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Cultivating Students' Creative Ability Based on TRIZ Theory and Mind Map

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Abstract. Cultivating talent is the key to improve the independent innovation and build an innovative country. In view of the actual higher education, we introduced TRIZ theory and mind map to teaching link. To guide college students to use TRIZ theory and mind map to participate in the various innovative design contests. It is proved that TRIZ theory and mind map can stimulate the potential of students of invention, cultivate students' scientific thinking habits and improve the comprehensive quality of college students.

Keywords: TRIZ theory; mind map; college students; innovation; education

1 The Present Situation of Innovation Education

More and more colleges develop innovation education with the purpose of cultivating the spirit of innovation and innovative personality as well as developing individual potential and improving individual comprehensive quality. Its main task is to cultivate students' innovative thinking ability. Innovation education is a thinking of creatively solving problems and finding problems [1]. It can not only reveal the nature and internal laws of the objective things, but also produce new and unprecedented thinking results. While many college teachers pay attention to the process of teaching to let students understand the contacts between the knowledge points, but they ignore the guidelines for the innovative learning methods. So students lack of comprehensive training of various ways of thinking lead to non-ideal effects.

2 TRIZ Theory and Mind Map

2.1 Introduction of TRIZ Theory

TIRZ theory is founded by Soviet inventor G.S. Altshuller in 1946, Altshuller found that product improvement, technical transformation and technical innovation in any areas is the same as biological systems—there are emergence, growth, maturity, aging and death through the process. For decades, Altshuller devoted most of his energies

to the research and improvement of TRIZ theory. Under his leadership dozens of research institutions, universities and enterprises of former Soviet Union constituted a research group of TRIZ theory to analyze nearly two million and five hundred thousand invention patents. Altshuller established a theory system including solving technical problem, methods and algorithms of innovation called TRIZ theory. TRIZ means "the theory of inventive problem solving (TIPS)"[2].

After the development of half a century, the TRIZ theory and method has developed into a set of mature theory to solve the problem of new product development practice and method system, It has been widely used all over the world and created tens of thousands of great inventions. The TRIZ theory have made great economic benefits and social benefits for many well-known enterprises such as Hewlett Packard, Motorola, General Electric, IBM, LG, Samsung and so on[3].

2.2 Introduction of Mind Map

The mind map is a thinking tool invented by the British memory father Tony Bazin. His definition of "mind map" in a book is "Mind map is the expression of radioactive thinking, so it is a natural function of human thinking". It is a very useful graphical technique and the master key to unlock the potential of the brain. The mind map is a new mode of thinking and learning methods (Fig. 1. The hand-painted mind map of silence). It will mobilize the logic, order, rules, text, numbers of left brain and image, imagination, color space, and other factors of right brain, and it can transform a long list of boring information into colorful, easy remembered and highly organized graph, it is very simple but interesting. The mind map can help you see your "mind map" in your brain, and present the process of thinking through the pictures reproduced. Using mind map can not only enhance the attention and memory, but also strengthen the thinking ability. What is more important is that it can inspire our imagination and creativity.

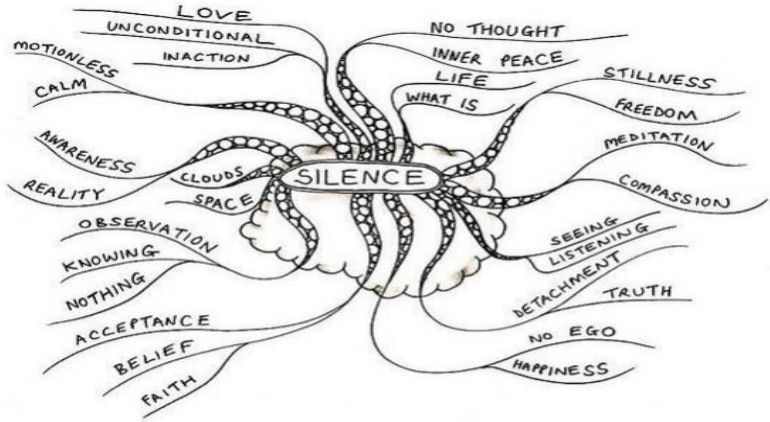

Fig. 1. The hand-painted mind map of silence.

3 The Innovation and Practice of the TRIZ Theory in University Students

TRIZ theory is an innovation method derived from knowledge. How to enable students to understand the rules and principles through the measurement of TRIZ theory and how to effectively make the practical problems in TRIZ theory and engineering together is the key to facilitate the expansion of TRIZ theory and to improve the inventive ability of university students. In order to improve the students' ability of applying TRIZ theory to solve the problem of innovation, colleges need cultivate students' innovative consciousness and innovative work habits with a destination and a system so that students can be familiar with the innovation process of the TRIZ theory.

3.1 The Practice of TRIZ Theory in the Curriculum Design and Graduation Design

Innovation capability can be acquired through learning and practice obtained. The class is the theoretical basis of innovation activities for students. Meanwhile, curriculum design and graduation design provide students with a good practical training environment for cultivating innovative ability. Therefore, curriculum design and graduate design are particularly important to undergraduates, especially to students with the requirements of professional practice and innovation capability.

3.2 Application of TRIZ Theory in the College Students' Innovation Contest

The responsibility of education is to impart knowledge with the purpose of stimulating students’ continuous creativity through hands-on practice, which can improve the mastery of knowledge and confidence in invention and innovation. According to the curriculum features of students' training program, the game established of training the students' innovation ability can help students overcome the inertia of thinking and put forward innovative design scheme using TRIZ theory. At the same time, students could be encouraged to participate in national or provincial quality competition applying TRIZ theory which can improve the ability of applying TRIZ theory, analyzing problems, innovative design and practical ability.

4 Cultivation of Innovative Thinking Ability by Using Mind Map

Text, number, symbol, color, flavor, intent, rhythm, note, etc entering into the brain can become a thinking center, from which spread outward and become a networked database of brain contacting each other. Mind map is exactly in line with the origin brain of radioactive thinking, and it has been able to fully mobilize the functions of

the brain to use the full-brain thinking.

4.1 The Use of Color, Full Mobilization of the Brain Function and the Use of Whole Brain Thinking in Study Notes

Modern brain research has shown that the brain is divided into the left brain (left brain cortex) and right brain (right brain cortex). Main function of the left brain is vocabulary, logics, numbers, orders, analyses, serials and so on, and the function of right brain is mainly responsible for rhythms, space consciousness, dimensions, imaginations, colors, daydreams, overall awareness and so on. It is only by fully utilizing both sides of the brain that can improve our intelligence and creativity [4]. It is expected to use colors more in the mind map, because colors can deepen our memory, and link keywords, colors and patterns what make our left and right brain synergies. Then we can make full use of the whole brain, which makes the brain's creative potential maximum.

4.2 The Radioactive Thinking Through Mind Map

Radioactive thinking is a natural way of thinking of the human brain. Whether it is a feeling, memory, or idea which includes texts, numbers, codes, foods, fragrances, lines, colors, imageries, rhythm, musical notes, etc, each kind of information into the brain can become a thinking center. Tens of thousands of branches radiate outward from the thinking center. Each branch represents a link with a central theme, and each link can be another central theme. Then it radiates outward tens of thousands of branches as well. In addition to accelerate information accumulation, radioactive thinking method through the mind map manages data on the basis of correlation which makes data storage, management and application more systematic and increase the operation efficiency of the brain, which allows you to explore the brain to create infinite imagination of the world.

4.3 Refactoring and Revising Stupid and Ridiculous Ideas, Expanding Thinking Flexibility and Originality

During the original production of mind mapping, there are many stupid and ridiculous ideas. But if we look at these ideas from a different angle or reverse thinking, perhaps these informal ideas will lead you into a new thought center. In the course of time, the new center will be updated, replaced by the more advanced concept. The students would not be in changeless inertial thinking, on the contrary they will know how to feel their strong flexibilities of thinking and make themselves more uniqueness, namely the original.

5 Conclusions

By the teaching and practices of TRIZ theory and mind map, the students have mastered the basic principles of TRIZ theory and mind map as well as basic method to solve the problem. Inertia thinking of students has been overcome. The enthusiasm of the students participate in class have been improved. The number and quality of students participating in innovation and scientific research have been increased. It also can increase the number of graduate design and curriculum design, improve the quality of graduation design and stimulate the students' enthusiasm and potential for innovation.

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