Monitoring of Influencing Factors on Teaching Ability of Higher Vocational Teachers' Entrepreneurship Education Based on Structural Equation①

ShenQing Qing [1,*] Feng Jiang Hua[2], Chen Beilei[3]

[1]*Shanghai Technical Institute of Electronics Information, ShangHai201411, China*
[2]*Shanghai Technical Institute of Electronics Information, ShangHai201411, China*
[3]*Shanghai Technical Institute of Electronics Information, ShangHai201411, China*
[*]*Corresponding author. Email: 1376450707@qq.com*

ABSTRACT
This paper takes higher vocational teachers as the starting point, and based on the original questionnaire of the project team, constructs a structural model of 4 factors and 21 indicators of theoretical practice, value concept, policy system, implementation conditions. aiming at 321 effective teacher survey questionnaires in 6 coastal provinces selected from the survey database, SPSS24.0 and AMOS24.0 are used to complete the reliability and validity analysis and confirmatory factor analysis of the data. the results show that theoretical practice has the most significant impact, and the factors such as entrepreneurship, entrepreneurship education concept, visit interaction, policy support, leadership attention, sufficient funds and school-enterprise cooperation are more significant. Three suggestions are put forward: 1. to integrate theory with practice, to create and integrate specialties, and to improve teachers' innovative and practical ability in an all-round way; 2. The school attaches importance to and strengthens the top-level system design to realize the stabilization and specialization of the entrepreneurship education team.3. School-enterprise linkage, specialization and combination, gathering industry experts resources to promote learning and teaching, and improving the teaching level of entrepreneurship education.
Keywords: *structural equation, higher vocational teachers, teaching ability of entrepreneurship education, influencing factors*

1. INTRODUCTION

According to the content of document No.12 [2015] of teaching, all colleges and universities should have sufficient ratio of full-time teachers in innovation and entrepreneurship education, build a talent pool of 10,000 outstanding innovation and entrepreneurship mentors, and provide professional guidance for employment and entrepreneurship [1]. Thus, it can be seen that the backbone force to further promote entrepreneurship education is the teachers who are working in the front line. The strength of their entrepreneurship education teaching ability will directly affect the quality of talent training. Therefore, this paper, from the perspective of teachers engaged in entrepreneurship education in higher vocational colleges, studies what factors will have an impact on the strength of their entrepreneurship education teaching ability, and therefore puts forward corresponding Suggestions will have important theoretical and practical significance.

2. LITERATURE REVIEW

The United States is the first country to conduct entrepreneurship education for college students. In 1985, the American association for the advancement of science proposed in the 2061 plan: science for all Americans that teachers' entrepreneurship education should weaken students' grasp of details and strengthen students' training in thinking and skills [2]. The innovation and entrepreneurship education in domestic colleges and universities has mainly gone through four stages: independent exploration by colleges and universities, pilot implementation by the government, comprehensive promotion by colleges and universities, and now deepening reform [3]. Typical research results related to the research topics in this paper include:. Hou Guibao (2004) proposed in the training module of entrepreneurship education teachers that the effective way to obtain entrepreneurship experience is to let entrepreneurship education teachers participate in the practice activities, carry out targeted learning in the education and teaching methods of entrepreneurship courses, and participate in various exchange activities related to entrepreneurship [4]. Zhu Xiaoyun et.al (2012) proposed that all staff should participate, and discussed

from the perspective of improving entrepreneurial teacher training and evaluation mechanism [5]. Huang Zhaoxin et al. (2019) proposed to reform the evaluation and employment mechanism of teachers in entrepreneurship education to promote the construction of full-time teachers [6].The overview of relevant literatures shows that, for higher vocational colleges in coastal areas, there is almost no empirical analysis on the teaching ability of teachers engaged in entrepreneurship education. Therefore, approved by the research group, this paper selected 321 survey data of teachers from 6 coastal provinces and engaged in entrepreneurship related work in higher vocational colleges, and carried out empirical analysis from the perspective of teachers' entrepreneurship education and teaching ability. Through the evaluation of teachers on the importance of relevant indicators involved in entrepreneurial work, the paper analyzes the correlation among various factors and puts forward specific suggestions, so as to enrich the research results in this field and provide references for the improvement of entrepreneurial teachers' teaching ability.

3. RESEARCH DESIGN

3.1. Construction of influencing factors

In addition to the original data of indicators such as gender, age, highest degree, professional category, professional title and years of entrepreneurship education, the influencing factors of vocational teachers' entrepreneurship education teaching ability are reorganized and simplified as shown in table 1. At the same time, according to Likert level 5 scale, the original questionnaire set options are cited, that is, “5 for very important; 4 for relatively important; 3 for important; 2 for less important; 1 completely not important”.

Table1 Summary of Influencing Factors

Latent variable	Observation variable
Theories and practice	A1 Entrepreneurship theories /A2 Subject knowledge other than entrepreneurship theory /A3 Experience of guiding students in entrepreneurship /A4 Entrepreneurship experience /A5 Part-time training in enterprises/A6 Integration of profession and innovation /A7 Experience in teaching and management /A8 Cooperation with students
Value and concept	B1 Strong entrepreneurship spirit /B2 Recognizing the concept of entrepreneurship education /B3 Recognizing teachers and students working together
Policy system	C1 Performance distribution /C2 Master and doctoral study /C3 Title appraisal /C4 Policy support from industry (government) /C5 Visit and interaction
Implementation conditions	D1 Sufficient fund /D2 Hierarchical teaching materials /D3 Entity entrepreneurship college /D4 Leading group /D5 Cooperation of schools and enterprises

3.2. Research subjects and methods

A total of 321 valid questionnaires were selected from the database of the research group to conduct empirical analysis on the survey data of teachers in 6 coastal provinces, including Liaoning, Hebei, Shandong, Zhejiang, Shanghai and Guangdong, who are engaged in entrepreneurship related work in vocational colleges. Among them, 47 (14.6%) were from Hebei, 53 (16.5%) from Liaoning, 114 (35.5%) from Shanghai, 33 (10.3%) from Zhejiang, 43 (13.4%) from Shandong and 31 (9.7%) from Guangdong. At the same time, combined with the choice setting of the original questionnaire of the research group, the relevant items in the questionnaire were reorganized and simplified from the perspective of factors influencing the teaching ability of entrepreneurship education of higher vocational teachers. In addition, the preliminary data sorting was completed on the EXCEL software platform, and while the reliability and validity analysis of the questionnaire was completed with the help of SPSS24.0, the confirmatory factor analysis was completed with the help of AMOS24.0, and the corresponding conclusions were drawn.

4. EMPIRICAL ANALYSIS

4.1. Reliability and validity analysis

On the basis of the original questionnaire options set up by the research group, this paper reorganizes and simplifies, and forms a new questionnaire in the form of a new combination of the original contents. In order to ensure the credibility of the subsequent empirical analysis results, the analysis of reliability and validity is carried out. Cronbach's alpha coefficient was used to test the reliability module. The results showed that the overall reliability coefficient was 0.958, and the reliability coefficient of each module was above 0.8. In other words, the reliability (stability) of the reorganized and simplified questionnaire was relatively high. See table 2 for details.

Table 2 Summary of the results of reliability and validity of each indicator

Index	KMO	Reliability coefficient
A1-A8	0.910	0.921
B1-B3	0.803	0.817
C1-C5	0.837	0.840
D1-D5	0.859	0.915
whole	0.945	0.958

4.2. Descriptive statistics

First, gender: 124 males (38.6%) and 197 females (61.4%). Secondly, age: 62 (19.3%) aged 30 and below, 126 (39.3%)

aged 31-35, 62 (19.3%) aged 36-40, and 71 (22.1%) aged 41 and above. Third, educational background: 40 with bachelor's degree (12.5%), 163 with master's degree (50.8%), 98 with doctor's degree (or postdocs) (30.5%), and 20 with others (6.2%). Fourth, disciplines: 6 in philosophy (1.9%), 60 in economics (18.7%), 10 in law (3.1%), 9 in education (2.8%), 13 in literature (4%), 1 in history (0.3%), 22 in science (6.9%), 50 in engineering (15.6%), 33 in agriculture (10.3%), 36 in medicine (11.2%), 56 in management (17.4%), 25 in art (7.8%). Fifth, titles: 18 senior (5.6%), 130 deputy senior (40.5%), 108 intermediate (33.6%), 44 junior (13.7%), and 21 undetermined (6.5%). Sixth, years of entrepreneurship education: 90 people with 2 years or less (28%), 135 people with 3-5 years (42.1%), 34 people with 6-9 years (10.6%), and 62 people with 10 years or more (19.3%).
Based on the above data results, the basic characteristics of the research object are summarized as follows: Women account for 61.4% of the total, 39.3% are aged 31-35 years old, and 50.8% have master's degrees. All disciplines are covered, mainly economics, management, engineering, medicine and agriculture, accounting for 18.7%, 17.4%, 15.6%, 11.2% and 10.3%, respectively.

4.3. Confirmatory factor analysis

In this paper, AMOS24.0 and WLS are used to construct the structural model and carry out confirmatory factor analysis based on the four factors and 21 indicators involved in influencing factors of vocational teachers' entrepreneurial education teaching ability. After the test and index modification, the model as a whole and the measurement results of each dimension passed the adaptation criteria, as shown in table 3. The first-order factor model of the factors influencing the teaching ability of entrepreneurship education of teachers in higher vocational colleges is constructed after the adaptation standard of each dimension is passed. See figure 1 for details

Table 3 Summary of model adaptation criteria

Index	χ^2value	df	χ^2/df	TLI	CFI	RMSEA
Theories and practice	29.907	13	2.301	0.938	0.925	0.064
Value and concept	0.339	1	0.339	1.028	1.000	0.000
Implementation conditions	0.246	3	0.082	1.052	1.000	0.000
Policy system	10.863	5	2.173	0.904	0.952	0.061
Whole model	382.717	168	2.278	0.962	0.982	0.063
Adaptation criteria	—	—	< 3	> 0.9	> 0.9	< 0.08

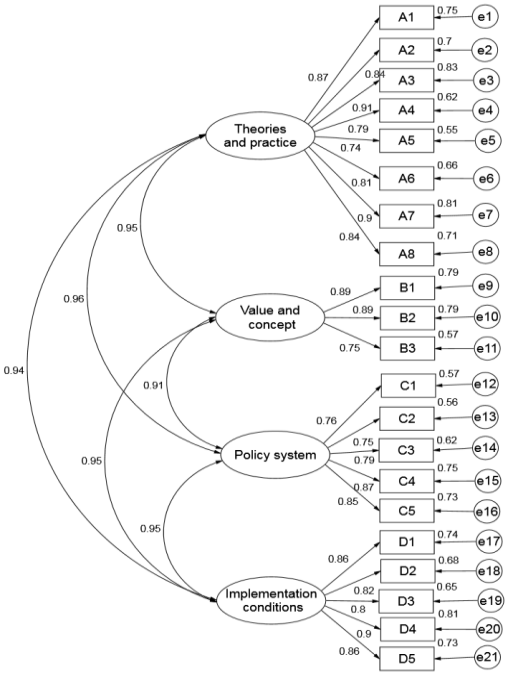

Figure 1 first-order factor model and parameter estimation

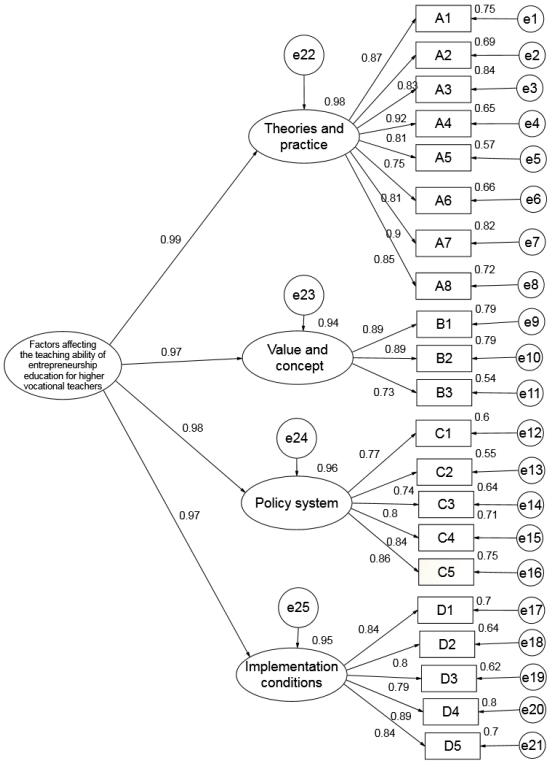

Figure 2 Secondary-order factor model and parameter estimation

At the same time, the factor loads of all the 21 indexes involving 4 factors were > 0.50, which reached the significance level. In addition, the correlation coefficient

involved in each dimension has also passed the significance test, and the interaction relationship between each dimension is very obvious.

According to Figure 1, theories and practice and policy system has the highest degree of relevance (0.96). That is, when the implementation of the policy system increases the contribution to theories and practice by one percentage point, the contribution of theories and practice to the teaching ability of entrepreneurship education of higher vocational teachers will increase by 0.96 percentage points. Secondly, by analogy, the degree of correlation between policy system, implementation conditions and value and concept is 0.95 and 0.91 respectively. The correlation between value and concept and implementation conditions is 0.95. The correlation between theories and practice, value and concept and implementation conditions is 0.95 and 0.94. Thirdly, according to the high correlation of each dimension, the second-order confirmatory factor analysis will be used to test whether the first-order latent variables can reflect a common variable.

According to the second-order confirmatory factor analysis, the second-order models of influencing factors on the teaching ability of vocational teachers in entrepreneurship education all passed the fitness index standard (2/df value was 2.278, and TLI, CFI and RMSEA values were 0.962, 0.982 and 0.063, respectively), that is, the model fitted well. See figure 2 for details.

4.4. Determination of index weight

In this paper, the weight is determined by normalizing the standardized coefficients of 21 indexes with 4 factors, as shown in formula (1):

$$Y = X / \sum_i X \quad (1)$$

For example, the weight of theoretical practice is: Y=0.99/(0.99+0.97+0.98+0.97)=0.253. According to the above calculation principle, the following index weight summary table 4 can be obtained:

Table 4 Weight of factors influencing the teaching ability of entrepreneurship education of higher vocational teachers

Latent variable/ weight	Observation variable/ weight
Theories and practice 0.253	A1 /0.129; A2 /0.123; A3 /0.136; A4/0.12; A5 /0.111; A6 /0.12; A7 /0.134; A8 /0.126
Value and concept 0.248	B1 /0.355; B2 /0.355; B3/0.291
Policy system 0.251	C1 /0.192; C2 /0.185; C3/0.2; C4 /0.209; C5 /0.214
Implementation conditions 0.248	D1 /0.202; D2 /0.192; D3 /0.19; D4 /0.214; D5/ 0.202

Table 4 shows the followings. First, among the four factors, “theories and practice” accounts for the highest weight (0.253); Second, in the “theories and practice” dimension, the top two factors include “experience of guiding students in entrepreneurship” and “experience of teaching and management” (0.136, 0.134). Third, in the dimension of “value and concept”, “strong entrepreneurship spirit” and “recognizing the concept of entrepreneurship education” have the highest weight (0.355, 0.355). Fourth, in the “policy system” dimension, the top 2 factors included “visit and interaction” and “policy support from industry (government)” (0.214, 0.209); Fifth, in the dimension of “implementation conditions”, the top 2 factors include “leading group”, “sufficient fund” and “cooperation of schools and enterprise” (0.214, 0.202, 0.202).

5. CONCLUSION AND SUGGESTION

5.1. Conclusion

Among the 4 factors and 21 indicators constructed, theories and practice has become the most important factor affecting teachers' teaching ability of entrepreneurship education in higher vocational colleges. In other words, 321 front-line teachers who are engaged in mass entrepreneurship and innovation work believe that solid theoretical foundation, rich experience and experience of venture capital and practice and other factors will play a positive role in mass entrepreneurship and innovation education and teaching. Among them, the experience to guide students' entrepreneurship and teaching management are significantly important.

In the dimension of value and concept, strong entrepreneurial spirit and recognition of entrepreneurship education concept play a major role in the teaching ability of entrepreneurship education of higher vocational teachers. In other words, entrepreneurship involves teachers' own pioneering thoughts, entrepreneurial thoughts and entrepreneurial concepts. The concept of entrepreneurship education involves the integration and renewal of traditional education, entrepreneurship education and teaching mode. These factors will have a direct impact on the teaching ability of entrepreneurship education.

In the dimension of policy and system, visiting interaction and policy support of industry (government) play a major role in the teaching of entrepreneurship education. The visit and interaction means that teachers engaged in mass entrepreneurship and innovation education can go out and have in-depth exchanges and learning with their peers or relevant institutions, such as brother colleges, venture capitalists, business incubation parks, etc., to make up for the lack of experience of the actual station. Industry (government) policy support from the perspective of policy and system to provide guarantee for teachers in mass entrepreneurship and innovation education teaching ability improvement.

In the dimension of implementation conditions, the leading group, sufficient funds and school-enterprise cooperation play a major role in influencing teachers' teaching ability of entrepreneurship education in higher vocational

colleges. The leading group, namely, the school has set up a special leading group for mass entrepreneurship and innovation education and teaching, which reflects the importance of the school on this work. Sufficient funds will provide support for the improvement of the teaching ability of mass entrepreneurship and innovation teachers, as well as visits and interactions. School-enterprise cooperation reflects the combination of theory and practice of mass entrepreneurship and innovation education.

5.2. Suggestion

5.2.1.Comprehensively improving the teachers' innovative and practical ability through the integration of theory and practice and the integration of profession and creativity

As a discipline that emphasizes practice and application, entrepreneurship education plays a very strong role in promoting students' entrepreneurship ability and stimulating their enthusiasm for entrepreneurship. As the front-line teachers of the discipline, their theoretical foundations, the understanding of the entrepreneurship theory as well as the ability to apply theory to practice (especially to guide students to participate in all kinds of business projects competition) will directly affect the effect of the innovation and entrepreneurship education. The specific methods involved include enterprise training, observing and guiding student competitions, following up the whole process of enterprise project incubation, participating in venture capital financing meeting, professional training in entrepreneurship field, etc.

5.2.2.Schools attaching importance to and strengthening the top-level system design to realize the stabilization and specialization of the entrepreneurship education team

The results of this survey have also shown that the establishment of a special leading group for mass entrepreneurship and innovation and the support of policies and systems are very important. Therefore, in order to avoid the "pure practical" entrepreneurship education and "temporarily joint" teaching staff, under the direct guidance of the school leadership, through the implementation of system design and policies to obtain financial support, professional title promotion, performance distribution and other career planning for teachers engaged in entrepreneurship education, as well as the cultivation and improvement of entrepreneurship education teaching ability and other contents should be realized. At the same time, through the access mechanism, selection model, professional training, the problem of mass entrepreneurship and innovation teachers "without a certificate on the job" would be solved, achieving the stabilization and specialization of the entrepreneurial teachers.

5.2.3.School-enterprise linkage, special and concurrent combination, gathering industry expert resources to promote learning and teaching, and improving the teaching level of entrepreneurship education

In the form of "theory teacher + industry entrepreneurship mentor (entrepreneur)" and "school classroom + enterprise (incubation park) second class", it provides a platform and technical support for teachers' practical connection, project incubation, and joint research and co-creation between teachers and students, so as to realize the testing and continuous improvement of entrepreneurship theory in practice. The entrepreneurship project should have the guidance of experts in and outside the school, so that the first-line entrepreneurship teachers can improve themselves in practice, participate in the work of industry venture capital experts, and finally create a high level of entrepreneurship education teachers with strong theoretical and practical experience.

REFERENCES

[1] The Ministry of Education of the People's Republic of China. (2015) Notice of the Ministry of Education on Doing a Good Job in Employment and Entrepreneurship for Graduates of 2016 National Ordinary Colleges and Universities. http://www.moe.gov.cn/srcsite/A15/s3265/201512/t20151208_223786.html

[2] Bao, S.M, Yang, D. (2016) The Basic Characteristics of the Development of Innovation and Entrepreneurship Education in American Colleges and Universities and Its Enlightenment —— Taking Massachusetts Institute of Technology, Stanford University and Babson College as Examples J. Higher Education Exploration,11:62-70.

[3] Liu, G.Q. (2016) Deepen the innovation and Entrepreneurship education reform in colleges and universities to further improve the quality of personnel training J.China Higher Education, 21:5-7.

[4] Hou, G.B. (2004) Problems and Development Strategies of Entrepreneurship Education J. Education and Vocation, 27: 16-17.

[5] Zhu, X.Y, Mei, W.H, Yang, C.(2012)Problems and Strategies of Constructing Faculty Team for Entrepreneurship Education in Higher Educational Institutions in China J. China Higher Education Research.09.

[6] Huang, Z.X, Huang, Y.J.(2019)The Quality Evaluation of Innovation and Entrepreneurship Education——An Empirical Study from 1231 Colleges and Universities in China J.Educational Research,7:91-101.

①Note: the data are from the survey database of the national social science foundation (education) key bidding project "evaluation system and monitoring research of innovation and entrepreneurship education" (subject number: AIA170007).