Research on Competency Model of Innovative Entrepreneurship Tutor in Application-oriented Universities*

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Abstract—In recent years, application-oriented universities have actively strengthened innovative entrepreneurship education and made continuous positive progress. As a key component of innovative entrepreneurship education system, the construction of innovative entrepreneurship tutor faculty is the basic guarantee for the implementation and exploration of entrepreneurship and innovation education in application-oriented universities. This article combines the expert interview, consulting literature, questionnaire survey, and factor analysis and so on to make raw data collection and collation analysis, and constructs the competency model of innovative entrepreneurship tutor, attempting to provide theoretical basis and reference for evaluating and promoting the competency quality of innovative entrepreneurship tutor in application-oriented universities, which also has certain theoretical significance and practical value for the construction of innovative entrepreneurship tutor team in application-oriented universities.

Keywords—application-oriented universities; innovative entrepreneurship tutor; competency model; factor analysis

I. INTRODUCTION

In recent years, innovative entrepreneurship education has become the focus of the educational reform in colleges and universities and the development of innovative entrepreneurship education is not only a response to the development strategy of national innovation leadership, but also an important measure to promote high-quality entrepreneurship and employment of college graduates, as well as an effective way to improve the quality of higher education teaching.

Application-oriented undergraduate education, as an important part of higher education in China, is the product of higher education transforming from elite education to mass education. [1]In recent years, application-oriented universities have actively explored and practiced innovative entrepreneurship education in line with the situation of

educational reform and development. As a key link in the construction of entrepreneurship and innovation education system, the team of innovative entrepreneurship tutors is the basic guarantee for the implementation and exploration of entrepreneurship and innovation education in application-oriented universities, and the necessary condition for the continuous development of entrepreneurship and innovation education in colleges. However, as the innovative entrepreneurship education in China is still in the exploratory stage, the existing entrepreneurship and innovation tutors team in application-oriented universities is seriously inadequate in quantity, and the level is mixed, which has become a bottleneck restricting the development of innovative entrepreneurship education in colleges and universities to a deeper level. Therefore, the application-oriented undergraduate universities, which aim at training innovative and applied compound talents, should explore the competency characteristics of innovative entrepreneurship instructors, strengthen the selection, assessment and training of innovative entrepreneurship instructors, and optimize the structure of the tutor team while deepening the reform of innovative entrepreneurship training model in order to ensure the healthy development of innovative entrepreneurship education.

II. THE CONNOTATION OF COMPETENCY OF INNOVATIVE ENTREPRENEURSHIP TUTOR

Competency refers to the combination of individual traits or behaviors that can drive individuals or organizations to undertake certain tasks and produce excellent performance. It mainly includes key features such as knowledge, skills, experience, attitude, personality, values and motivation. [2]The competence of innovative entrepreneurship tutor mainly refers to the comprehensive literacy state of entrepreneurship and innovation teaching staff and their behavior mode that is needed in the process of making students successfully acquire innovation consciousness, entrepreneurship, and practice ability of innovative entrepreneurship. It not only has the characteristic of personalization, but also has the characteristic of specialization. As an important link in the construction of innovative entrepreneurship education system in application-

oriented undergraduate colleges, exploring and researching the competence of tutors is undoubtedly an important way in the construction of innovative entrepreneurship teachers, which has a positive significance for enhancing the teaching effect of entrepreneurship and innovation and improving the teaching quality of entrepreneurship and innovation.

III. THE PROCESS AND METHOD OF CONSTRUCTING COMPETENCY MODEL OF INNOVATIVE ENTREPRENEURSHIP TUTOR

A. The Process of Constructing the Competency Model of Innovative Entrepreneurship Tutor

The standard process of constructing competency model is as follows: (1) to determine the training goal of entrepreneurship and innovation education in application-oriented undergraduate universities. The purpose of application-oriented undergraduate colleges is to cultivate applied interdisciplinary talents with innovative consciousness who can find problems creatively, analyze problems and solve problems. As a new educational idea, entrepreneurship and innovation education has the talents training thought of broadening the students' vision, strengthening the cultivation of students' innovative spirit and entrepreneurial ability, so the application-oriented universities and entrepreneurship and innovation education agree highly with each other in the idea of talent cultivation. [3](2) To determine the assessment latitude of entrepreneurship and innovation tutors in application-oriented universities Under the background of entrepreneurship and innovation education, the tutor's function lies not only in the explicit indicator of teaching and educating people and scientific research results, but also in the implicit indicator of the tutor's post examination, such as the tutor's personality quality, innovative consciousness, practical ability, knowledge transfer ability, and interpersonal communication ability and so on. (3) To collect and arrange the original sample data. Generally, questionnaires, expert interviews, literature review and other methods are used to collect the original data samples. (4) To confirm the competency characteristic factors of innovative entrepreneurship tutor: Through gathering the expert interview and summarizing, the frequency and the scores of the competency characteristic factors are summed up, and the explicit and invisible indicators of the competency characteristics of the innovative entrepreneurship tutor are extracted. (5) To construct the competency model of the innovative entrepreneurship tutor. The author collects relevant data and analyzes to build competency model. After consulting a large number of literatures, no specific research on the competency model of innovative entrepreneurship tutors in application-oriented undergraduate colleges has been found, and the common reference is the iceberg model.

B. The Method of Constructing Competency Model of Innovative Entrepreneurship Tutor

This paper aims at the personalized characteristics of the innovative entrepreneurship tutors in the application-oriented undergraduate universities. It mainly collect, analyze and extract 32 corresponding competency characteristic factors of innovative entrepreneurship tutor as shown in "Table I" by means of literature research and expert interviews, and then compiles the extracted competency characteristics of innovative entrepreneurship tutor into a questionnaire, which requires respondents to rate the importance of each characteristic factor by using the number 1 ~ 5. 1 indicates very unimportant, and 5 indicates very important.

TABLE I. COMPETENCY CHARACTERISTIC FACTORS OF INNOVATIVE ENTREPRENEURSHIP TUTOR IN APPLICATION-ORIENTED UNDERGRADUATE UNIVERSITIES

competency characteristic factor
Strong professional knowledge, curriculum design, Language expression skills and teaching skills, Paying attention to professional ethics education, Strong scientific research ability, Inspiring students to think, application ability of multimedia technology, stimulating lively atmosphere of class, Professional practical skills, practical experience of enterprises, rich social experience, applied Technology Research and Social Services, grasping industry trends, Being good at contacting school and enterprise cooperation, Strong strain ability, being good at solving problems, dedication, sense of responsibility, Respect and care for students, fair and just, integrity, being good at listening to students' views and feedback, achievement motivation, self-confidence, independent thinking, creative, being good at learning, summary and reflection, good attitude, outlook on life, world outlook, values, coordination and communication, teamwork, establishment and maintenance of social relations, good emotional control and self-regulation, good teaching evaluation

A sample of 50 innovative entrepreneurship tutors from application-oriented universities in Fujian Province is selected as the research object. In this survey, 50 questionnaires are sent out, and 50 valid questionnaires are collected. The rate of recovery and the effective rate of the questionnaires are all 100%. The subjects are mainly young and middle-aged tutors, some of them are full-time teachers who are engaged in the research and practice of innovative entrepreneurship teaching, while some of them are part-time tutors who have the experience of entrepreneurship, venture capital or business management practice, and have strong representativeness. The details are shown in "Table II".

TABLE II. DISTRIBUTION OF OVERALL SAMPLE CHARACTERISTIC

order number	variables	category	frequency	ratio
1	identity	teacher	28	56%
		entrepreneur	16	32%
		business manager	6	12%
2	gender	male	27	54%
		female	23	46%
3	age	under 20	0	0
		20-30	16	32%
		31-40	26	52%
		41-50	8	16%
		over 50	0	0

IV. CONSTRUCTION OF THE COMPETENCY MODEL OF INNOVATIVE ENTREPRENEURSHIP TUTOR

A. Descriptive Statistics

Descriptive statistics is usually the first step of statistical analysis. First, descriptive statistics analysis of average value, standard deviation, skewness, and kurtosis is made to the

variable indexes of the sample data. [4] Rex B. Kline points out in "Principles and Practice of Structural Equation Modeling" that if the absolute value of the skewness of the data sample is less than 3 and the absolute value of the kurtosis is less than 10, then the data sample basically conforms to the normal distribution. In this paper, SPSS 24.0 is used to make descriptive statistics to the data sample, and the results are shown in "Table III".

TABLE III.   DESCRIPTIVE STATISTICS OF COMPETENCY FACTOR VARIABLES

Descriptive Statistics							
	number of cases	mean value	standard deviation	skewness		kurtosis	
	statistics	statistics	statistics	statistics	standard error	statistics	standard error
T1: solid professional knowledge	50	4.68	0.587	-1.699	0.337	1.943	0.662
T2: Language expression skills and teaching skills	50	4.68	0.587	-1.699	0.337	1.943	0.662
T3: application ability of multimedia technology	50	4.22	0.954	-1.199	0.337	1.295	0.662
T4: Paying attention to professional ethics education	50	4.76	0.625	-2.402	0.337	4.198	0.662
T5: Inspiring students to think	50	4.76	0.591	-2.366	0.337	4.338	0.662
T6: stimulating lively atmosphere of class	50	4.54	0.762	-1.584	0.337	1.752	0.662
T7: Strong scientific research ability	50	3.88	0.94	-0.674	0.337	0.462	0.662
T8: curriculum design	50	4.4	0.857	-1.904	0.337	4.602	0.662
T9: being good at learning, summary and reflection	50	4.64	0.663	-2.076	0.337	4.64	0.662
T10: practical experience of enterprises	50	4.46	0.813	-1.999	0.337	5.487	0.662
T11: rich social experience	50	4.38	0.855	-1.653	0.337	3.588	0.662
T12: establishment and maintenance of social relations	50	4.28	0.858	-1.595	0.337	3.607	0.662
T13: grasping industry trends	50	4.64	0.598	-1.466	0.337	1.192	0.662
T14: Being good at contacting school and enterprise cooperation	50	4.44	0.733	-0.918	0.337	-0.516	0.662
T15: Strong strain ability, being good at solving problems	50	4.64	0.631	-2.079	0.337	5.322	0.662
T16: dedication	50	4.74	0.487	-1.667	0.337	1.991	0.662
T17: sense of responsibility	50	4.76	0.476	-1.829	0.337	2.657	0.662
T18: Respect and care for students	50	4.62	0.753	-1.922	0.337	2.781	0.662
T19: fair and just	50	4.68	0.653	-2.317	0.337	5.68	0.662
T20: integrity	50	4.56	0.787	-2.434	0.337	7.702	0.662
T21: being good at listening to students' views and feedback	50	4.8	0.495	-2.526	0.337	5.854	0.662
T22: achievement motivation	50	4.22	0.864	-1.242	0.337	2.329	0.662
T23: independent thinking, and creative	50	4.68	0.621	-2.332	0.337	6.486	0.662
T24: self-confidence	50	4.76	0.476	-1.829	0.337	2.657	0.662
T25: Professional practical skills	50	4.84	0.37	-1.913	0.337	1.726	0.662
T26: good attitude	50	4.74	0.527	-1.958	0.337	3.14	0.662
T27: Outlook on life, world outlook, values.	50	4.56	0.812	-2.344	0.337	6.701	0.662
T28: coordination and communication	50	4.74	0.527	-1.958	0.337	3.14	0.662
T29: teamwork	50	4.74	0.527	-1.958	0.337	3.14	0.662
T30: applied Technology Research and Social Services	50	4.48	0.789	-2.141	0.337	6.59	0.662
T31: good emotional control and self-regulation	50	4.58	0.609	-1.165	0.337	0.391	0.662
T32: good teaching evaluation	50	4.24	0.797	-0.718	0.337	-0.248	0.662
number of valid cases (in column)	50						

According to the descriptive statistics, it can be seen that the absolute value of the skewness of data sample is less than 3, and the absolute value of the kurtosis is less than 10, which is in line with the requirements of normal distribution, and suitable for further analysis.

B. Factor Analysis

Factor analysis is a statistical method to cluster the most representative variables from many variables according to their correlation. The purpose of factor analysis is to reflect the majority of information of the original data with fewer factors. In this paper, KMO and Bartlett test are used to test the data sample for factor analysis to examine whether the data sample is suitable for factor analysis. The results are shown in "Table IV"

TABLE IV.   RESULTS OF KMO AND BARTLETT TEST

measure of KMO sample adequacy		0.722
sphericity test of Bartlett	approximate chi-square	1237.628
	degree of freedom	496
	significance	.000

As can be seen from the above table, the value of KMO is 0.722, which is greater than 0.7, showing that the variables have greater intercommunity. The approximate value of Bartlett test is 1237.628, and the significance is 0.000, less than 0.01, which indicated that the variable has correlation.

In order to further distinguish the coefficient in the factor load matrix and make it more significant, the orthogonal rotation of the maximum variance is chosen to do the principal component analysis, and analysis and integration are made to the original factor. The results show that the rotation tends to converge after nine iterations and 5 common factors are extracted according to the eigenvalues

greater than 1 in "Table V". "Table VI" reflects the variance

contribution of the five common factors.

TABLE V.   Factor Categorization Table of Competency Characteristics

common factor 1		common factor 2		common factor 3		common factor 4		common factor 5	
topic	load	topic	load	topic	load	topic	load	topic	load
T4	0.793	T16	0.734	T7	0.601	T10	0.780	T1	0.737
T6	0.537	T17	0.661	T9	0.688	T11	0.621	T2	0.534
T8	0.743	T20	0.476	T23	0.605	T13	0.595	T3	0.594
T12	0.630	T21	0.738	T28	0.663	T14	0.686	T5	0.490
T18	0.831	T22	0.461	T30	0.707	T15	0.631	T32	0.658
T19	0.805	T24	0.548			T25	0.503		
T29	0.562	T26	0.612						
T31	0.591	T27	0.601						

From "Table V", it can be seen that the distribution of the five common factors after the maximum rotation of variance is more balanced and the structure validity is better.

TABLE VI.   Eigenvalues of Common Factors and Variance Contribution Rate

common factor	eigenvalue	Variance contribution rate (%)	Cumulative contribution rate (%)
1	5.247	16.398	16.398
2	4.463	13.947	30.345
3	4.202	13.131	43.476
4	4.177	13.053	56.529
5	2.655	8.297	64.826

"Table VI" reflects the explanation situation of the five common factors after rotation to the original variance: the variance contribution rate of the common factor 1 is 16.398%, the variance contribution rate of the common factor 5 is 8.297%, and the cumulative variance contribution rate of the 5 common factors 5 is 64.826%, indicating that the extracted five common factors reflect 64.826% information of the original variable, which is more representative.

Finally, the feature classes of common factors are identified and named, and the competency factor hierarchical model is obtained as shown in "Table VII".

TABLE VII.   Competency Factor Structure Model of Innovative Entrepreneurship Tutor in Application-oriented Universities

Competency factor	competency characteristic factor
teaching influence	Paying attention to professional ethics education, stimulating classroom atmosphere, curriculum design, establishment and maintenance of social relationship, respect and care for students, fair and just, team cooperation, and being good at emotional control and self-regulation
personality accomplishment	Dedication, responsibility, integrity and honesty, being good at listening to students' opinions and feedback, achievement motivation, self-confidence, good mentality, outlook on life, world outlook, and values
scientific research accomplishment	Strong scientific research ability, independent thinking, creative, being good at learning, summary and reflection, coordination and communication, and applied technology research and social services
practical accomplishment	Enterprise practical experience, rich social experience, professional practical skills, grasping industry trends, being good at connecting school-enterprise cooperation, strong strain ability, and being good at solving problems
teaching accomplishment	Good teaching evaluation, solid professional knowledge, language expression skills and teaching skills, multimedia technology application ability, and inspiring students to think

C. Reliability Analysis

Reliability analysis is also called analysis of reliability. In order to test the internal consistency of variable data, the reliability coefficient method of Cronbach α is used to test the reliability of each common factor. The results are shown in "Table VIII".

TABLE VIII.   Reliability Analysis of Common Factor

common factor	number of items	reliability coefficient of Cronbach α
teaching influence	8	0.904
personality accomplishment	8	0.863
scientific research accomplishment	5	0.839
practical accomplishment	6	0.830
teaching accomplishment	5	0.789

From "Table VIII", it can be seen that the reliability coefficient of Cronbach α of each competency factor is over 0.7, which indicates that the internal measurement structure of the data sample is good and the reliability is higher.

D. Determining the Weight of Competency Characteristic Factor

The weights of the common factors are calculated by the mean value of the original variables of the subordinate factors of the common factors and ordered in descending order. The corresponding weights of the subfactors are calculated by the same method. The results are shown in "Table IX".

TABLE IX. WEIGHTS OF COMPETENCY CHARACTERISTIC

common factor	weight	contouring subfactor	weight
personality accomplishment	20.36%	being good at listening to students' views and feedback	12.92%
		sense of responsibility	12.82%
		self-confidence	12.82%
		dedication	12.76%
		good attitude	12.76%
		Integrity	12.28%
		Outlook on life, world outlook, values	12.28%
		achievement motivation	11.36%
teaching influence	20.10%	Paying attention to professional ethics education	13.01%
		teamwork	12.95%
		fair and justice	12.79%
		Respect and care for students	12.62%
		good emotional control and self-regulation	12.51%
		stimulating lively atmosphere of class	12.40%
		curriculum design	12.02%
		establishment and maintenance of social relations	11.69%
practical accomplishment	20.05%	Professional practical skills	17.66%
		Strong strain ability, being good at solving problems	16.93%
		grasping industry trends	16.93%
		practical experience in enterprises	16.28%
		Being good at contacting school and enterprise cooperation	16.20%
		rich social experience	15.99%
teaching accomplishment	19.83%	Inspiring students to think	21.08%
		solid professional knowledge	20.73%
		Language expression skills and teaching skills	20.73%
		good teaching evaluation	18.78%
		application ability of multimedia technology	18.69%
scientific research accomplishment	19.66%	coordination and communication	21.14%
		independent thinking, and creative	20.87%
		being good at learning, summary and reflection	20.70%
		applied Technology Research and Social Services	19.98%
		Strong scientific research ability	17.31%

From "Table IX", it can be seen that the factors that influence the competence characteristics of innovative entrepreneurship tutor in application-oriented undergraduate universities are personality accomplishment (20.36%), teaching influence (20.10%), practice accomplishment (20.05%), teaching accomplishment (19.83%) and scientific research accomplishment (19.66%) in order of weight.

E. Induction of Competency Model of Innovative Entrepreneurship Tutor in Application-oriented Colleges

Through the empirical analysis above, five main characteristics factors of the competence of innovative entrepreneurship tutors in application-oriented universities are obtained, including personality accomplishment, teaching influence, practice accomplishment, teaching accomplishment and scientific research accomplishment, and the corresponding weights of each characteristic factor are determined. From this the author concludes and constructs the iceberg model of the competence characteristics of innovative entrepreneurship tutor in application-oriented universities in "Fig. 1".
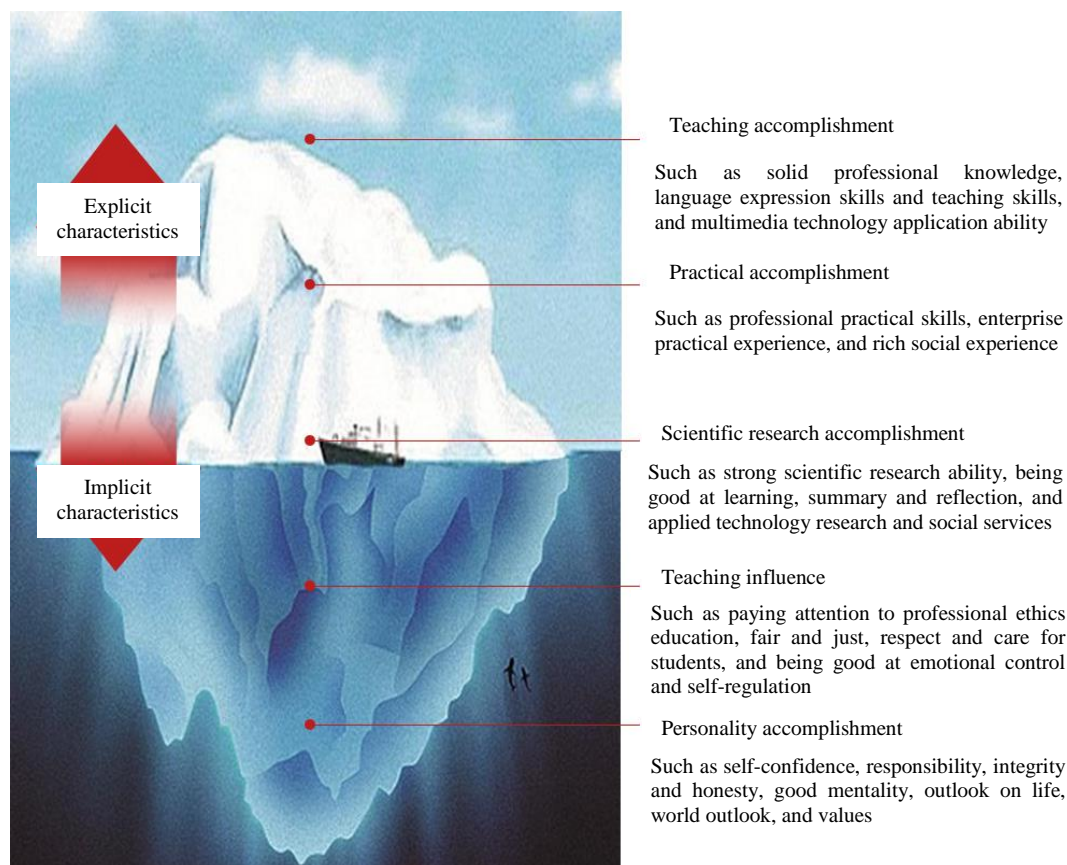
Fig. 1. Iceberg model.

David C. McClelland, an American psychologist, constructs the "iceberg model". He believes that the human quality is like an iceberg, and that the part floating on the sea level is often presented in people's view, which is easy to be valued, so it is called dominant quality while the part hidden below sea level is easily ignored and is therefore referred to as implicit quality. [5]The explicit qualities of innovative entrepreneurship tutor include the exterior appearance of teaching accomplishment, practice accomplishment and scientific research accomplishment, which are easy to be evaluated and measured, and can be easily changed and promoted through training. The implicit quality includes the inner quality such as teaching influence and personality quality, which is inherent and difficult to evaluate and measure, but it plays a key role in the tutor's behavior orientation and teaching effect.

V. CONCLUSION

A. Selection of Innovative Entrepreneurship Tutor

There is a serious shortage of teachers' resources in the existing entrepreneurship and innovation tutors in application-oriented universities. The structure of the faculty is not reasonable, so it is difficult to meet the current development needs of innovation and entrepreneurship education in colleges and universities and restricts the development of innovative entrepreneurship education to a deeper level. Therefore, the construction of entrepreneurship

and innovation tutors in application-oriented universities should actively integrate the teachers' resources inside and outside the colleges and universities to further optimize the structure of teacher staff, evaluate and select the tutor's competency quality according to the competency model, and establish entrepreneurship and innovation tutor teachers, and promote the quality of entrepreneurship and innovation tutor teachers to continuously improve, to make it adapt to the needs of the development of application-oriented undergraduate education. Only when the quality of tutor team has been improved in an all-round way, can the effect of university innovation and entrepreneurship education be guaranteed, to achieve the greatest value of high-level application-oriented personnel training.

B. Evaluation and Assessment of Innovative Entrepreneurship Tutor

At present, the innovation and entrepreneurship education in China is still in the exploration stage. Innovative entrepreneurship tutor is an Important Link in entrepreneurship and innovation, but the research on the evaluation and assessment system construction of entrepreneurship and innovation tutors is relatively few. Often there are problems such as single evaluation indicator and insufficient effectiveness of the assessment system. The comprehensiveness and fairness of the assessment are questioned, and the result of the examination can neither accurately reflect the shortcomings of the tutor in terms of

ability and quality, nor give scientific guidance in the direction of capacity enhancement. [6]The competency model of innovative entrepreneurship tutor can give scientific basis for university administrators to assess the comprehensive quality of mentors. It can reflect the core index of the construction of the tutor team more comprehensively and effectively, change the performance orientation, and further develop the potential of the tutor, so as to guide and motivate the entrepreneurship and innovation tutor to balance and improve their competency quality, and make it adapt to the requirements of application-oriented undergraduate education to the competency of the innovative entrepreneurship tutor.

C. Training of Innovative Entrepreneurship Tutor

At present, the teacher training seldom does the training demand research beforehand, which leads to the final training effect and the training efficiency are greatly reduced. The application of competency model can not only clearly evaluate the cognition structure and ability level of innovative entrepreneurship tutor, but also help to determine the focus of tutors' training, formulate tutors' training plan and ensure the effect of tutors' training. It can also identify the shortcomings in the ability and quality of innovative entrepreneurship tutor through the competency model. Therefore, according to the competency model, the university management department can make corresponding dynamic adjustment to the tutor's training goal, which is conducive to designing the training content more scientifically, so that the tutor can improve the corresponding competency quality and meet the post requirement after receiving the targeted training.

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