

A Review of Research Methods of Creativity

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Keywords: Creativity, Research methods, Organic combination

Abstract: Since the 1950s, the study of creativity has attracted the attention of the international community and scholars, but there are no consistent methods to study creativity. This paper gives an overview of creativity from the perspective of research methods, and summarizes that the research methods of creativity are mainly case study, psychological measurement, experiment, biostatistics, cross-cultural comparative study, and computer simulation technology. In the end, it briefly reviews the research methods of creativity, and draws a conclusion that the future research methods of creativity should be more ecological and territorial, so as to meet people's needs and perfect the theory of creativity.

1. Introduction

The earliest study of creativity can be traced back to Plato in ancient Greece, but the real scientific study on creativity was marked by the speech on creativity delivered by J. P. Guilford at the American Psychology Association in 1950. From then on, many scholars have conducted in-depth study on creativity. However, due to its complexity, creativity has not been defined in a unified way since today, which has resulted in different understanding of creativity in academic circles. Many scholars have different research routes on creativity, and naturally there are differences in research methods. By analyzing the literature on creativity research, the author found that there are six methods to study creativity: case study, psychometric method, experimental method, biostatistics method, cross-cultural comparative study, and computer simulation technology.

2. Introduction to Research Methods

2.1 Case Study

Early research on creativity focused on creative individuals, so most of the research on creativity started with case studies, such as Galton's (1869) *Genetic Genius* and Gruber's (1838) Darwinism. After that, scholars mostly used the case study method to study the emergence of creative views of creative individuals and quantitatively analyzed the growth materials of some creative historical figures. Recently, Gardner (2007) studied seven geniuses, including Freud and Einstein, in the article *Creating Minds*, and revealed the growth law of creative talents. As the research of creativity goes deeper, the definition of creativity has also changed. In the early days, it was only limited to some scientists, artists and creative writers, etc., but now it also studies the creativity of ordinary

people. Thus, the method of case study also expands the research object. For example, Beghetto, Ronald (2010) recently made a brand-new thinking on the change of the concept of creativity in the article Looking back at how we can open up the challenges of everyday creativity? Review of day-to-day creativity and new perspectives on human nature. [1]

The advantage of applying the case study method to study creativity is that it can study not only historical figures but also the present and even the future of individuals, thus increasing the richness and authenticity of understanding creativity. The limitation is that more individual cases will be accumulated to promote the results of this research method, which increases the difficulty of research. At the same time, the analysis and creation of individual works by using this method will naturally require corresponding skills and understanding. If the corresponding conditions are not met, no result can be obtained, and even if it is obtained, it is wrong. Therefore, in order to avoid this situation, scholars began to study the creativity of healthy living people, so that they can directly conduct face-to-face research and get feedback if there is any mistake. For example, from 1991 to 1995, Csikszentmihalyi et al. interviewed 91 outstanding creative contributors using the interview method, believing that the support and challenge provided by the duality of early experience contributed to later creativity. [2]

2.2 Psychological Measurement

According to the current literature, in a large number of studies on creativity, psychological measurement is used to study the process, characteristics, personality and influencing factors of creativity. The psychological measurement of creativity was initiated by the divergent thinking test compiled by J. P. Guilford. Since then, the measurement tools of creativity have gradually increased, and the applicable population has also expanded from creative individuals to ordinary people. For example, the Torrance Test of Creative Thinking, the Gilford Distributed Mind Test in 1957, the Chicago University Test of Creativity by two psychologists, Gaicers and Jackson from the University of Chicago in the early 1960s, and the Wallach-Kogan Test by Wallach & Kogan in the mid-1960s are commonly used by scholars in their research. Scholars who measure the creative personality generally use the Discovery Talent Group Questionnaire by S. Rimm and G. Davis, the What Kind of Person Do You Belong to in the Creative Personality Self-Report Scale by Torrance and the Interest Inquiry Questionnaire. At present, scholars often use the rating of external judgment and Amabile's consensus assessment technique (CAT) to evaluate the creativity of products. [3]

Psychological measurement has exerted great influence on the research of creativity, so it is still used by most scholars. For example, Fu Shixia and Luo Lingling (2005), Chinese scholars, put forward the evaluation model of creativity of scientific and technological groups by self-designed questionnaire. Although the validity of using psychometric method to study creativity is questioned, it is still possible to use it to study creativity through the correct selection of tools, objective scoring and interpretation of results. Of course, this method alone cannot fully understand the creativity, which needs to be combined with other methods. For example, Wang Ling et al. (2010) explored the influence of goal orientation on creative personality by experimental and psychometric methods. [4-8]

2.3 Experimental Research

The experimental study of creativity mainly refers to the artificial manipulation of individual behavior and environmental conditions in order to identify which factors affect the performance level of creativity, including laboratory experiments and natural experiments, involving external information and guidance, intuition, mental synthesis, image and perception, emotion, individual cortical arousal, level of attention, disinhibition and reactivity, individual internal motivation,

attitude and other factors in problem solving on creativity.

Laboratory experiments are generally used to provide a scene in the laboratory for the subjects to react or to operate some creative tasks on the computer. For example, Reiter-Palmon, Roni; Illies, Marcy Young; Cross, Lisa Kobe; Buboltz, CaraBeth; Nimps, Tom (2009) provided three practical daily problems for the subjects to solve in *Creativity and Domain Specificity: Effects of Task Types on Multiple Indicators of Creative Problem-Solving*. [4] Natural experiments are generally used in education and creativity cultivation. They all offer courses according to the theory, and check whether the courses are effective at intervals, such as *Experimental Research on Developing Children's Creativity* by Zhang Jinghuan.

Although the causal relationship between the two can be found by experimental research, the scene provided by this method is different from the real one. That is to say, this method can't be used for comprehensive research, because it only aims at one aspect, and some irrelevant factors have to be controlled during the experiment. Therefore, the research results are also questionable, which requires keeping the advantages of this method closer to life, making it more ecological, and increasing the empirical validity of the experiment.

2.4 Biometrical Method

In recent years, with the rise and development of cognitive neuroscience, the study of EEG and brain function has also provided a new research means for the study of brain mechanism of creativity, making it possible to observe the physiological changes of individuals when solving creative problems through these technologies. For example, Bechtereva et al. (2004) used positron emission tomography (PET) technology to investigate the changes of cerebral blood flow in long-distance association. Razumnikova (2007) used EEG technique to investigate the cortical activity of long-distance association.

Using this method to study creativity starts from the physiological mechanism of creativity to reveal some physiological changes in the process of creation, which is of course quite different from the cognitive mechanism of creativity. However, scholars can combine it with other methods to explore creativity in order to have a deeper understanding of creativity.

2.5 Computer Simulation

This method is to study human creativity by computer simulation. Researchers try to find some algorithm rules that can simulate creativity, or simulate creativity by using heuristic or special program guidance to explore in the problem space. For example, Langley, Simon, Bradshaw and Zicu developed a computer model called BACON. Although there is a big difference between human and computer creativity, some computer terms have been used to describe the information processing process since the rise of cognitive psychology. Therefore, some cognitive changes in the process of creation can be understood through the computer.

Although this method provides researchers with a way to understand creativity, after all, the creativity simulated by computer is different from that of human beings. It is not reasonable to direct people to develop creativity by completely simulating the results of creativity research by computer. Therefore, this method can be used to understand a part of creativity, rather than relying on it completely.

2.6 Cross-Cultural Comparative Study

This method began in 1960s, because researchers found that people in different cultures have different understanding and attitudes towards creativity. At present, it is mainly used to study the

influence of Chinese and western cultures, regional cultures and national cultures on creativity. For example, Hu Weiping et al. conducted a study on the scientific creativity of 1087 middle school students (aged 11-15) in the UK. Wang Shuxiu, Yongbo Zhang, et al. respectively made a comparative study on the personality characteristics of creativity of college students from the Uyghur, Kazak and Han ethnic groups in China and the gender differences, ethnic comparison and individual development characteristics of the cognitive style of students from three ethnic groups with relatively small population, the Nu, Jingpo and Lisu ethnic groups in the frontline of Yunnan border, as well as the relationship with creativity. [9-10]

With the deepening of people's understanding of creativity, researchers can not only study the characteristics of creative talents growing up in different cultural backgrounds, but also understand the common characteristics of creativity in different cultural backgrounds using this method. However, to study creativity in this way requires an understanding of the culture of the research subjects, or else the result will be mixed with the influence of the author's culture. For example, the rational process is deemed as the essence of human thinking in western culture, while intuitive thinking is placed above logical thinking in eastern culture, without knowing which errors will inevitably arise in the research.

3. Conclusion

At present, the research on creativity has reached a certain scale, so it is necessary to develop and research methods suitable for creativity research to provide technology for the development of creativity. Although many methods have been applied in their research, the methods used in the previous research are relatively single and cannot organically combine with other methods, either one method is used to study a certain dimension of creativity, or another method is used to study other dimensions of creativity, which results in people not being able to fully understand creativity. Thus, it is necessary to combine these methods to study creativity. Some research results have shown, such as Sternberg, that the old paper-and-pencil test is not enough to measure a person's creativity. Obviously, the combination of various methods is more conducive to testing the theory. In the meantime, people are increasingly demanding practicality, so research divorced from reality can no longer meet their requirements, which urges creativity research to focus on ecology and empirical validity, so research methods will naturally change accordingly. Secondly, as the social division of labor is becoming more and more detailed, people in different fields have different understanding of creativity, it is necessary to combine the characteristics of the field itself to demand a method to study creativity so as to make it more realistic and reliable. In short, the future research methods of creativity should be more ecological and field-oriented, so as to meet people's needs, and improve the theory of creativity.

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