Study on the Relationship Among College Innovation Culture and Student's Creative Thinking

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Abstract

Based on innovation education perspective, a concept model of the relationship among college innovation culture and student's creative thinking is established, where college innovation culture is classified as material culture, institutional culture and spiritual culture. By the survey data of 1,645 questionnaires from 25 universities, the result shows that all three kinds of culture have positive impacts on student's creative thinking and spiritual culture has the greatest effect, which enriches the innovation education perspective, and provides constructive guidance to cultivate college students' creative thinking by such an empirical study.

Key words: College innovation culture; Creative thinking; Innovation education perspective

INTRODUCTION

With the rapid development of globalization and the deepening of the knowledge economy, international competition is becoming increasingly fierce. Talents with creative thinking have become the key to success, which becomes a common concern among countries. In China, the strategy of reinvigorating the country through science and education and the strategy of strengthening the country through human resource development has been implemented vigorously. Campus is the cradle for the growth of creative talents, and culture always has a subtle effect on people. So, campus innovation culture may play a significant role in developing creative students. So far, researches on the campus culture and students' creative thinking are mostly qualitative study, rarely few of which are quantitative. To enrich this field, this study is to verify the relationship between three kinds of college innovation cultures and student's creative thinking by an empirical study, in a method of questionnaire survey to college students, and finally to put forward some countermeasures to cultivate talents with creative thinking.

1. THEORETICAL BASIS

Innovation Education Theory provides some theoretical guidance for the training of innovative talents, whose theoretical prototype is General Electric's creativity education courses, which are to provide staff training to improve their creativity. In 1945, Wertheimer (1961) discussed the human thought process in solving questions from simple to complex, and proposed to see the problem as a whole in order to solve them creatively, and finally explained the possibility and regularity to cultivate human creativity. Subsequently, in the United States, some prestigious university like MIT, Harvard, developed creativity courses, and then a large number of civil-related education and research institutions emerged. As a result, creativity education moved forward. To the 1990s, with the rise of the knowledge economy, in order to meet this international challenge, many countries had felt the education reform is urgently needed. At this time many scholars recognized that the creativity education focusing on creating educational techniques was insufficient to meet social development needs, and should put the emphasis on cultivating innovation spirit, skill and thinking, instead.

So far, the interpretation of Innovation Education has no uniform definition, the current academic generally considered it has two definitions both in the broad and narrow sense. Innovative Education narrowly refers to the teaching activities for the purpose of cultivating students' innovative quality and innovative thinking; differing from the exam-oriented education or spoon-feeding education, the broad interpretation refers to the new educational activities, with a focus on human creativity development, in order to foster innovation quality and improve the innovation capacity (Lei, 2007; Voss, Gruber, & Szmigin, 2007). This article focuses on innovative education in the narrow sense.

Guilford (1959) first proposed the three-dimensional structure model of intelligence, linking the human creativity to divergent thinking, and hold the view that divergent thinking has fluency and originality features, and that is the core of creativity. Innovative thinking is an advanced form of general human thinking, deriving from the condition type of thinking in the creation of an organic combination of activities and breakthrough leap (Gong, 2011). Human creative thinking has many factors. American psychologist Steinberg (1999) found six factors associated with the occurrence of creative thinking, by the method of psychological measurement, history measurement and case studies.

Innate intelligence and knowledge structure are important to develop students' creative thinking, as well as the external environmental factors. Universities are the base of technological innovation talent. As the students' intelligence and knowledge structure almost have the basic shape, therefore the campus environment becomes the key factor. Most scholars classify the campus culture from the morphological perspective, like Wang (2009) considers that campus culture includes material culture, institutional culture and spiritual culture; Hong (2013) thinks campus culture is the sum of material culture and spiritual culture; And others scholars thinks innovation culture is all the innovation activities and modalities and the total atmosphere, including material culture, institutional culture and spiritual culture (Zhang, Ma, Wang, & Chen, 2008).

Currently researches on the relationship between creative thinking and culture mostly are basic theoretical research, very little of which is empirical research, or analysis subdividing innovation culture into different types. It has an important theoretical and practical significance to study from a quantitative point of view. Based on innovative educational theory, and the review of relevant research at home and abroad, referring to Zhang's studies, who classifies innovation culture into material culture, institutional culture and spiritual culture (Zhang, Ma, Wang, & Chen, 2008), this article explores the relationship between the different cultures and the students' creative thinking, by an empirical analysis of 1,645 university students. The result shows that material culture, institutional culture and spiritual culture all have positive impact to college students' creative thinking. So the school can improve the scientific equipment, build excellent teachers team, establish incentive mechanism, create a good innovation atmosphere, to promote the cultivation of students' creative thinking.

2. HYPOTHESIS

2.1 Material Culture and Creative Thinking

Material culture is all factors to adapt to students' innovative needs which are visible and tangible, including teachers, laboratories, research conditions, patents and papers. Yang, Yuan, and Feng (2013) considers that students' mode of thinking is affected by the material culture of campus and cultivating innovative talents is inseparable from material basis. A good physical environment is conducive to innovative thinking, making it more fluid (Yuan, 2009). Teachers and students can directly feel the edification of the material culture, and be affected by the subtle influence in the way of thinking, behavior, cultural attitudes, etc. (Ma, 2009). Through the above analysis, we propose the following hypothesis:

H1: Campus material culture has a positive impact on the students' creative thinking.

2.2 Institutional Culture and Creative Thinking

Campus institutional culture, is a reflection of innovation culture in the regulatory framework, such as the various management systems, codes of conduct (Sun, 2010). This article specifically includes assessment system, incentive system and leadership emphasis. Malinowski (2001) said: "All the cultural evolutionary spread processes firstly take place in the form of institutional change." The institutional culture deriving from institutional system ensures the smooth development of the campus work (Li, 2013). Institution has psychological restraints on students to regulate their behavior, like a ruler. Yuan (2009) uses an empirical research, to analyze the impact of four different campus cultures on college students' creative thinking, where institutional culture can regulate student behavior, and contribute to a good school spirit and learning style. Thus it can be seen that, campus's innovation institutional culture is positive for students' creative thinking. We propose the following hypothesis:

H2: Campus institutional culture has a positive impact on the students' creative thinking.

2.3 Spiritual Culture and Creative Thinking

Spiritual culture is the highest level of campus spirit. It reflects the inherent demeanor of the school, and specifically manifested in educational philosophy, the school motto, school ethos, teaching style, learning style. Spiritual culture determines the direction of campus

culture development, and is internalized in the material culture and institutional culture (Kan, 2009). Spiritual culture in this study includes cultural events, public opinion, cultural atmosphere, and learning environment (Zhang, Ma, Wang, & Chen, 2008). Excellent spiritual culture can correct students' learning attitude. Guo (2002) considers that good spiritual culture and academic atmosphere can stimulate creative thinking, and cultivate their innovative spirit and practical ability. Wang (2011) thinks that creating thinking not only comes from scientific research, but also benefits from humanistic culture. Meanwhile, a good spiritual culture can lead a correct thinking direction for students (Li, 2005). Through the above analysis, we propose the following hypothesis:

H3: Campus spiritual culture has a positive impact on the students' creative thinking.

3. METHOD

3.1 Sample Selection and Data Collection

This study takes college students in Guangdong Province as the research object. This study collected data by the questionnaire survey. To ensure the validity, this study commissioned the Guangdong Provincial Committee of the Communist Youth League to send invitations to 25 universities in Guangdong and ask them to hand out questionnaires to their students. Finally, 1,714 copies of paper questionnaires were collected. After excluding the invalid questionnaires, 1,645 copies of valid questionnaires is remaining and the effective rate is 95.97%. The descriptive statistical analysis refers to Table 1 below.

Table 1
Descriptive Statistics of Respondents (*N*=1645)

Items	Options	Quantity	Percentage
Gender	Male	820	49.85%
	Female	788	47.90%
	Blank	37	2.25%
Grade	Freshman	22	1.34%
	Sophomore	860	52.28%
	Junior	585	35.56%
	Senior	135	8.21%
	Fifth grade	7	0.43%
	Graduate	22	1.33%
	Blank	14	0.85%

To be continued

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Items	Options	Quantity	Percentage
College Types	Vocational school	598	36.35%
	Undergraduate school	1034	62.24%
	Others	4	0.24%
	Blank	19	1.16%
Major	Social sciences	244	14.83%
	Science & engineering	554	33.68%
	Economic management	540	32.83%
	Others	263	15.99%
	Blank	44	2.67%

3.2 Questionnaire Design

Firstly, this study divides the innovation culture into 3 types: material culture, institutional culture and spiritual culture. There are 13 items in the rating scale. After doing an exploratory factor analysis to 3 constructs by SPSS19.0, we find that "Paper Level" in the material culture is an interference factor, so we delete that item and use the reformative scale with 12 items. Besides, we use a scale developed by Zhang (2005) to measure creative thinking, which has 5 items: logical thinking, convergent thinking, divergent thinking, dialectical thinking and critical thinking. This study uses 5-point Likert scale.

4. RESULT

4.1 Reliability and Validity Analysis

Before data analysis, we should ensure the reliability and validity. We use SPSS19.0 and result of reliability and validity refer to below Table 2. Firstly, Cronbach's α of all the variables are greater than 0.7, and CITC are greater than 0.4, which mean the reliability is high. Secondly, this study has good content validity because of using mature scales. Each factor loading in the table is greater than 0.5, which shows that indicators can intensively explain the measured factors. KMO of all the constructs are greater than 0.6 and that means variables have strong correlations and are suitable for factor analysis. AVE of all the constructs are greater than 0.5, so the convergent validity is preferably.

Table 2
Results of Reliability and Validity

Variable	Measured variable	Factor loading	Cronbach's α	CITC	KMO	AVE	Variance explained (%)
Creative thinking	logical thinking	.750		.581			
	Convergent thinking	.793		.635			
	Divergent thinking	.768	0.799	.605	0.821	0.5546	55.478
	Dialectical thinking	.720		.557			
	Critical thinking	.688		.520			
Material culture	Teaching staff	.767		.528			
	Lab. construction	.586		.400			
	Scientific research project	.648	0.714	.451	0.714	0.5012	47.067
	Scientific research funds	.613		.409			
	Patent application	.791		.562			
Institutional Culture	Check-up system	.804		.505			
	Incentive system	.726	0.713	.448	0.636	0.6371	63.701
	Leaders emphasis	.859		.603			
spiritual culture	Cultural activity	.792		.598			
	Public opinion	.943		.785			
	Cultural atmosphere	.566	0.832	.399	0.695	0.682	68.222
	learning environment	.944		.787			

4.2 Results Analysis

This article takes students' creative thinking as the dependent variable, and takes the three different types of cultures as independent variables, to build a multiple regression model. We make a test by SPSS19. 0. The results are shown as Table 3.

Table 3
Multivariate Regression Coefficient

Model	Unstandardized coefficients		Standardized coefficients			Collinearity statistics	
	B	Standard error	Trial version	T	Sig.	Tolerance	VIF
(Constant)	-.176	.065		-2.694	.007		
Material culture	.300***	.030	.230	10.119	.000	.349	2.869
Institutional culture	.215**	.029	.194	7.352	.000	.260	3.850
Spiritual culture	.533***	.027	.478	19.602	.000	.303	3.297
Dependent variable: Creative thinking							

The regression result shows that:

Material culture has a positive impact on the students' creative thinking. Hypothesis H1 is supported, because: Good teachers help students to think and solve problems by teaching in classes and guiding privately. Perfect facilities, adequate scientific research projects and matching funds can provide practice conditions and guarantees to students for practicing. Humanized procedures for patent applications can motivate students. All these can improve students' creative thinking ability.

Institutional culture has a positive impact on the students' creative thinking, but the coefficient is lowest so the influence is relatively the minimum. Hypothesis H2 is supported, because: the more attention that school leaders pay to students' innovation, the more support that students will receive; the more attractive the incentive measure is, the more power that students will have. But the check-up system sometimes will restrict students' behaviors which may bring negative feelings to students so that other factors' stimulation is receded.

Spiritual culture has a positive impact on the students' creative thinking and the coefficient is the highest. Hypothesis H3 is supported, because: Ample campus creative activities and a good creative atmosphere, allow students access more knowledge and like-minded partners. A proper orientation of public opinion can help students establish good creative ideas. An excellent learning environment is also conducive to students' thinking and practice. Students' creative thinking is unconsciously influenced and this spirit is more deeply rooted.

CONCLUSIONS AND SUGGESTIONS

According to the empirical findings, the author puts forward some suggestions to promote college students' creative thinking, as follows:

(a) Optimize the material culture in campus and provide basic conditions to cultivate creative thinking. Schools should timely update the advanced teaching equipment, laboratory facilities and scientific instruments to combine teaching with modern technology. Besides, teachers' knowledge, teaching style, teaching mode make a difference to students' thinking and the quality of new knowledge, so schools need to cultivate a number of outstanding teachers to spread new ideas, new theories, new knowledge using innovative and effective teaching methods. What's more, more research projects are supposed to be accessed to students, especially some industry-university-research cooperating projects. Only through the real projects, students can improve their hands-on ability. In the meantime, schools should also give some supporting project funding to guarantee the project development. Otherwise, the shortage of funds will reduce the enthusiasm of the students.

(b) Strengthen the institutional culture, provide students with institutional assurance. Firstly, school leadership should attach more importance to students' creative thinking and emphasize it in the annual plan to deliver the significant value of creative thinking to teachers and students. Secondly, incentives should be developed. Teachers are the key to cultivate talents, so schools should reward them who have guided students with bonuses, workload reduction or academic title evaluation, according to their performance. Motivation for student cannot be ignored, as well. Credit, scholarship, postgraduate recommendation can be incorporated into the incentives. Finally, appraisal system should not be too rigid since an inflexible appraisal system might make people resisting.

(c) Value the spiritual culture, and create a good atmosphere for creative thinking. Campus Spiritual Culture is the crystallization of ideas, behavior and thinking during the long term development of the school, which imperceptibly motivates students to move forward. Based on the results obtained, spiritual culture has the greatest impact on students' creative thinking. As a consequence, schools should pay more attention to it. Firstly, create a good academic atmosphere and democratic environment. Schools need to enrich second classroom activities to create an innovative atmosphere. Secondly, schools should organize or encourage students to organize various cultural activities in accordance with interest. It not only promotes the innovative culture, but also can provide communicative opportunities to like-minded students, which are beneficial to generate new ideas and exercise creative thinking. Thirdly, schools should take advantage of public opinion to promote the value of creative thinking. Finally, advocate intersection of liberal arts and science and it will help to broaden students' knowledge, and enhance creative thinking ability.

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