

## *Retraction*

# **Retracted: The Impact of College Students' Creativity on Their Innovation Behavior in the "Internet +" Era: The Mediating Role of Creative Self-Efficacy**

### **Security and Communication Networks**

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*Security and Communication Networks* has retracted the article titled "The Impact of College Students' Creativity on Their Innovation Behavior in the "Internet +" Era: The Mediating Role of Creative Self-Efficacy" [1] due to concerns that the peer review process has been compromised.

Following an investigation conducted by the Hindawi Research Integrity team [2], significant concerns were identified with the peer reviewers assigned to this article; the investigation has concluded that the peer review process was compromised. We therefore can no longer trust the peer review process, and the article is being retracted with the agreement of the Chief Editor.

The authors do not agree to the retraction.

### **References**

- [1] S. Chen, J. Wu, J. Huang, and J. Cao, "The Impact of College Students' Creativity on Their Innovation Behavior in the "Internet +" Era: The Mediating Role of Creative Self-Efficacy," *Security and Communication Networks*, vol. 2022, Article ID 5193764, 7 pages, 2022.
- [2] L. Ferguson, "Advancing Research Integrity Collaboratively and with Vigour," 2022, <https://www.hindawi.com/post/advancing-research-integrity-collaboratively-and-vigour/>.

## Research Article

# The Impact of College Students' Creativity on Their Innovation Behavior in the "Internet +" Era: The Mediating Role of Creative Self-Efficacy

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Social progress is driven by innovation; especially, in the context of "Internet +" innovation and entrepreneurship, college students serve as a frontier group that brings new ideas and new technologies into society, and as such college students' creativity and innovation behavior are important for their country's future social and economic development. Therefore, China vigorously advocates the cultivation of college students' innovative ability to meet the needs of the development of the times. Determining the key factors currently influencing innovation behavior by college students is an area of current research interest. Building on the literature, this study uses the questionnaire survey method to analyze data from 226 college students relating to creativity, innovation behavior, and creative self-efficacy, exploring the mechanisms by which the students' creativity affects their innovation behavior in the context of "Internet +" innovation and entrepreneurship. The results show that creativity has a significant positive effect on innovation behavior among college students and that creative self-efficacy plays a mediating role in this relationship.

## 1. Introduction

"Internet +" in modern society means the combination of the Internet and various other traditional industries. This combination is based on information and communication technology and the Internet platform, integrating the Internet into traditional industries. The process makes the social resource allocation reintegrated and optimized. The innovation ability and creativity of college students in the "Internet+" era are crucial to the development of the whole society. The improvement of creativity in higher education will help stimulate the creative energy of innovation and entrepreneurship in the whole society, promote the transformation and application of scientific and technological innovation achievements, serve innovation and development, and benefit mankind. Stimulating the innovation behavior of college students has become an important task of higher education personnel cultivation [1]. "Innovation behavior" refers to all of the behaviors involved in developing new ideas, from the generation of these ideas to their

realization. Innovation behavior is an important indicator of the quality of innovation and entrepreneurship education in colleges and is highly sought after when college graduates enter the workforce. The university places a very important position on improving students' innovative ability and strengthening their entrepreneurial practice.

The philosopher Francis Galton pointed out that creativity springs from human potential and talent [2]. Taylor [3] argued that creativity has multiple levels of development. The lower two layers are technical creativity, which is the innovative use of knowledge and skills, and inventive creativity, which involves the use of existing materials, methods, and technologies in new or unusual ways. After targeted training, such as divergent thinking training, critical thinking training, and so on, most people can master these two levels.

Although many studies have highlighted a positive relationship between creativity and innovation behavior [4, 5], creativity does not necessarily lead to innovation behavior [6]. In some circumstances, individual creativity is not fully

displayed or innovation-related enthusiasm is low, which inhibits innovation behavior [7]. Despite this research, no clear consensus has been reached on the mechanism(s) through which creativity affects innovation behavior; further theoretical development and empirical testing are needed.

Creative self-efficacy, as the internal driving force behind individual innovation, has a positive impact on individual innovation behavior. Previous studies have demonstrated the above relationship in different settings [8, 9]. Individuals with high creative self-efficacy are more willing to try, learn, and practice new skills [10]. Based on this, we regard the effect of creative self-efficacy on individual creativity as occurring via the stimulation of intrinsic motivation. This study therefore uses creative self-efficacy as a mediating variable.

Focusing on a particular course, this research explores the teaching of innovation and entrepreneurship courses in colleges and universities, studying students throughout the whole process from stimulating creativity to implementing innovation behaviors. In this innovation and entrepreneurship course, students developed a complete innovation project in a relatively short period of time, which can be seen as a miniature version of the creative process. Examining this project helps us to elucidate the mechanism of the above process. This research enriches existing creativity theory and opens the “black box” that transforms creativity into innovation behavior. It also provides theoretical support for innovation and entrepreneurship education in colleges and universities, helping them to more effectively stimulate individual creativity and promote innovation behavior. Exploring the relationship between college students’ creativity and their innovation behaviors can help us to understand how innovation behaviors are formed and developed. This will help colleges and universities to better stimulate innovation behaviors in college students, improving students’ entrepreneurial abilities and thus employment prospects.

## 2. Theoretical Basis and Research Assumptions

*2.1. Creativity and Innovation Behavior in College Students.* There is still no widely accepted definition of individual creativity. Some scholars have focused on the creative process when developing their definitions, while others have focused on the results; some have highlighted the subjectivity of creativity, while others have highlighted its objectivity, and some have viewed creativity as a personality trait, while others have focused on creative cognitive styles. Dewey argued that creativity is the ability to find and solve problems. Quilford stated that skill in innovation reflects the ability of individuals to generate new ideas, create new products, or combine existing ideas and products to produce changes. Ward and Smith saw creativity as the ingenious combination of various components that previously seemed to have no relationship, resulting in novel and effective connections. Amabile conceived of creativity as the generation of novel and beneficial ideas by individuals [11]. Based on these definitions, this study defines individual creativity as the ability of an individual to generate new ideas, discover new patterns, or create new things when engaging in an

activity. It is related to a variety of factors such as the individual’s knowledge level, intelligence quotient, and mobility and is a comprehensive reflection of the individual’s various abilities. The manifestations of creativity include creating new methods, inventing new products, updating new technologies, and defining new theories. At the same time, it is also a necessary psychological quality for the successful completion of a creative activity. Therefore, the level of individual creativity is one of the important criteria for distinguishing talents. Furthermore, with the changes in China’s national conditions, the Chinese education authority has increasingly paid attention to the cultivation of students’ creativity [12].

Individual innovation behavior is the concrete manifestation of individual creativity and the foundation of organizational innovation. There are a range of definitions of innovation behavior. West and Farr, for example, defined innovation behavior as the activity of individuals generating ideas, introducing new ideas and processes, and then applying them to organizations [13]. Scott and Bruce believe that in the process of activities, individuals generate new ideas and make new behaviors through multi-stage practice, which are called innovation behaviors. Janssen believes that the formation and realization of new ideas that are beneficial to individual, team, and organizational performance are innovation behaviors. For the purpose of this study, “individual innovation behavior” refers to introducing novel and useful viewpoints based on a sound understanding of a problem and executing unique actions to solve the problem [14]. We believe that the innovation behavior of college students is reflected in their daily lives and learning and in the ways in which they use innovative thinking and methods to solve practical problems. Innovative college students will bring to their future workplaces an ability to adopt unique actions to solve problems in the organization, increase learning efficiency, revolutionize work methods, and design innovative products.

*2.2. The Influence of Individual Creativity on Innovation Behavior.* We define creativity as an individual ability, while we consider innovation a behavior. The two are conceptually different but closely related. Just as human behavior more generally is driven by human capabilities, individual innovation behavior is driven by individual creativity. Individual creativity enables human beings to generate novel and useful ideas, and through innovation behavior, these ideas are transformed into tangible products and practical use of these products. In an organization, effectively transforming creative thinking into innovation behavior is the key to producing innovative products, services, and even management models. Several studies have shown that an individual’s creativity has positive effect on innovation. For example, Yao et al. [15], through a survey of 360 Chinese employees in various industries such as real estate and finance, showed that employees’ self-assessed creativity and their supervisors’ assessments of their innovation behavior were correlated. Research has also shown that highly creative employees enjoy novelty, adventure, and innovation. They demonstrate

their creative characteristics through the work process, and creative activities bring them a sense of meaning and self-realization. They also have the courage to face various risks and challenges while engaging in innovation behavior. Zhao et al. found that individual creativity had positive effect on organizational innovation [16].

Given the above literature, we propose the following hypothesis.

H1: individual creativity has a positive effect on innovation behavior.

*2.3. The Mediating Role of Creative Self-Efficacy.* According to cognitive evaluation theory, an individual's self-efficacy can effectively trigger his or her intrinsic motivation. Creativity self-efficacy is the belief that individuals believe that they can achieve innovation goals, and it plays an important role in individual innovation actions. When faced with a given task, whether an individual is motivated to achieve that task often does not depend on the characteristics of the task itself; rather, it is determined by the individual's sense of self-efficacy in relation to the task. The level of creativity self-efficacy may affect whether individuals are "willing" to exert their own creativity and carry out internal innovation behaviors. Creative self-efficacy leads to intrinsic motivation [17], which increases the amount of effort invested when an individual faces a difficult situation. Individuals with high creative self-efficacy are good at actively learning new skills and knowledge, are confident in their own innovative thinking, are intellectually daring, and are good at putting new ideas into practice. Individuals with high creative self-efficacy take the initiative to innovate continuously. In contrast, individuals with low creative self-efficacy tend to be conservative, have a single thinking mode, and lack self-confidence. They tend not to take risks and frequently fail to effectively present their existing ideas or viewpoints.

As mentioned earlier, creativity has a positive effect on individual innovation behavior [31]. This influence may be achieved through the mediating effect of creative self-efficacy. Individuals usually do not have a good self-awareness of their own creativity and often just do what they want to do.

Creative self-efficacy is an important factor in the transformation of creativity into innovation behavior. This link is evident when we examine four categories of people with differing degrees of creativity and creative self-efficacy. First, individuals with low creativity and low creative self-efficacy are completely lacking in innovative thinking ability. They do not typically consider attempting innovation behavior, and it is difficult for them to realize the transformation of creativity into innovation behavior. Second, individuals with low creativity but a strong sense of creative self-efficacy feel that they can create many novel and interesting things. This category of person will keep trying, but the results will not be ideal. Third, individuals with high creativity and low creative self-efficacy always have several innovative ideas in their minds in life and work. However, their lack of creative self-efficacy means that they have no confidence in

implementing these ideas, such that their innovative thinking is never realized. Fourth, individuals with high creativity and high creative self-efficacy are confident in attempting and realizing certain innovation behaviors, thereby performing well in tasks or work processes.

Based on this, we believe that some highly creative individuals may not be able to directly transform creativity into innovation behaviors, as creative self-efficacy plays a mediating role. Individuals with high creative self-efficacy are confident in their ability to generate and execute innovative ideas and participate in innovative activities. They actively exert their creativity to deal with the complexity, uncertainty, and risk of innovation activities, thereby demonstrating more innovation behavior. We believe that creative self-efficacy plays a partial mediating role between creativity and innovation behavior.

We therefore propose the following hypothesis.

H2: creative self-efficacy plays a partial mediating role in the relationship between creativity and innovation behavior.

### 3. Research Methods

*3.1. Research Methods and Procedure.* We targeted 226 college students in China to serve as our sample. The project team carried out data collection in 12 classes at two liberal arts and sciences colleges. The participants were asked to fill in online questionnaires that yielded dynamic panel data for analysis.

*3.2. Measurement.* The measurement scales in this study were primarily drawn from Western research. To ensure the validity of the scale in the Chinese context, we adopted a translation-back-translation procedure. Each resulting item in the questionnaire was measured using a 5-point Likert scale, with the respondents asked to evaluate the accuracy of the statement in relation to their current situation.

To examine the participants' performance of creativity, we measured creativity and innovation behavior at the same time. The measure of creativity was Tierney and Farmer's four-item scale, and the measurement of innovation behavior was Scott and Bruce's six-item scale. The measure of creative role identity was Karwowski's scale. Creative performance, innovation behavior, and creative role identity were measured three times: before, during, and after each class. The evaluation of previous innovation experience was derived from the comprehensive score in the first lecture, and the score for previous innovation experience was obtained from teacher evaluation and group mutual evaluation data.

### 4. Results

SmartPLS (version 3.2.8) was used to analyze the data in this study. Partial least squares structural equation modeling (PLS-SEM) is the most effective processing tool for explaining a path model [32] and has been widely applied in business and management research (e.g., Jaafar et al., [20]; Chaouali et al., [21]; Taghizadeh et al., [22]; Shujahat et al., [23]). The choice of PLS-SEM was based on the following

TABLE 1: Means, standard deviations, excess kurtosis, skewness, and PLS loadings of data collected.

	Mean	Median	S.D.	Excess kurtosis	Skewness	PLS loading
Creativity1	3.717	4	0.986	0.175	-0.632	0.863
Creativity2	3.619	4	0.962	-0.369	-0.253	0.904
Creativity3	3.465	3	0.964	-0.473	-0.093	0.892
Creativity4	3.416	3	0.966	-0.28	-0.116	0.910
CSE1	3.482	4	0.992	-0.275	-0.293	0.834
CSE2	3.624	4	0.938	-0.155	-0.412	0.863
CSE3	3.522	4	0.956	-0.254	-0.293	0.883
CSE4	3.765	4	0.899	0.478	-0.697	0.835
CSE5	3.469	3	0.898	-0.597	-0.036	0.794
CSE6	3.487	3	0.923	-0.093	-0.165	0.875
CSE7	3.482	3	0.956	-0.297	-0.209	0.844
IB1	3.602	4	0.941	0.251	-0.473	0.865
IB2	3.544	4	0.996	-0.09	-0.448	0.901
IB3	3.584	4	0.998	0.113	-0.597	0.909
IB4	3.761	4	0.957	1.276	-1.059	0.882
IB5	3.805	4	0.939	0.692	-0.827	0.861
IB6	3.571	4	0.962	0.062	-0.487	0.879

three considerations. First, PLS-SEM does not require data to be normally distributed, nor does it require a very large sample size [31]. Second, PLS-SEM has good explanatory power for complex models [32]. Third, PLS-SEM is appropriate to use in exploratory studies such as this one, in which the relationships among variables are still unclear [26].

**4.1. Validity and Reliability.** Table 1 shows the means, standard deviations, kurtosis, skewness, and PLS loadings of all three variables. In this study, the lowest value of the PLS loading is 0.834, demonstrating good reliability. Hair et al. [27] recommended a loading of 0.5, while Hulland [28] stated that 0.4 is acceptable for exploratory research.

Table 2 shows the values of Cronbach's alpha and composite reliability (CR). For good reliability, the values of Cronbach's alpha and CR should be higher than 0.7 [29], while to show convergent validity, the average variance extracted (AVE) value should be higher than 0.5 [30]. In this study, the CR values were 0.955, 0.940, and 0.947 for innovation behavior, creativity, and creative self-efficacy, respectively, and the AVE values were 0.779, 0.796, and 0.718 for innovation behavior, creativity, and creative self-efficacy, respectively. The data therefore demonstrated acceptable levels of reliability and convergent validity.

A correlation test was conducted to confirm discriminant validity. The value of each construct's AVE was higher than its correlation values, confirming discriminant validity [31].

**4.2. Testing of Hypotheses.** To test the hypotheses, PLS bootstrapping was run through SmartPLS with the subsamples of 5,000. Figure 1 demonstrates the results of the model. As shown in Figure 1, creativity significantly affected creative self-efficacy and innovation behavior: the correlation coefficients were 0.886 and 0.386, respectively,  $p < 0.001$ . Creative self-efficacy significantly affected innovation behavior, with a correlation coefficient of 0.502,

TABLE 2: Reliability, validity, and correlations of the constructs.

	Cronbach's alpha	CR	AVE	IB	Creativity	CSE
IB	0.943	0.955	0.779	0.883		
Creativity	0.915	0.940	0.796	0.830	0.892	
CSE	0.934	0.947	0.718	0.843	0.886	0.847

Note. AVE: average variance extracted; CR: composite reliability; IB: innovation behavior; CSE: creative self-efficacy.

$p < 0.001$ . The value of R-squared for the research model was 74.30%, indicating that the model had good explanatory power.

As shown in Table 3, creativity had a larger total effect on innovation behavior than did creative self-efficacy. Creative self-efficacy had a mediating effect on the relationship between creativity and innovation behavior. Although creativity had a direct effect on innovation behavior, an indirect effect mediated by creative self-efficacy was also observed. Both of the hypotheses were therefore supported. This finding has important implications for colleges that wish to conduct educational reforms.

## 5. Discussion

This paper sheds light on the mechanisms by which college students' creativity influences their innovation behavior. Through the collection of data from 226 students in 12 liberal arts and sciences classes at two colleges and universities and following empirical analysis of the samples, the two hypotheses initially proposed were supported.

We found that college students' creativity had a significant positive effect on their innovation behavior. Highly creative college students find it easy to come up with new ideas, new concepts, and new theories, have a strong spirit of exploration and adventure, are willing to innovate and create, and are able to realize their innovation behavior in the form of new technologies and new inventions. Their thinking is sharp, they can adapt to changes and draw

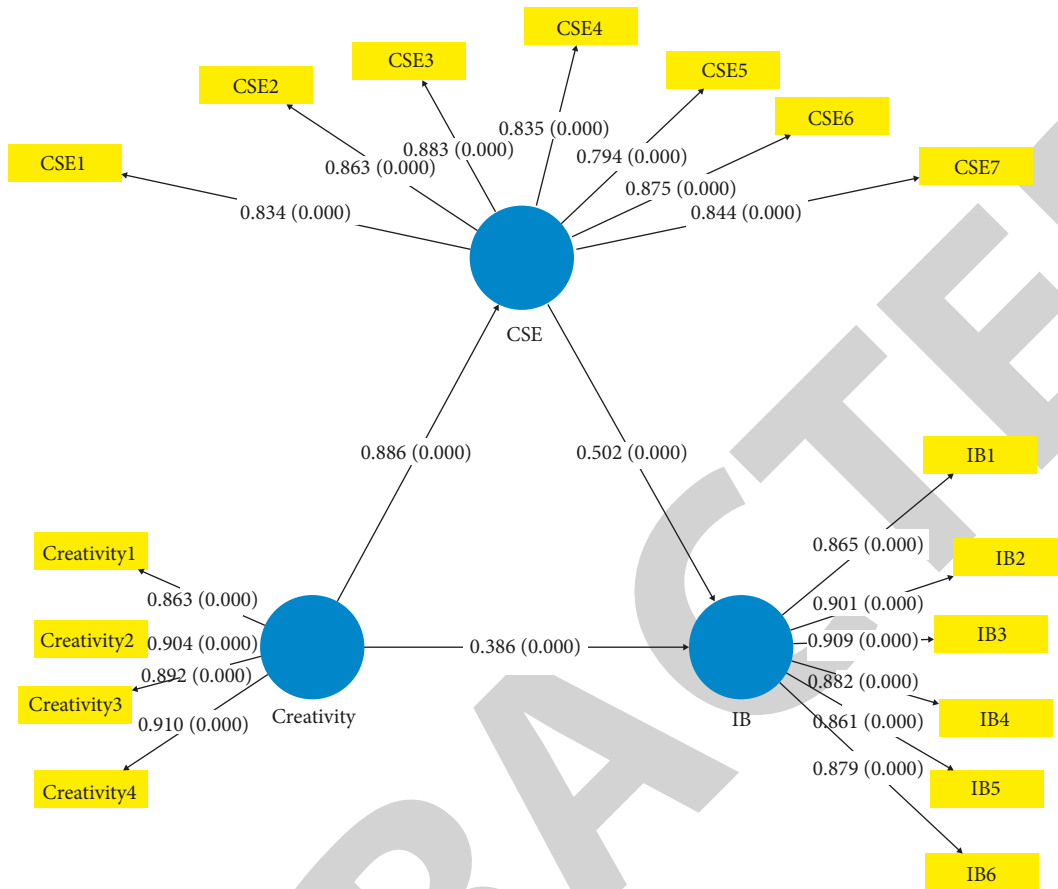


FIGURE 1: The results of PLS analysis.

TABLE 3: Direct, indirect, and total effects of each factor on creative role identity.

Construct	CSE (direct effect)	IB (direct effect)	IB (indirect effect)	IB (total effect)
Creativity	0.886***	0.386***	0.444	0.830
CSE		0.502***		0.502

\*  $p$  value < 0.05, \*\*  $p$  value < 0.01, and \*\*\*  $p$  value < 0.001.

inferences from a set of facts, and they are not easily subject to cognitive biases such as functional fixedness. They respond to ideas and come up with their own ideas swiftly. In many cases, they have unique insights and show a clear direction and originality in their problem solving. They carry out innovative activities by combining divergent thinking and convergent thinking. Conversely, low-creativity college students tend to lack the ability to integrate knowledge and experience, are not typically good at transferring and utilizing subject knowledge, have a single way of thinking, lack flexibility and comprehensiveness in considering problems, lack self-confidence, fear failure, and have a herd mentality. Those who blindly follow authority are accustomed to “seeking stability and convergence” and dare not take risks, making it difficult for them to display innovation behaviors.

Our findings also suggest that the creativity of college students affects their innovation behavior through creative self-efficacy, with creative self-efficacy showing a mediating effect. The above result is consistent with recent research findings in entrepreneurial contexts [32]. Creative self-

efficacy plays an important role in improving people’s ability to mobilize learning enthusiasm, cognitive resources, and actions [33]. Social cognitive theory supports this view. According to this theory, whether college students can transform their creativity into innovation behaviors in their daily study, life, or future work depends on their individual assessment of their own abilities and values, as well as their ability to anticipate the results of their activities. Creative self-efficacy is therefore closely related to innovation activities.

## 6. Theoretical Implications and Suggestions for Future Research

The theoretical significance of the results of this study is as follows. First, this study confirms the mechanism whereby college students’ creativity influences their innovation behavior, focusing on the Chinese context. Second, the study fills a gap in research on the mechanism by which college students’ creativity leads to innovation behavior. We show

that creative self-efficacy is the mediating variable between the two. Finally, this study opens the “black box” of college students’ creativity to examine how their innovation behaviors are formed, providing theoretical evidence that innovation and entrepreneurship education in colleges and universities can effectively stimulate individual creativity and promote innovation behaviors.

This study has several limitations. First, to examine the mechanism by which college students’ creativity influences their innovation behavior, we selected only a small number of key variables for investigation. Follow-up research could consider other mediating variables. Second, we explored the influence of college students’ creativity on their innovation behavior as a mediating effect. Follow-up research could explore the relationship between the two as a moderating effect. Third, organizational behavior is a multi-level construction, and colleges and universities are one of the important social organizations, shouldering the heavy responsibility of cultivating young innovative talents. As the main members of this organization, students are the backbone of future social innovation. Studying the innovative behavior of college students, on the one hand, enriches the research scope of organizational behavior and, on the other hand, provides reference suggestions for how colleges and universities can cultivate innovative talents and promote social innovation. Subsequent research can explore the mechanism behind innovative behavior from a multi-level perspective. Finally, the participants in this study were college students majoring in arts and sciences. In follow-up research, innovation behavior within businesses could be investigated and compared with our findings for college students.

### Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### Conflicts of Interest

The authors declare that they have no potential conflicts of interest.

### Acknowledgments

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