed);** p<.01(two-tailed);* p<.05(two-tailed).

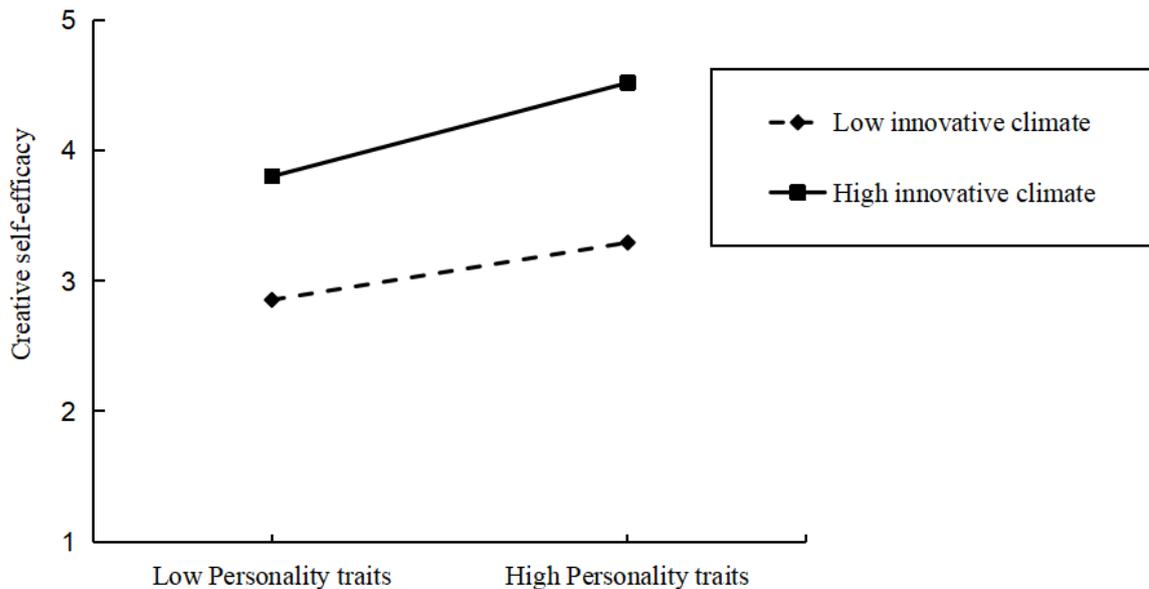


Figure 2: The moderating effect of innovative climate

5.6 Moderated Mediation Effect Test

We utilized the Bootstrap method (sample size of 5) to test the moderated mediated effect test model, and the test results are shown in Table 10. Comparing the data of the low-level group and the high-level group of the innovative climate path, it can be seen that when the innovative climate is strong, the effect of non-cognitive ability on creativity is stronger than that of low innovative climate, indicating that the innovative climate positively moderates the mediating role of creative self-efficacy between non-cognitive ability and creativity. Hypothesis H3b was tested.

Table 10: Mediating effect with moderation.

	Path	Effect	Effect	SE	ILCI	ULCI
IC	NA → CS →	Low level (-1 + SD)	.18	.04	.11	.25
		High level (+1 + SD)	.29	.04	.21	.38
	C	Group difference	.11	.05	.01	.21

Abbreviations: IC = innovative climate; NA = non-cognitive ability; CS = creative self-efficacy; C = creativity.

6. Conclusion and Outlook

6.1 Conclusion

This study constructed a moderated mediated effect model of the influence of non-cognitive abilities on students' creativity from the perspective of the interaction between individual abilities and the environment, introduced creative self-efficacy as a mediating variable and innovative climate as a moderating variable, explored the creativity cultivation paths of college students in the context of new quality education, and examined the mediating role of creative self-efficacy and moderating role of innovative climate. The study finds:

The non-cognitive abilities of openness, extroversion, conscientiousness, and agreeableness can significantly promote students' creativity, while neuroticism hinders students' creativity. This is consistent with existing findings that, for college students, students high in openness tend to have stronger learning and insight abilities, and can quickly absorb new knowledge and transform it into creative outcomes; extroverted students are enthusiastic and confident, and are more motivated when faced with iterative validation and high-challenging tasks required for creativity; and due diligence makes students serious and responsible in their approach to learning and tasks, and such an attitude is conducive to creativity in this attitude is conducive to deeper investigation in creative activities. Individuals with high agreeableness are empathetic, kind, and communicative. In teamwork, these students can better understand the ideas and needs of others, facilitating the collision and integration of ideas and providing a rich source of inspiration for creative activities. On the other hand, students with strong neuroticism are easy to fall into negative emotions and illogical thinking due to difficulties in regulating their own emotions and thinking, which is not conducive to individuals making creative behaviors.

Creative self-efficacy plays a mediating role between students' non-cognitive abilities and creativity. The dimensions of non-cognitive abilities affect students' creativity by influencing their creative self-efficacy, which in turn affects their creativity. For example, students with high openness believe more in their ability to solve problems creatively, and this confidence prompts them to actively try new ideas and methods, which enhances creativity; positive feedback received by extroverted students during socialization enhances creative self-efficacy and further stimulates creativity.

Innovative climate positively moderates the effect of non-cognitive abilities on creative self-efficacy and positively moderates the mediating effect of non-cognitive abilities on creativity. In an environment with a highly innovative climate, students can feel that innovation is encouraged and supported, and non-cognitive ability promotes creative self-efficacy more strongly. For example, in a campus full of innovative atmosphere, students with high openness can obtain more resources and opportunities, and their creative self-efficacy improves more obviously, which in turn promotes creativity more significantly; at the same time, the innovative atmosphere strengthens the mediating effect of creative self-efficacy between non-cognitive ability and creativity, and better promotes the development of students' creativity.

6.2 Practical Implications

This study provides three practical insights for the cultivation of college students' creativity in the context of new quality education.

First, Schools should fully recognize the importance of non-cognitive abilities, reverse the unscientific educational evaluation orientation of "score theory only", avoid short-sighted and test-oriented education, and pay attention to the cultivation of students' non-cognitive abilities and the shaping of innovative talents, which is a key strategy to enhance students' core competitiveness.

Second, continuously improve creative self-efficacy and increase creative behavior. Compared with individuals with low creative self-efficacy, individuals with high creative self-efficacy will be more proactive in transforming creative thinking into creative behavior. For example, to strengthen direct experience, students strengthen their own skills training, participate in more innovative activities, and take the initiative to accumulate practical experience to improve their creative ability; to strengthen alternative experience, self-efficacy mainly comes from language reinforcement and indirectly increases creative behaviors by focusing on other people's achievements and reinforcing the power of role models.

Third, schools should actively create an innovative atmosphere, a good external environment is an important measure to cultivate innovative talents and promote educational reform and development. For example, cultivating innovative teachers, constructing innovative curriculum systems, strengthening innovative practical experiences, etc., breaking the limitations of traditional teaching, and increasing the possibility of students' creative behavior.

6.3 Research Limitations and Prospects

The current study considers the five dimensions of non-cognitive ability separately, but people are complex unities, and most of them possess more than two personality traits, there may be interactions between different personality traits, and such interactions may have more complex and unique effects on students' creativity. Future research can combine the five traits to explore the mechanism of influence on students' creativity under different trait combination patterns.

Secondly, according to the trait activation model, this study shows the mediating role of creative self-efficacy between non-cognitive ability and creativity as well as the moderating role of innovative climate, but according to the creativity component theory of Amabile(1988), intrinsic motivation includes psychological capital and so on in addition to self-efficacy, and the future research can further incorporate these potential mediating and moderating variables to build a more complete theoretical model.

Finally, the research data in this paper are all based on students' self-subjective evaluation, and there are differences in the standards of self-evaluation among different students, so future research can introduce diversified evaluation methods such as teachers' evaluation, mutual evaluation by classmates, and objective behavioral observation, and synthesize data from various aspects for analysis to eliminate the subjectivity of self-evaluation.

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