



An Empirical Study on Entrepreneurial Education Competency of Young College Teachers Based on K-means Clustering Algorithm

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Abstract. Innovation and entrepreneurship education is an important part of activating students' innovative thinking and helping them successfully implement entrepreneurial behavior. In order to implement and promote the reform of innovation and entrepreneurship education in Colleges and universities, it is necessary to study the competency of innovation and entrepreneurship education teachers. This study uses the literature research method to sort out the research status of innovation and entrepreneurship education teachers at home and abroad. This paper takes the innovative and entrepreneurial teachers in Hebei Province as the research object, analyzes the composition, current situation and existing problems of the competency of innovative and entrepreneurial teachers in Hebei Province from the theoretical and empirical levels, and puts forward some countermeasures and suggestions to improve the competitiveness of teachers. Firstly, the samples in the dataset sample space are regarded as k-nearest neighbors, and the samples in each neighborhood space are averaged to replace the original samples to form a new feature space. At the same time, after the formation of a new feature space, in order to increase the discrimination between samples, K-means clustering is used in the original feature space, the clustering center of each sample is merged into the new feature space, and the elbow method is used to determine the K value in the k-means.

Keywords: K-means · Innovation and entrepreneurship education · Teacher competency · Structural model

1 Introduction

With the progress of Internet technology and the popularization of computers, especially the rapid improvement of mobile network in recent years, the data obtained by human beings from various ways grows exponentially, and these data are often disordered. To obtain useful information from it means that the consumption of time and energy is also exponential growth. Therefore, how to retrieve effective information from big data in a short time is an important part of computer technology research and development [1]. The research of artificial intelligence provides a new way to solve problems for human

beings. As one of the core of artificial intelligence, machine learning obtains further learning by collecting human activity data, and then uses computers to simulate the same behavior as human beings as possible, which greatly reduces the time and energy spent on some repetitive meaningless labor.

The research on Teachers' competence in innovation and entrepreneurship education is a realistic research topic in the field of teacher research and even education research. With the attention and support of the state on innovation and entrepreneurship education, innovation and entrepreneurship teachers, as the main body of teaching implementation, are highly expected. Therefore, it is of theoretical and practical significance to study the composition of teachers' competence and analyze the current situation of teachers' competence in innovation and entrepreneurship education.

2 Improved GLOCAL Algorithm Based on K-means

2.1 Global and Local Correlations

Tag relevance is the key to multi label learning framework. In order to standardize the model, label association is used. The correlation of global and local tags may coexist. In order to combine the two, the label manifold regularization term is introduced. The basic idea of global manifold regularization is obtained from the example level Manifold Regularization optimization. Specifically, the higher the positive correlation between the two tags, the closer the corresponding classifier output is, and vice versa [2–5]. In other words, the positive correlation label will make the corresponding classifier output similar, while the negative correlation label will make the corresponding output result not similar.

Similar to the example level manifold regularization term, label Manifold Regularization can be defined as:

$$\sum_{i,j} [S_0]_{i,j} \|f_{i,:} - f_{j,:}\|_2^2 \quad (1)$$

Where S_0 $l \times l$ global label correlation matrix.

2.2 Tag Relevance

The success of label Manifold Regularization depends on a good tag correlation matrix. In the correlation coefficient between tags is usually calculated by cosine distance. As shown in Fig. 1. However, there are only a few positive examples in some training sets, which results in noise in the estimation. When the label is missing, the observed label distribution is very different from the real label distribution, which will cause errors. In this algorithm, we learn the Laplacian matrix directly without specifying the correlation measure or labeling the correlation matrix.

The standard regularization formula is used:

$$R(U, V, W) = \|U\|_F^2 + \|V\|_F^2 + \|W\|_F^2 \quad (2)$$

In the original label clustering, determine the number of clusters K , the algorithm in this chapter obtains the K value by comparing the experimental results in the iterative process.

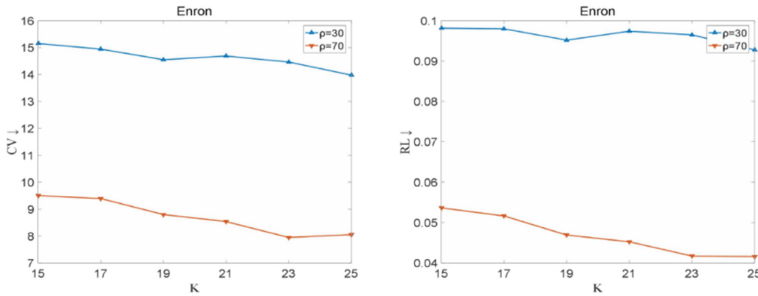


Fig. 1. Clustering number k of Enron dataset

3 Analysis on the Problems and Causes of Teachers' Competence in Innovation and Entrepreneurship Education

As a long-term systematic project, innovation and entrepreneurship education needs to continuously inject a lot of human and material resources to promote its development. In this systematic project, the construction of the capacity of the innovative and entrepreneurial teachers is very important [6]. The “basic requirements for entrepreneurship education and teaching in general undergraduate schools” issued by the Ministry of education clearly points out that colleges and universities should create conditions to set up entrepreneurship basic compulsory courses for all students, and support colleges and universities with conditions to develop and open elective courses (including practical courses) of entrepreneurship education according to the school running orientation, personnel training specifications and discipline characteristics. Referring to the ratio of innovation and entrepreneurship teachers and students in Colleges and universities, the teacher–student ratio between full-time teachers and students should not be less than 1:500. Based on the actual number of innovation and entrepreneurship education teachers participating in the questionnaire survey and the actual teaching situation mentioned by teachers, the author confirms that there is a shortage of innovation and entrepreneurship education teachers in some colleges and universities, which is difficult to meet the teaching needs. It is far from satisfying the demand of all teachers to set up the course of entrepreneurship.

3.1 The Teaching Staff Is Younger, and Most of Them Are Novice Teachers

Whether from the perspective of academic career characteristics, echelon metabolism, or compared with the structure of university teachers in developed countries, the middle-aged teachers account for the largest proportion of good university teachers, while the

proportion of young teachers and old teachers is relatively small, and the two are basically symmetrical. The formation of a standard or similar normal distribution structure, innovation and entrepreneurship teachers as a part of the university teacher group is no exception [7–10]. According to the survey results of this study, the teaching team of innovation and entrepreneurship education is mainly composed of young teachers aged 40 and below, and most of the teachers have been on the job for less than five years, and novice teachers are the main teachers. Young teachers and novice teachers as a group of teachers who have just entered the new post, the sudden change of their roles makes this group have the pleasure of being a new teacher and can put most of their efforts into their work. However, teachers in this stage need to undergo a period of transformation from adaptation to stability, development and maturity. In the process of transformation, teachers' professional ideal, external factors of universities and society will play or promote or hinder the competency of teachers.

3.2 Professional Identity Is Not High, Lack of Subjective Initiative

Professional identity refers to the subjective psychological feeling that teachers can accept their profession from the bottom of their heart, and can make positive perception and positive evaluation on all aspects of teachers' occupation, so as to be willing to engage in the teacher's occupation for a long time [4]. It affects teachers' working enthusiasm and enthusiasm. Teachers' professional recognition is the basis of improving teachers' competence. Generally speaking, teachers with high professional identity can feel the pleasure of post work from the bottom of their heart and have a sense of achievement and satisfaction for the post, so as to seek help from various aspects to improve their competence. According to the results of the questionnaire, nearly 90% of the teachers think that innovation and entrepreneurship education is very important to the development of colleges and universities and the growth of students. Most of the teachers are enthusiastic and determined to strive for the cause of mass entrepreneurship and entrepreneurship education when they first enter the post of innovation and entrepreneurship education [11]. However, the score of teachers' professional identity is generally low. Some teachers even have job burnout and have the intention to change jobs. Liu Ling, a scholar, has shown that professional identity can negatively predict job burnout. The lower the level of teachers' professional identity, the greater the possibility of teachers' job burnout.

4 Simulation Analysis

We use the data obtained in the third part for simulation analysis, as shown in Fig. 2 and Fig. 3. From Fig. 2 and Fig. 3, we can know that when we use the k-means algorithm, after the set iteration, the system gradually returns to the normal level, which fully shows that the teaching and innovation level of young teachers is improving year by year. From Fig. 3, we can also see this trend, when young teachers are young teachers this trend is more obvious in old age.

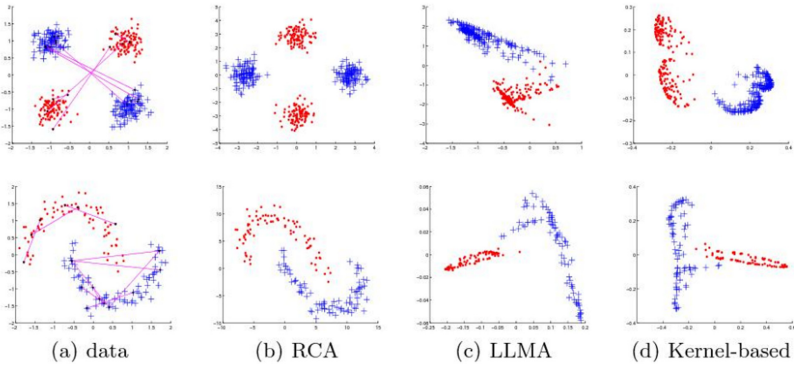


Fig. 2. Comparison results of several algorithms

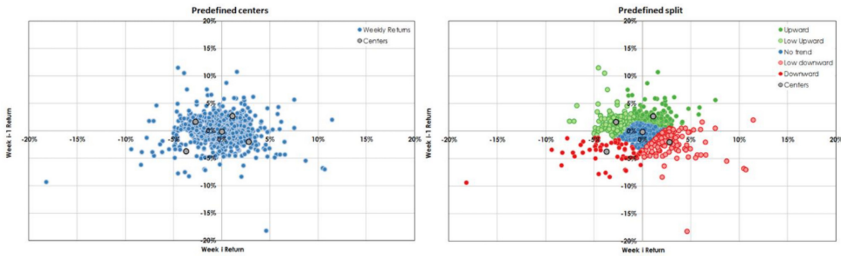


Fig. 3. Simulation results with K-means

5 Why Should We Vigorously Promote the Continuing Education of Young Teachers in Higher Vocational Colleges

5.1 It Is the Inevitable Choice to Improve the Quality of Young Teachers in Higher Vocational Colleges

Every front-line teacher hopes to become a teacher with experience, quality and ability, and get the respect and love of students. However, everyone knows that this can not be achieved in a short time, so we need to focus on our own educational ideas, In this way, the necessity of continuing education is highlighted. With the development of society, we have entered an era of information technology. Under the background of big data manipulation, the update of information is faster than before. I don't know how many times [12–14]. If we keep up with the rapid pace of development, all we can do is to constantly update our knowledge reserves and improve our professional quality. I believe that it's never too old to learn an old saying. It can be seen that vigorously promoting the continuing education of young teachers in higher vocational colleges is the inevitable choice to improve their own quality and realize their own sustainable development.

5.2 On the Development of Higher Vocational Education in the Context of Innovation and Entrepreneurship

Today, with the steady development of education, the development of higher vocational education has attracted much attention. At the time of the rising tide of the new curriculum reform, higher vocational education, as an important part of the education system, has been widely concerned. Due to the direct transportation of talents from home and abroad, the education requirements at this stage are particularly important. This concern greatly improves the requirements for young teachers in higher vocational colleges. They should not only have excellent theoretical experience, but also take into account the practical operation of skilled teaching level [15]. They should not only have a wide range of knowledge, but also have high quality and moral cultivation. This shows the development of Higher Vocational Education Based on the background of innovation and entrepreneurship the objective requirement of higher vocational education is to continuously carry out continuing education for young teachers in order to meet the needs of development.

6 How to Carry Out the Continuing Education of Young Teachers in Higher Vocational Colleges

6.1 Strengthen School Training and Improve the Continuing Education System of Young Teachers in Higher Vocational Colleges

To strengthen the training of young teachers in higher vocational colleges, this training should be carried out by the school with the goal of improving teachers' teaching ability and quality level, aiming at the further education and sublimation of teachers' knowledge level, teaching skills and moral concept. For example, it is necessary to set up a discipline based group for young teachers' continuing education, which is led by excellent old teachers to share, summarize and teach, form a good mentoring system, and pay attention to the psychological dynamics and skills improvement of young teachers anytime and anywhere. As shown in Fig. 4. We should hold a variety of professional education seminars to promote the interaction between young teachers and old teachers, and ultimately improve their own quality.

6.2 Increase the Opportunities of Off Campus Training and Make a Strong Supplement to Continuing Education

With the rapid development of the times, in order to make young teachers meet the needs of the development of knowledge education to the greatest extent, it is necessary to create opportunities to go out for further study. Only in this way can we improve the continuing education of young teachers in higher vocational colleges mo [16–18]. A model of white plan application is to select and evaluate excellent teachers regularly to work in relevant universities or higher levels for a period of time. There are two advantages in this way. First, it can form a benign competitive physique among teachers, so that teachers can pay

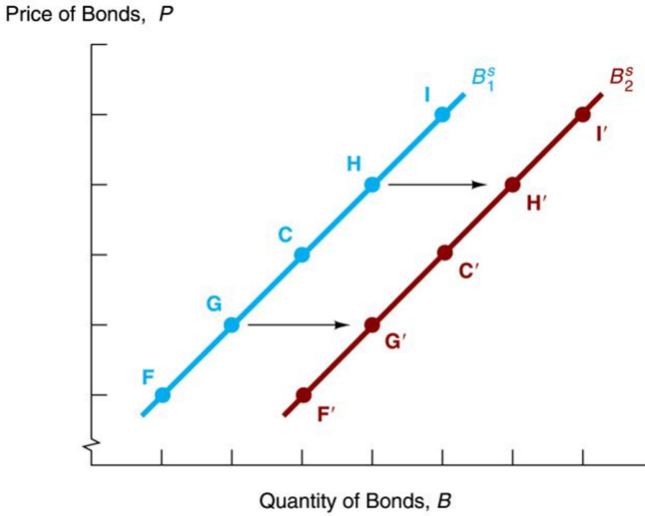


Fig. 4. Indicators of education system

more attention to their own quality and teaching skills, and get the opportunity of further study. Second, it can effectively carry out continuous education for young teachers in Higher Vocational Colleges in the process of training, so as to better help young teachers grow up.

6.3 Strengthen the Depth of Enterprise Investigation and Research

With the characteristics of education, young teachers in higher vocational colleges can conduct more in-depth investigation and Research on a related enterprise, so as to fully understand the potential development direction of the industry and the demand for talents in the direction of innovation and entrepreneurship [19]. Only in this way can we know ourselves and the other strategically, can we grasp the essence of teaching in the process of international teaching, and cultivate high-quality talents for enterprises and society, which is also an alternative way of continuing education for young teachers in higher vocational colleges.

7 Entrepreneurship Education in the Field of American Basic Education

7.1 The Origin of Entrepreneurship Education in American Basic Education

When it comes to entrepreneurship education in the field of basic education in the United States, we must talk about Horace Moses, an American businessman, and his junior achievement. Since its establishment in 1919, the youth business association has been playing an important role in American education. Horace Moses believes that high school students know very little about the actual situation of business. Business theory

knowledge learned from books is only a starting point, and practical experience is much more important than book knowledge. So Moses volunteered to help curious students set up their own companies, conduct market surveys, select commodities, determine manufacturing plans, price commodities, and then sell them [20, 21]. At the same time, they set up accounts and calculate the company's profit and loss. The goods they deal in are very simple, but no matter the size of the goods, all business activities have to take certain risks. In 1919, few people could have imagined that Moses' idea of teaching business practice to students in his spare time would have such a huge repercussion in the United States. It is from the 1920s that there has been a ten-year commercial boom in the history of the United States. The education of youth business community has contributed a lot. Since then, business people throughout the United States have volunteered to organize youth business community education in schools in their communities, even during the economic crisis and war in the 1930s.

7.2 Entrepreneurship Education Program in the Field of Basic Education

In primary schools (6–11 years old), local businessmen teach basic business knowledge, such as business organization, business management, production and marketing. The total class hours are 4 h. 2. In junior high school (12–13 years old), there is a business course once a week to introduce students to more complex contents, such as supply and demand, corporate finance, global market, labor market and banking services for individuals [22]. In senior high school (14–18 years old), practical economics is taught for one semester with comprehensive contents. In addition to full-time teachers, there are also business volunteers who teach economic system once a week and help students start and run their own companies. Facing the wave of younger entrepreneurs, the United States began to implement the “financial literacy 2001 plan” in January 1998. It popularized “advanced education” in finance, investment and financing, marketing, business and other aspects to middle school students, and actively cultivated “future managers”. Young business community entrepreneurship education enables children to receive free entrepreneurship education. Entrepreneurs and students share the joy of success together, It will have a profound impact on children's life.

8 One of the Fastest Growing Areas of Entrepreneurship Education in the U.S. in the Early 1980s was Entrepreneurship Education

In American colleges and universities, entrepreneurship education has been a rapidly growing field since the early 1980s.

Entrepreneurship courses are very popular in Colleges and universities. In the United States, the number of business schools offering at least one entrepreneurship course increased from 210 in 1985 to 351 in 1991, with an increase of 67%. Since 2000, Harvard Business School has listed entrepreneurship as a compulsory course for MBA students in their second year. At present, 369 universities in the United States have offered at least one entrepreneurship course. Entrepreneurship courses are offered not only in business schools, but also in engineering schools, nursing schools and art schools. A study shows

that 37.6% of the universities surveyed offer entrepreneurship courses in undergraduate education, 23.7% offer entrepreneurship courses in postgraduate education, and 38.7% offer at least one entrepreneurship course in both undergraduate and postgraduate education. Some universities take entrepreneurship as a minor (second major), Some universities have taken it as a major, and some even set up entrepreneurship departments. 23.7% of universities offer entrepreneurship courses in graduate education, and 38.7% of universities offer at least one entrepreneurship course in both undergraduate and graduate education. Some universities take entrepreneurship as a minor (second major), some universities have taken it as a major, and some even set up entrepreneurship departments [23–25]. The teaching methods of entrepreneurship course in Colleges and universities, case teaching and entrepreneurship plan become the center of entrepreneurship teaching. The best way to learn is to apply the knowledge to practice. Therefore, teachers organize students to carry out entrepreneurial group activities. The students in the class are divided into several groups. Each group prepares a business plan, and then evaluates it collectively. The evaluation criteria are: (1) the novelty of the entrepreneurial plan; (2) the feasibility of the entrepreneurial plan; (3) the degree of the entrepreneurial team to make the best use of their talents.

9 Conclusion

The improvement of Internet technology in the direction of mobile terminal is more powerful. People can get the information they want at any time and anywhere. The diversity of access to information and the diversity of information content means that people no longer have enough time and energy to distinguish effective information from invalid information. The emergence of artificial intelligence is a good help to solve this dilemma. Through training the existing samples, we can simulate the similar working effect according to the characteristics of human extracting information, and machine learning is an important means of its research. The competency of innovation and entrepreneurship education teachers refers to the synthesis of various abilities and qualities which are necessary for the successful implementation of innovation and entrepreneurship education teaching behavior. Clarifying the composition and development status of teachers' competence in innovation and entrepreneurship education can promote the improvement of teachers' competence, urge university administrators to carry out education and teaching reform, and select and train teachers with more pertinence.

References

1. Zhou, Z.: Machine Learning. Tsinghua University Press, Beijing (2016)
2. Zhang, M.: A new multi label lazy learning algorithm. *Comput. Res. Dev.* **49**(11), 2271–2282 (2012)
3. Cao, S., Lei, J.: Report on the Development of Innovation and Entrepreneurship Education in Chinese Universities. Wanjian publishing company, Shenyang (2009)
4. Yang, X.: Research on College Students' Employment and Entrepreneurship Education. Economic Science Press, Beijing (2015)
5. Kan, Y., Zhan, T.: Research on curriculum style of higher vocational entrepreneurship education. *Sci. Technol. entrepreneurship monthly* **5** (2013)

6. Wu, J.: On the continuing education of young teachers. *Continuing Educ. Res.* **2**, 10–12 (2004)
7. Jing, W.: Problems to be solved in teachers' continuing education. *China Adult Educ.* **9**, 88–89 (2003)
8. Zhou, A.: On the continuing education of higher vocational teachers. *Higher Educ. Res.* **3**, 8–9 (2004)
9. Duan, D.: Exploring global competency training path. *China Soc. Sci. J.* 2021-03-17 (001)
10. Shao, W., Yu, L.: The path of improving the moral education competency of university teachers under the background of "Internet plus." *J. Heilongjiang Teachers Dev. College* **40**(03), 26–28 (2021)
11. Wang, Y.: Basic education teachers' competency and its promotion path under the background of smart education. *Pedagogy of Teachers*. Fu, H., Wang, Z.: Research on the competency promotion strategy of judicial social workers. *Leg. Syst. Soc.* **08**, 111–113 (2021)
12. Hong, X., Wei, Y., Ou, J.: Qualitative research on editorial literacy in the new media era. *Publishing Sci.* **29**(02), 32–41 (2021)
13. Wang, X., Zhang, Q., Kong, M., Zhang, Y.: Analysis on the quality of middle managers in Weihai area and discussion on the training methods. *Enterp. Reform Manage.* **05**, 96–97 (2021)
14. Yang, X., Xia, C., Wang, W., Zhang, J.: Research on the construction of power supply enterprise technical personnel training system based on competency model. *Enterp. Reform Manage.* **05**, 116–118 (2021)
15. Tian, W., Zhang, H., Geo, F., Li, J., Yu, K.: Enlightenment of civil aviation reform experience on training military pilots. *Trainer* **01**, 9–15 (2021)
16. Huang, S.: Research on the competency of college physical education teachers under the background of curriculum reform. *Hubei Sports Sci. Technol.* **40**(03), 279–282 (2021)
17. Chen, F.A.B.: The influence and enlightenment of Pisa evaluation on curriculum reform in the world. *Mod. Educ. Manage.* **03**, 108–113 (2021)
18. Zhu, Y.: Home school education, hand in hand. *Moral Educ. Primary Secondary Schools* **03**, 79 (2021)
19. Jin, J., Jiang, Y.: Analysis on the development process of enterprise internationalization talent training. *Mod. Bus. Ind.* **42**(10), 27–28 (2021)
20. Sun, C., Meng, X.: Global competency education for the future: review and reflection. *Chongqing Higher Education Research*: 1–18 [2021-04-11] <http://kns.cnki.net/kcms/detail/50.1028.G4.20210310.1825.007.html>
21. Lin, L., Li, Y.: Research on the application of diversified teaching evaluation methods in the practice teaching of community nursing. *J. Nurs. Educ.* **36**(05), 466–469 (2021)
22. Xia, Y., Wang, N., Yu, X., Che, Y.: Current situation and reform exploration of postgraduate training of obstetrics and gynecology. *China Continuing Med. Educ.* **13**(07), 3–6 (2021)
23. Hong, M.: The basic idea of the curriculum construction of school parent education. *Chinese J. Educ.* **44**(03), 14–18 (2021)
24. Cui, S., Li, W., Wang, S., Hongqing: canonical correlation analysis of thinking characteristics and implicit professional quality of preventive medicine students in Shandong province. *Med. Soc.* **34**(03), 60–63 (2021)
25. He, Q., Kang, Q.: The current situation, problems and Countermeasures of rural primary school teachers' teaching competence – based on the investigation and analysis of Jiangxi province. *Chinese J. Educ.* **03**, 82–86 (2021)