The Influence of Co-operative Education to Creativity – Base on Organizational Innovation Encouragement

Qinghua Qin

PH.D Candidate, Chinese Graduate School, Panyapiwat Institute of Management
120645952@qq.com

Tienan Wang

Doctoral Supervisor, Chinese Graduate School, Panyapiwat Institute of Management
wtn@hit.edu.cn

Abstract

Collaborative innovation theory has been widely applied to explain university and enterprise cooperative education, but few know about how Technology University of China can find a right cooperative education way to enhance the quality of personnel training. In this paper, we argue that organizational innovation encouragement may be a mediator between university and enterprise cooperative education. The authors tested the hypotheses with data collected 427 students who had participated cooperative education form four Technology Universities, Guangxi, China. The results support the hypothesis that the university co-operative behavior and enterprise co-operative behavior have significant influence on the student's creativity. This study extends the research field of collaborative innovation and provides a new perspective in this theory.

Keywords: University Enterprise Cooperation Education; Organizational Innovation Encouragement; Creativity

Introduction

Creativity is defined as the production of new and useful ideas concerning products, services, processes and procedures (Amabile, 1996; Oldham & Cummings, 1996; Shalley, 2004; Zhou, 2001). Research on student's creativity, as a sub-area in the field of micro organizational behavior, has had a relatively short history. The foundation for this research began in the late 2000s. In China, the shortage of innovative employee is expected to reach about 22 million in 2020. Therefore, the cultivation of innovative employee will be placed in front of a Chinese industrial impassable ridge (McKinsey, 2016). This research will focus on the new type of Technology Universities in China, and try to find the right way to teach students' creativity.

At present, the university enterprise cooperative education is the common way to train students at Technology Universities in China. The most of research are focused on the quality for participation such as production, learning and research. For quantitative research, Xu (2011) developed measurement scale to verify the knowledge sharing and knowledge acquisition process as an intermediary role. However, how to cultivate student's creativity? Can Technology Universities teach student's creativity through classes? Whether the Technology Universities could directly copy the cooperative teaching mode from traditional Chinese

universities? Amabile (1997), Zhou&George (2001), Yang(2011) researched on organizational innovation influence on creativity of encouragement. They have developed on the strategic human resource management field. Yang (2011) has verified encourage innovation through the intermediary function of belief role identity and effectiveness, impact on employees' creativity.

Based on the above theory, this research focused on the Technology Universities in Guangxi, China. We selected 427 students who had participated cooperative education, to explore how students could learn from two kinds of organization between universities and enterprises. On the other hand, students also can participate in practices through two different atmospheres and learn from different types of mentors in order to improve their creativity. Therefore, the research tries to explore organizational innovation encouragement as mediating variables, to influence student's creativity and promote the development of university enterprise cooperation as a new education mode.

Literature Review and Hypothesis

Haken (1971) pointed out collaborative theory. It is defined as the complex system of each subsystem, mutual cooperation, mutual competition, which makes the whole system to form a new quality stable, orderly structure, ultimately achieve the effect of 1+1>2. Bransford, Barron and Pea (2005) proposed that collaborative theory transplantation in the education field. To explore the play the self-organization ability of each subsystem in the education system, under certain conditions, the formation of cooperation, coordination, synchronization, complementary and collaborative effect. March (2010) pointed out a new employee performance could be decreased with the growth of experience accompany university experience learning error. He also found out the detailed implementation between experience knowledge and education knowledge management. Therefore, experience knowledge has a strong spatio-temporal focus. It can be directly applied to specific situations and academic knowledge emphasized the usefulness.

Collaborative innovation is a kind of long span integrated innovation organization pattern, including university, enterprises, government, agencies and other organizations. In the practice level, the researchers need to build collaborative innovation platform and organization to promote the collaborative innovation scientific development. Therefore, the authors should formulate policies and measures favorable to support with the development of collaborative innovation platform, increase investment to cultivate the comprehensive competitiveness of the R&D organization, take the initiative to strengthen domestic and international exchanges and cooperation, enhance the enterprise innovation ability because cooperation is emphasized. At the same time, the authors carry out educational activities of the cooperative, various social institutions have combined impact on students.

It can improve the efficiency and effect of education benefit. That means the information exchange from family, university, community are clear. It can be used to educate students in order to improve the effect of education efficiency. In this study situation, university enterprise cooperative education including university cooperative behavior and enterprise cooperative behavior, organizational innovation encouragement mainly refers to the university and enterprise organization created two kinds of innovative atmosphere for students.

The mechanism of the impact of university enterprise cooperation education and creativity

In the literature, Jiang (2007), Jiang (2004) and Zhang (2006) discussed the university enterprise cooperation practice could significantly improve the students' creativity. Amabile (1997) found out the diversity and cultural complementarily of members could help each other to enhance the creativity. Zhou and George (2001) pointed out leadership support and coworker feedback can positively affect the creativity in working environment. Therefore, researchers believe that the university enterprise cooperation can be a good combination of theory and practice, and give full play to the university and enterprise in the creativity advantage. Students can learn from university and enterprises' tutors, through work and practice to complete the internalization and explicit knowledge, and thus has a significant impact on the creativity of students participating in the cooperation. Another important factor is when enterprise demand member from university to participate in technology research and development. The university is able to provide the appropriate candidates.

The most important point is the students can be employed by enterprises or find a job after they graduated. Therefore, many researchers have realized that the cooperation enterprises can bring different kinds of benefits to the university, such as a keen awareness of the market, business model teaching, entrepreneurship, leadership. Enterprises can offer a real working environment and assigned clear working tasks in order to help students to improve their creativity. Based on the above discussion and puts forward relevant hypotheses as follows:

Hypothesis 1: University co-operative behavior is positively related to students' creativity.
Hypothesis 2: Enterprise co-operative behavior is positively related to students' creativity.

Mediating effect of organizational innovation encouragement

Employee's creativity is an important research topic in human resource management. Organizational innovation encouragement is also an important issue to creativity research field. It is a key factor affecting creativity. Organizational innovation encouragement is a part of KEYS measuring scale. It is divided into organizational creativity support, supervisory creativity support and colleague creativity support. It belongs to the study of organizational innovation atmosphere. Amabile (1997) found that organizational creativity within the psychological situation would affect the creative production, that explained the key influencing employees to create inner driving force and its working environment is closer.

In fact, there is a more profound logical relation, cooperation for leading enterprises, to encourage university organizational innovation between the two identities and support, and build a good atmosphere for the students' creative ability. University teacher and business mentor support, supervisor support and colleague support to further promote the students' creativity. Based on the above discussion and puts forward relevant hypotheses as follows:

Hypothesis 3A: Organizational creativity support plays an intermediary role between university co-operative behavior and students' creativity.
Hypothesis 3B: Supervisory creativity support plays an intermediary role between university co-operative behavior and students' creativity.
Hypothesis 3C: Colleague creativity support plays an intermediary role between university co-operative behavior and students' creativity.

Hypothesis 4A: Organizational creativity support plays an intermediary role between enterprise co-operative behavior and students' creativity.

Hypothesis 4B: Supervisory creativity support plays an intermediary role between enterprise co-operative behavior and students' creativity.

Hypothesis 4C: Colleagues creativity support plays an intermediary role between enterprise co-operative behavior and students' creativity.

Based on the above discussion, the empirical model is shown in Figure 1.
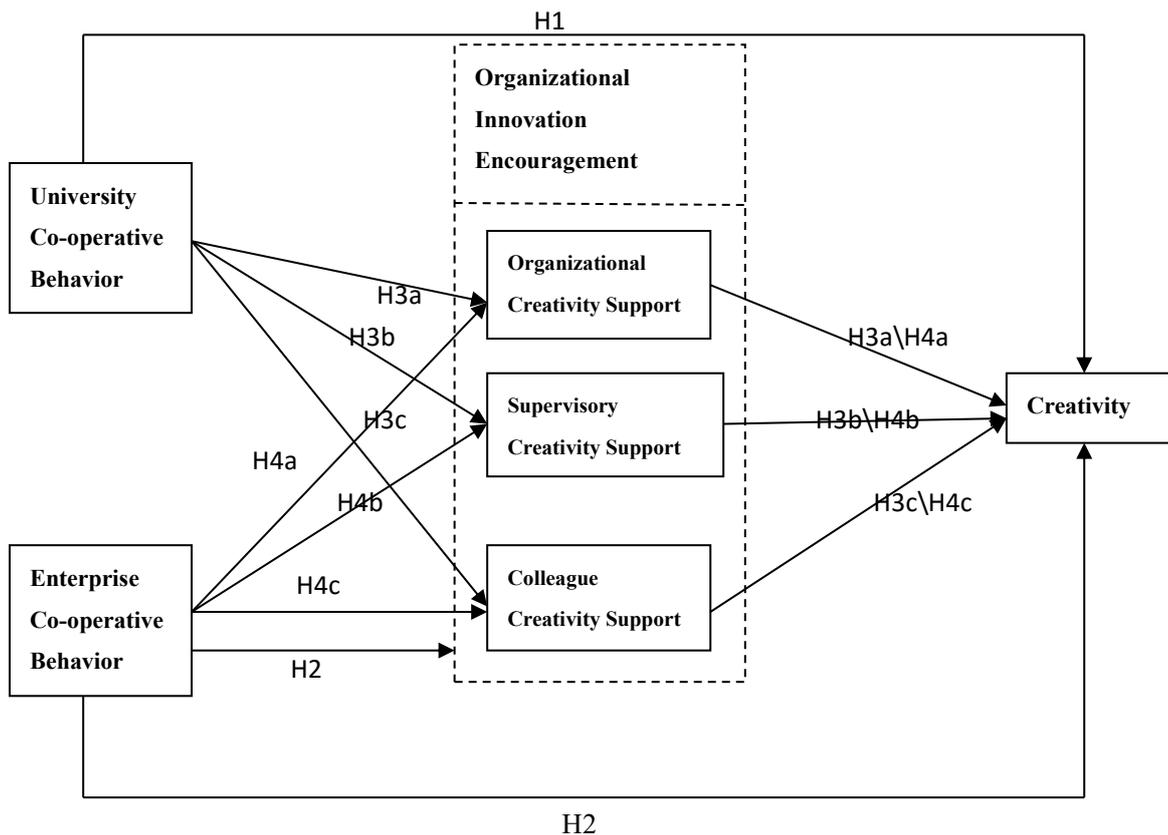

Figure 1. Empirical research model

Method

Sample selection

The authors selected four respectively Technology Universities in Guangxi, China, including Guangxi University of Science and Technology Lushan College, Baise University, Qinzhou University and Nanning College. Two or three researchers constituted a research group, each group collected 115 students who had participated cooperative education to fill in questionnaires. As a result, the total 4 universities and 460 questionnaires have been collected. There were 427 questionnaires valid data. The participation proportion of female is 59.72% are higher than male. Up to 37.94% are four year undergraduates and the fourth year students are 23.42%. The proportion of three year college students are 11.48% and also included 3.51% graduated students who have participated in cooperative education. In the discipline, literature

and history (economic management, education, management science and engineering etc.) is the highest proportion reach 85.71%, followed by engineering (electronic technology, printing technology, bio technology) reach 8.9%. In the form of participating in the cooperation, is to participate in the largest number of enterprises reach 36.53%, the graduation internship, internship programs for the second, up to 19.2%, while other forms account for 14.52%. In the time of participation in university enterprise cooperation, the number of people within one month is 47.54%, the main content is to participate in enterprises followed by projects, and participation in university enterprise cooperation for more than 1-3 months, the proportion are 19.67%.

Variable measurement

Independent variables

Xu (2011) developed cooperative education scale, measured from the two latitude enterprise and enterprise cooperation behavior of university enterprise cooperation, training aspects of universities and enterprises is mainly reflected in: through cooperation to keep abreast of business need the type of personnel and job information, and through collaborative innovation production, learning and research, the view of the scientific research achievements into profitable projects. At the same time, the successful cases in the process of the theory study provide new production and management philosophy, to help enterprises solve practical problems in the process of operation. Finally, the universities can raise the employment rate of graduates who had been trained through cooperation education. The authors changed some scale items on the basis of semi-structured interviews, such as "The university teachers know knowledge; skill level is very high" to "The university to arrange a special teacher guidance when we practice". Make changes for "The university helps enterprises to solve business management problems" to "The university provided teaching cases and formulate the development strategy ". For the enterprise level scale improvement increase:"The enterprise is good at summing up practical experience in the production process or the case for teaching", "The university provides a new teaching idea". At last, remove some items to the organizational innovation encouragement.

Mediating variables

This study from three aspects: organizational creativity support (OCS), superior creativity support (SCS) and colleagues creativity support (CCS) to measure organizational creativity encouragement (OCE) (Qiu et al., 2009). The organizational innovation atmosphere scale of organization concept innovation support on behalf of the organization structure, leadership effectiveness represents superior support for innovation the construct and operation team on behalf of colleagues innovation support structure, and that the three dimensions of organizational support is divided to encourage innovation, in order to get the organization to encourage innovation in the final scale.

Dependent variable

This study focused on how to educate student's creativity. Analysis of change in cooperative education is an important issue for enterprises who are primarily interested in seeing if and when universities provide human resources' benefits to the firm. Therefore, the authors defined innovative creativity (IC) as dependent variable. According to Tiemey，Farmer and George（1999）research results, they used 9 items and 5 points project to measure employees' creativity. Zhou and George (1996) increased 4 entries, the total 13 items. Other researchers also verified it effectiveness in the Chinese context.

Result

Analysis process

This study proposed three competition models as showed as table 1. There is no intermediary model M1 for cooperative education directly to the students' creativity. M2 is a full mediation model and M3 is an intermediary model. We can see the fitting M3 model indexes are better than M1 and M2. Therefore, the hypothetical M3 model is the best fitting model, which covers organizational creativity support, superior creativity support and colleague creativity support on the mediating effect of students' creativity. We keep the model, and will further below in the interpretation of the model, and then test the hypothesis.

Table 1. Creative talent creativity structural equation model fitting index

Model	X^2	Df	X^2/df	GFI	RMSEA	CFI	NFI	NNFI	RFI
M1	923.997	374	2.472	0.868	0.059	0.945	0.910	0.940	0.903
M2	2047.203	892	2.295	0.816	0.055	0.929	0.882	0.925	0.874
M3	2041.382	890	2.294	0.817	0.055	0.929	0.882	0.925	0.874

（*$P<0.05$ Two-sided Test   **$P<0.01$ Two-sided Test   ***$P<0.001$ Two-sided Test）

Reliability and Validity

Fornell & Larcker (1981) pointed out the construct validity, convergent validity and discriminate validity of the theoretical model can be determined by combination of reliability and average variance extracted. The results are showed in Table 2. The combined reliability ranged from 0.91 - 0.6. The factors are higher than 0.7 standards. It shows that the six variables have the ideal validity. AVE value is 0.57 - 0.73, more than 0.5 standards. It is a good party validity. The further calculation are showed in Table 3 and the correlation coefficient is between 0.69--0.81. The data reflect a good discriminates validity.

Table 2. M3 optimal model combination reliability and AVE

Dimension	UCB	ECB	OCS	SCS	CCS	IC
Composite Reliability	0.93	0.93	0.91	0.92	0.93	0.96
AVE	0.61	0.57	0.66	0.69	0.73	0.68

Table 3 presents the relationship between university enterprise cooperation behavior, organizational innovation support and students' creativity. The whole questionnaire variables have strong correlation significantly.

Table 3. Coefficient PEARSON correlation between latitude of variable

	Mean Value	Standr- ad Erro	UCB	ECB	OCS	SCS	CCS	IC
UCB	3.52	1.09	1					
ECB	3.5	1.06	0.762**	1				
OCS	3.72	1.03	0.750**	0.796**	1			
SCS	3.76	0.98	0.712**	0.740**	0.810**	1		
CCS	3.81	0.97	0.692**	0.723**	0.788**	0.832**	1	
IC	3.70	0.99	0.731**	0.742**	0.798**	0.782**	0.770**	1

**. The correlation was significant on the 0.01 level (double tail)

Hypothesis Testing

In this study, the authors used AMOS24.0 as the following method to test the mediating effects of organizational innovation encouraging dimensions. In order to make clear the specific impact of university enterprise cooperation education on student's creativity, we construct the SEM model of the university enterprise cooperation education, and the creativity model.
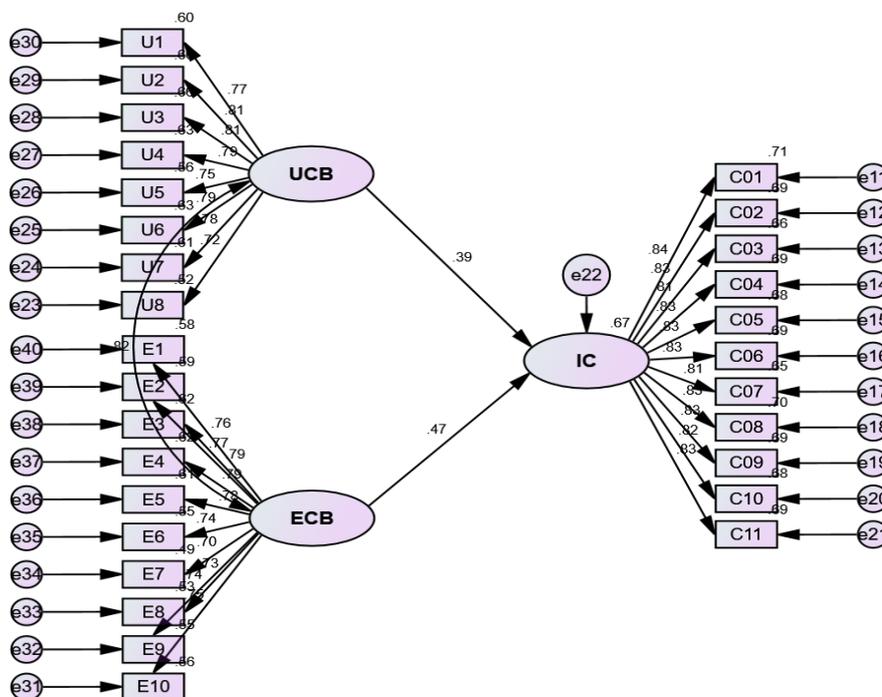

Figure 2. University enterprise cooperation behavior and the impact on student's creativity

As shown in figure 2 and the following table 4: RMSEA=0.059, to achieve the recommended value, CFI, NFI, NNFI and RFI are more than 0.9, the model is acceptable.

Table 4. University enterprise cooperation behavior impact on student's creativity

Variable Relationship			Normalized Coefficient	Path T Value
UCB	<--->	ECB	0.821***	9.816
IC	<---	UCB	0.399***	5.786
IC	<---	ECB	0.489***	6.857

Model fitting index value：GFI=0.868，RMSEA=0.059，CFI=0.945，NFI=0.910，
NNFI=0.940，RFI=0.903

Note: when the value of T is greater than 1.96, the p<.05 is represented by *; when greater than 2.58, the p<.01 is indicated by * *;P<.001 is greater than 3.29, expressed in * * *

Influence of results from the cooperative education creativity of the main effect, the correlation coefficient of the university enterprise cooperation behavior and enterprise cooperation behavior is 0.821, the correlation coefficient of the university enterprise cooperation and student's creativity is 0.399, the correlation coefficient of enterprise cooperation behavior and innovative creativity in 0.489 the level of P<0.001. That is significantly related to the university, the enterprises cooperation behaviors have a positive influence on the creativity. On the other hand, the university cooperation behaviors also have a positive influence on the creativity, assuming that H1 and H2 established.

The authors detect the mediating effect of organizational innovation and encourage each dimension, it can be seen from table 5: university enterprise cooperation behavior in joining the organization innovation support, supervisor support and colleague mediator innovation support three factors, standardized coefficient of only 0.144, the P value is 0.024 < 0.05 significant, therefore, between the three a cooperation in the enterprise behavior and creativity to play a mediating role, assuming H3a, H3b and H3c established. The enterprises cooperation behavior in joining the organization innovation support, supervisor support and colleague mediator innovation support three factors, standardized coefficient of only 0.005, the P value is 0.964, far greater than the significance level of 0.05, Therefore, the three factors play mediating role between the enterprise behavior, university behavior and creativity. H4a, H4b and H4c established. In the modified model, the authors deleted direct role from enterprise cooperation behavior to creativity.

Table 5.   Assumes the path coefficients of the M3 model

Factor relation			Normalized path coefficient	T Value	Sig. Value
OCS	<---	UCB	0.259	4.474	***
SCS	<---	UCB	0.27	4.233	***
CCS	<---	UCB	0.252	3.848	***
OCS	<---	ECB	0.690	10.177	***
SCS	<---	ECB	0.628	8.938	***
CCS	<---	ECB	0.619	8.604	***
IC	<---	OCS	0.359	3.902	***
IC	<---	SCS	0.235	3.632	***
IC	<---	CCS	0.215	3.782	***
IC	<---	UCB	0.144	2.264	0.024
IC	<---	ECB	0.005	0.045	0.964

（*P<0.05 Two-sided Test   **P<0.01 Two-sided Test   ***P<0.001 Two-sided Test）

The figure 3 shows the revise models and table 6 shows revised model structural equation model fitting index.
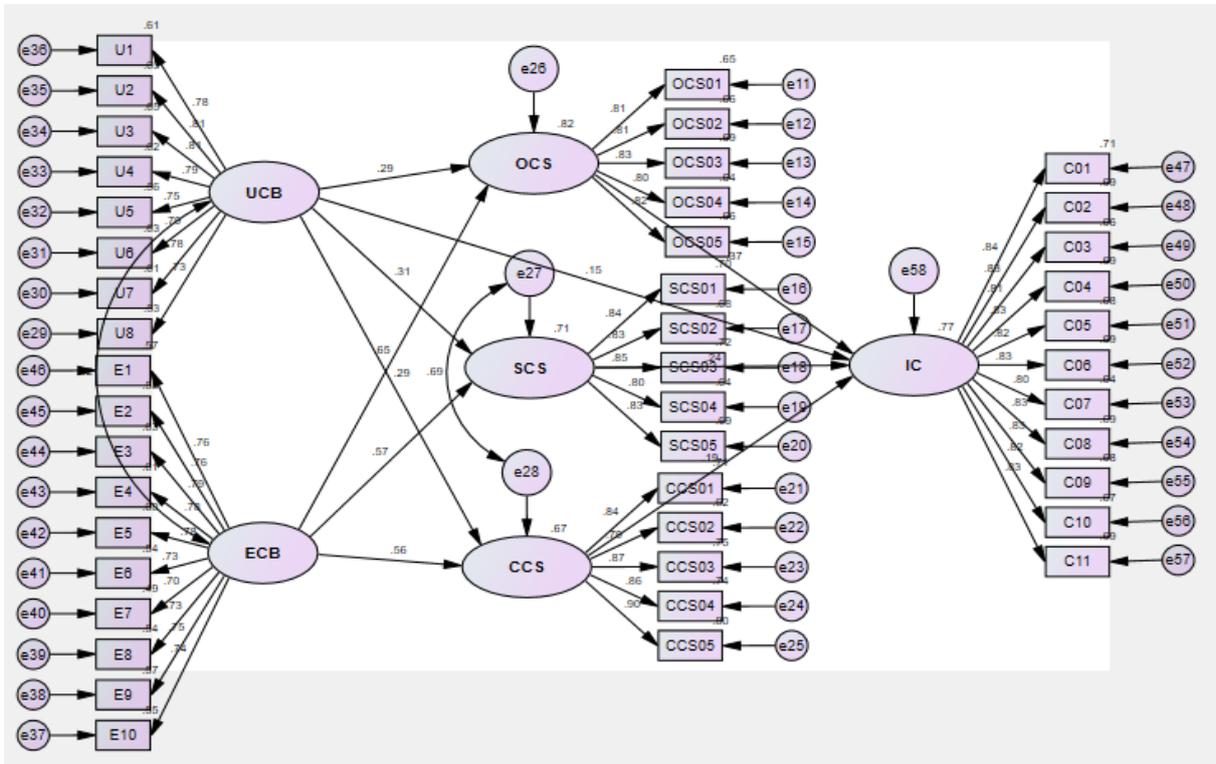

Figure 3. Correction, assume the path structure equation M3 the whole model

Table 6. Revised M3 model creative talents creativity structural equation model fitting index

X^2	Df	X^2/df	GFI	RMSEA	CFI	NFI	NNFI	RFI
1164.733	619	1.882	0.872	0.045	0.961	0.920	0.958	0.914

Discussion

This study makes a contribution to the collaborative theory by focusing on cooperative education, to examine organizational innovation encouragements as a mediator. Based on the above results, universities and enterprises to participate in cooperative education on students' creativity and have a certain impact. However, when organizational innovation support, superior innovation support and colleague support to creativity as the intermediary effect, this effect from enterprises to creativity is not significant. When the dimension affects creativity through organizational innovation encouragement, the coefficients are high. The result proved the high effect of collaborative innovation between the university and the enterprise organization. The results also support the idea that organizational innovation encouragements play an important role for student education. We can find out studying environment are an important factor for universities' classes. Furthermore, we also can transfer the courses from universities' classroom to the enterprises' workplace in order to earn more real work scenes for students.

Our study addressed the gap by cooperative from two organizations. Organizational innovation encouragements are full mediating effect between enterprise co-operative behavior and innovative creativity. It can be considered the enterprises are the most important participating in the cooperation education. If enterprises can more actively participate in cooperative education, it can bring the more resources to the universities. For example, the staff of enterprises becomes a practice tutor to train students. The enterprise also can invest funds and equipments to establish the laboratory for universities. Therefore, each student could be conducted by academic tutor and practice tutor. They will have a stronger identity sense of career in psychology, and thus more conducive to creativity.

Limitations and future research

Firstly, the primary data is collected through questionnaire survey, due to time, manpower and energy constraints, the questionnaire items are answered by the same person. There will be some homologous variance. Secondly, this research employed the method of cross section, the conclusion of the study has not been test by timing. This cooperative education measures are at the one time. According to the measurement results, there is a causal relationship between them. Despite the consistent conclusion most previous qualitative research contents and conclusions of this study, but the cross section design that we cannot let the other possible explanations are excluded. Finally, this study is used convenient sampling rather than completely random sampling method to collect the sample data.

This research has only scratched the surface of cooperative education. Further research should be carried out, collecting a bigger sample for the questionnaire and conducting face to face interviews in both universities and enterprises sides. For example, the author will collect data from the enterprise, university, students and participate in cooperative education, try to

collect a probability sample, in order to ensure a random sample and relating to be free of possible bias, Therefore, the author suggests that future research may consider design throughout the study in the conditions allow as far as possible by using random sampling method to collect standard sample information. Furthermore, snowball sampling of conducting interviews will be used for the further research as well.

Conclusion

The research aims to analyze how Technology Universities in China design to train student's creativity. As mentioned that nowadays, there is enterprise participate in universities' education, therefore, for teaching transformation and innovative thinking such as, teaching method, critical thinking, innovative ideas, are more and more important for supply in the demand of high education. This paper focused on the topic of organization innovation encouragement. We found the relationships between university co-operative behavior, enterprise co-operative behavior and student's creativity in the Technology Universities of China. The results support university co-operative behavior, enterprise co-operative behavior have a significant influence on the student's creativity. Organization innovation encouragement plays the part of the intermediary role between university co-operative behavior and student's creativity. It plays a mediating role between enterprise co-operative behavior and student's creativity. Our model offers a mediator effect, explanation of education-level change. Importantly, the contributions from model of practice change are limited to collaborative theory, but extend practice as well.

In conclusion, enterprises could improve on practice education field for universities, and universities should make use of enterprises' resources in order to help students to earn more creativity. In China, more and more innovation demands for traditional industry, such as international trade, IT, marketing sales and financial etc. Technology Universities as a new type of universities in China, it might become a base to train students' creativity in order to solve the problem of innovative talents shortage. However, all the problems might be the same situation for any new or less experiences universities to develop cooperative education. Technology Universities need to increase its promotion, try to solve the enterprise problems and make its distinctive from traditional universities in order to create awareness of the brand image for vocational education.

References

Amabile, T. M. (1997). Motivating creativity in organizations: On doing what you love and loving what you do. *California management review*, 40(1), 39-58.

Bransford J, Barron B, Pea R D, et al. (2005). Foundations and opportunities for an interdisciplinary science of learning. *The Cambridge handbook of the learning sciences*, 39-77.

Bagozzi, R. P., & Yi, Y. (1998). On the evaluation of structural equation models, *Journal of the Academy of Marketing Science*, 16(1), 74-94.

Chen, J., & Yang, Y. J. (2012). The theoretical basis and connotation of collaborative innovation. *Science Research*, 30 (2), 161-164.

Fornell C, Larcker D F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 15, 39-50.

Haken, (2005). Synergetics Mysteries of nature form. Shanghai Translation Publishing House.

Huang, J.R. (2007), Interpretation of school enterprise cooperation. *China Training*, (1), 56-56.

Jiang, L.H.(2007), On the cultivation of students' creative ability. East China Normal University.

Jiang, M.D.(2004), Research on talents training in cooperation between universities and enterprises. Hohai University, 2004.

Liu L.(2017), Teaching behavior of teachers' Informatization Based on TPB and TAM model. *Modern Educational Technology*, 27 (3), 78-84.

Lv L,F. & Yang T.J.(2005), Internal motivation, external motivation and its effective use. *Journal of Hubei University of Economics: Humanities and Social Sciences*, 2 (7): 22-23.

March.(2010), March on management. Shanghai: Oriental publishing house.

McKinsey.(2016), Online shopping tyrant, *IT Manager World*, (13): 6-7.

Oldham,G.R. & Cummings.(1996), A Employee creativity: Personal and contextual factors at work. *Academy of Management Journal*, 39:607-634

Shalley, C. E., Zhou, J., & Oldham, G. R. (2004), The effects of personal and contextual characteristics on creativity: Where should we go from here? *Journal of Management*,30(6), 933-958.

Xu, X.Y. (2011), Research on the impact of school enterprise cooperation education on creativity of skilled personnel. Wuhan University.

Yang, J. (2011), Organizational innovation to encourage the influence of employee creativity: the mediating role of role identity and efficacy beliefs. Nanjing University.

Zhou J, George J M. (2001), When job dissatisfaction leads to creativity: Encouraging the expression of voice. *Academy of Management Journal*, 44(4): 682-696.

Zhang, Y.B. (2006), The idea of cooperative education in production in the new century -- from the point of view of postmodernism. *School Administration*, (46): 145-158.