

# Analysis of the Quality Evaluation System of College Students' Entrepreneurship Education Based on 5G, Big Data and Artificial Intelligence

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**Abstract:** Many countries in the world use 5G technology to develop the future society and accelerate the strategic composition of 5G. Each generation of mobile network standards is designed to respond to changes in the use of mobile communications. The 5G network features high speed, large capacity, low latency and high reliability, which meet people's needs for the network and bring great convenience to people. With the improvement of information technology, all walks of life have developed rapidly, but the education industry lags behind in the process of informatization, and most of them still follow the past education methods. For the evaluation of teaching quality, it is also a simple evaluation based on the quality of students' test results or the evaluation of teachers. The data collection process is cumbersome, and such evaluations lack systematic and comprehensive. Nowadays, the hidden value of big data and artificial intelligence (AI for short) has gradually become the focus of attention of all walks of life, which can bring about better development opportunities for the education system to be more rationally reformed and entrepreneurship education for college students. The purpose of this paper is to use big data and AI technology to study the quality evaluation system of entrepreneurship education for college students. This paper distributed 300 questionnaires through online questionnaires, face-to-face surveys, and email surveys. Finally, 211 colleges, 985 colleges, college students' entrepreneurial enterprise internships, and participation in young entrepreneurs' associations were investigated. In the final survey, 220 valid questionnaires were collected. According to the calculation, the questionnaire has high reliability and validity. In the overall quality index of entrepreneurship in various dimensions of college students, the survival, growth dimension and the internal benefit dimension belong to the middle level, and the innovation dimension and the external benefit dimension belong to the middle and lower level. The average score of the overall quality of college students' entrepreneurship is 2.904, which is lower than 3 points, indicating that the overall quality of college students' entrepreneurship is low. The mean values of the question items of the innovation dimension and the external benefit dimension are 2.836 and 2.529 respectively. In addition, this paper analyzed individual factors according to the gender, personality, educational background, and average annual income of the survey respondents, and concluded that gender has nothing to do with entrepreneurial quality, but personality, educational background, and average annual income had a certain positive correlation with entrepreneurial quality. Therefore, this paper used big data and AI to evaluate the quality of college students' entrepreneurship education and achieves good research results.

**Keywords:** Entrepreneurship Education for College Students; Big Data; Artificial Intelligence; Questionnaire Survey Method; Quality Evaluation System; 5G Technology

## 1. Introduction

The nearly 15 years of educational reform has also brought about rapid development of China's education, trained a number of talents, and significantly improved the overall quality of the people. The generation of large amounts of data, known as big data, requires effective tools to manage this data. AI has become a powerful tool for processing big data, with recent breakthroughs in several areas of machine learning. At the same time, the information network has become larger and more complex, generating a large amount of runtime statistics such as traffic load, resource usage, etc. Emerging big data and AI technologies may include a series of new demands, new applications, and new scenarios in

terms of computing networks such as e-health, intelligent transportation systems (ITS), industrial Internet of Things (IIoT), and smart cities. Big data and AI-driven network technologies also provide a lot of help for discovering new features, characterizing user needs and system capabilities in network resource allocation, security and privacy, system architecture, modeling, and applications, and can even explore and solve big data and artificial intelligence problems of network technology in these fields.

5G network technology has had an unprecedented impact on all aspects of our daily life. Among many areas of our life, education is an important area affected by the latest technology. A lot of money has been invested in big data and AI-based entrepreneurship education programs for college students. However, there are few applications in practice. Early economic assessments help improve the decision-making of the analytics developers behind these solutions, aiming to increase the likelihood of successful implementation, but there is a lack of advice on their use. There are currently attempts to develop and apply a framework that combines best-practice methods of economic assessment with the development of analytics, thereby enabling developers to identify barriers to success and select analytics worthy of further investment. But inclusive innovation has yet to reach societal scale due to a deep-seated divide between wealth creation and social equity. At present, some people use food as an initial test bed, and propose a fusion innovation model to solve such challenges still faced by society in the 21st century, linking departments and disciplines around comprehensive goals on both sides of the socio-economic divide, in order to achieve the goal of wealth creation innovation. Consider its externalities in advance. The convergent innovation model is supported by two key enablers that combine advanced digital infrastructure with leading scientific knowledge on the drivers of human behavior in different contexts. However, the construction of the entrepreneurship education quality evaluation system is not perfect, and the actual effect of the proposed entrepreneurship model is not clear. In all eras of big data and AI, it is very necessary to improve the quality evaluation system of entrepreneurship education for college students. Therefore, improving the employability of college students is an important guarantee to promote the employment of college students and improve the quality of employment, as well as one of the important goals of higher education reform.

Regarding the development of entrepreneurship education for college students, many scholars have carried out related research on it. Among them, Elkuch A analyzed the obstacles to entrepreneurship of students and graduate students in the Held research method held in Rwanda through qualitative interviews and quantitative surveys and support. Elkuch A identified the lack of access to financial capital as a major problem and developed a reciprocal crowdfunding model to alleviate the problem. The concept of crowdfunding is disconnected from the online world and mutually beneficial, making it an effective option for funding African student entrepreneurship [1]. Nielsen S L researched the different aspects and tensions that occur in students' intra-student and contextual negotiation in the process of exploring the possible identities of entrepreneurs. It expanded the knowledge of how the university environment affects students' entrepreneurial processes from the perspective of multiple identities. This framework is the starting point for discussing the psychological processes and tensions associated with the construction of students' entrepreneurial identities, and what it means for entrepreneurship education [2]. Faisal U explored the scope of student inclusion in K-12 schools to address waste management. Students can convert earned points into skills to purchase educational products such as skill development tools, ICT applications, project kits, and more. It can also be used for some entrepreneurial programs in schools. Students are also familiar with e-commerce activities. Thus, the program develops students' entrepreneurial skills while providing environmental education [3]. Pruett M compared teacher and student perceptions and beliefs about entrepreneurial motivations and barriers and student aspirations to explore implications for entrepreneurship education (EE). The survey found significant differences between teachers and students in terms of entrepreneurial motivation and barriers, university environment and student aspirations. Pruett M articulated especially regarding students' self-confidence and perceptions of failure and risk [4]. These methods can indeed stimulate the entrepreneurial enthusiasm of some college students to a certain extent, but the effect of entrepreneurial guidance for college students is not ideal. It is also necessary to further improve the quality evaluation system of entrepreneurship education for college students.

In order to improve the quality evaluation system of entrepreneurship education for college students, some scholars have proposed methods that combine big data and AI technology. L Dube discussed the structure, methodology and development of AI platforms that support convergent innovation. Gather insights on consumer sentiment and behavioral drivers by analyzing user-generated content on social media platforms [5]. Bakker L proposed a framework to stimulate the development efficiency of big data analytics and AI-based solutions by selecting those analytical applications that are feasible and worth developing. For these applications, the results of early economic assessments can be used to guide investment decisions and identify key requirements [6]. Canales C outlined key principles of AI

for perioperative physicians and discusses the limitations and ethical challenges of the field [7]. Li J studied the deployment of big data and AI in network technology. Li J's topics range from big data and AI algorithms, models, network and system architecture to network architecture [8]. However, the effect of these methods on the evaluation of college students' entrepreneurship education is not ideal, so it needs to be further improved.

5G technology will trigger a major reform in the education ecology, and promote the personalized, accurate, intelligent and ubiquitous development of teaching. Today, on the basis of 5G, many emerging technologies will change the way of education, such as the use of AR/VR technology in distance education, which will generate a lot of video traffic. From the perspective of college students themselves, the employment situation of college students is not optimistic, which indicates that the employability of college graduates is low. In the employment competition in the talent market, they lack skills training and practical experience, and they do not have the skills and qualities required for recruitment. With the development of information technology, the previous methods can no longer meet the current environment. The innovation of this paper is that it proposes to use big data and AI technology to research and evaluate the quality of college students' entrepreneurship education, and to investigate college students' entrepreneurs in different colleges and universities by means of questionnaires, and to test the validity and reliability of the questionnaire.

## 2. Quality Evaluation Method of Entrepreneurship Education based on Big Data and AI

### 2.1 Entrepreneurship Education for College Students

#### (1) Research Status of Quality Evaluation of Entrepreneurship Education

College students' entrepreneurship has always been a problem that colleges and universities attach great importance to, because college students' entrepreneurship is not only faced with financial problems, but also interpersonal and technical problems, as shown in Figure 1. Over the years, countries have paid more and more attention to improving the development of the basic education quality evaluation system, especially developed countries are more representative. In the United Kingdom, unified education standards have been implemented since the 19th century, and the more influential "Qualifications and Curriculum Bureau" established in 1997 is to test the educational level uniformly by formulating various educational certificates. The PISA international evaluation project initiated by the most influential OECD (that is, the English abbreviation of the Organization for Economic Cooperation and Development), which is currently the most influential in the world, focuses on evaluating students' analytical ability, thought formation and lifelong learning. Ability is a comprehensive evaluation research project, which can find and analyze the hidden dangers of the country in education [9-10].

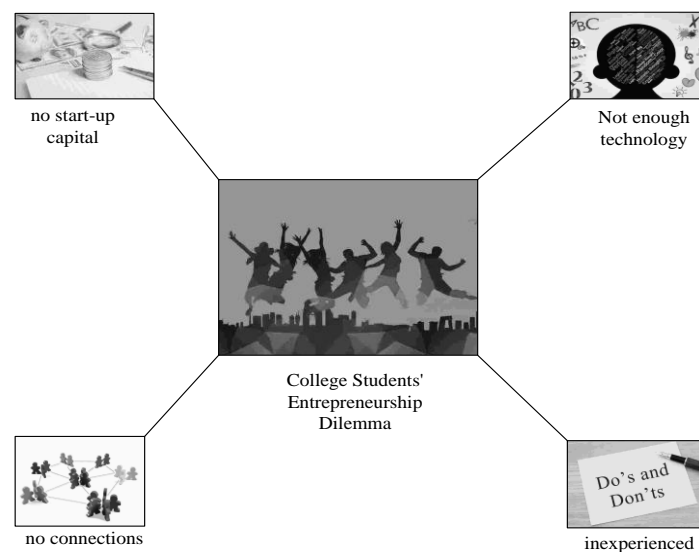


Figure 1: Current Situation of College Students' Entrepreneurship

At present, the relevant research methods of education quality evaluation and evaluation in academia mainly include: education quality evaluation and evaluation method based on fuzzy

comprehensive analysis method, DMT education quality evaluation and evaluation method, education quality evaluation method based on big data and AI. The research on education quality evaluation and evaluation methods is basically in its infancy in China [11-12]. Colleges and universities shoulder the responsibility of social development and talent training. The talent training objectives of colleges and universities should not only follow the principle of market supply and demand, but also consider the adaptability of education methods and social needs. Researching the methods of education quality evaluation and evaluation, and then developing an education quality evaluation system based on big data has great application prospects, which is very important for the education industry.

## (2) Research Significance of Entrepreneurship Education Quality Evaluation

We should pay attention to the importance and necessity of entrepreneurship education in colleges and universities, the training ways of entrepreneurship education, and the innovation of entrepreneurship education model. The exploration of the quality evaluation of entrepreneurship education can deepen the research on the entrepreneurship quality of college students. At present, the research on the entrepreneurial quality of college students is mostly limited to the general theoretical discussion of the status quo and problems, and corresponding countermeasures are put forward on this basis [13-14]. This paper intends to construct a comprehensive index system to measure and evaluate the current situation of college students' entrepreneurial quality, analyze its influencing factors in depth, and put forward specific countermeasures and suggestions accordingly, so as to make the research on college students' entrepreneurial quality more in-depth, scientific and rigorous. Secondly, it can enrich the content of entrepreneurship research [15]. The investigation of entrepreneurial quality in previous entrepreneurship research basically studies entrepreneurial performance under the framework of organizational performance, which is difficult to fully reflect the entrepreneurial process and nature. Focusing on the connotation of entrepreneurial quality, this paper constructs an operable index system to measure and evaluate the entrepreneurial quality of college students [16-17]. There are still many angles to explore in the empirical research on the impact of entrepreneurship education on college students' employability.

In addition, the research on the quality evaluation of entrepreneurship education is conducive to scientific evaluation of the quality of current mass entrepreneurial activities, and provides decision-making basis for all participants in entrepreneurial activities. In today's increasingly active mass entrepreneurial activities, entrepreneurial quality is particularly worthy of attention [18]. Scientific, comprehensive and in-depth measurement and evaluation of the entrepreneurial quality of college students is the basis for the decision-making of all participants in entrepreneurial activities. The evaluation index system of college students' entrepreneurial quality constructed in this paper reflects the process and essence of entrepreneurial activities, and is also suitable for the evaluation of the general public's entrepreneurial quality to respond to the above practical needs [19-20].

## (3) Contents of Quality Evaluation of Entrepreneurship Education

Contents of Quality Evaluation of Entrepreneurship Education: "Basic work ability, job seeking skills and professional skills, which are required for college students to find jobs and be competent for jobs. According to the influencing factors of education quality, such as school environment and conditions, teacher conditions, management level, educational activities and academic quality, etc, the results evaluation and process evaluation indicators are formed. The evaluation content is determined as follows: school-level evaluation content, including: teachers' classroom education plan and educational process; students' learning behavior and moral quality [21]; subject test and staged unified examination results and test paper answers; school curriculum plan and curriculum goal completion; teachers' structure; educational environment and school management; teachers' education process; students' learning behavior and moral quality; subject test and staged unified examination results and examination papers [22]. The construction of evaluation index system is the core element of evaluation, which is an organic whole composed of various evaluation indicators and evaluation standards at all levels, which is helpful for quantitative and qualitative analysis of education quality [23]. According to the evaluation content, this paper constructs an evaluation index system from four aspects: entrepreneurial team, employees, government and customers, as shown in Figure 2.

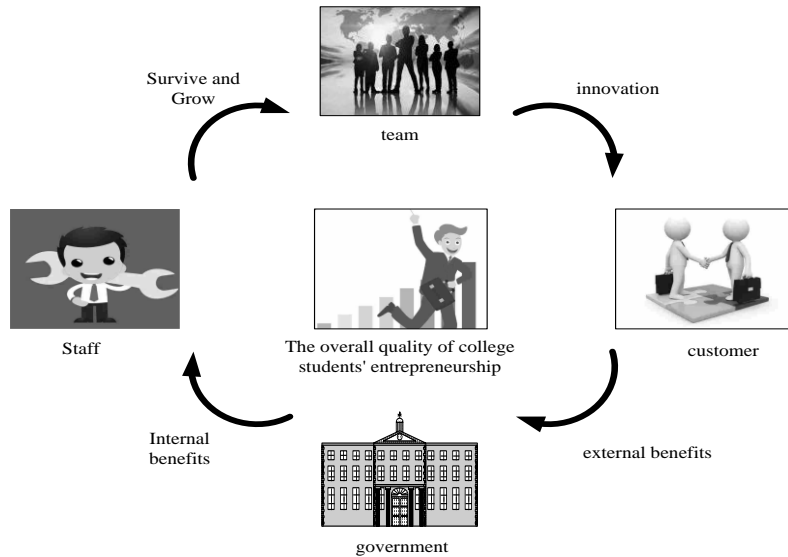


Figure 2: Dimensions of the evaluation indicators of college students' entrepreneurial quality

Taking college students' entrepreneurship education test scores and entrepreneurial performance as source data, a statistical analysis norm index is constructed to obtain characteristic data of test quality. The build metrics are shown in Tables 1 and 2:

Table 1: Educational indicators commonly used to evaluate scores

Code	Index	function
1	average	The ratio of the sum of a set of data to the amount of data. To illustrate the general level of the student or the class overall
2	standard mark standardized score	To determine the relative position of the analysis object in a group
3	mode	Represents the most frequent occurrence value in a set of data.
4	median	It reflects the general level of the group and is not easily affected by extreme values
5	Score segment	The distribution of a certain test can be analyzed to reflect the true level of the group
6	Hierarchical grade	Compared with the statistics of grades, this index can see the statistics of all levels more intuitively and make a more objective analysis of the class
7	position in a name list	The original scores of the candidates are arranged in the order from large to small, and the arrangement position is the ranking of the candidates in the current group, indicating the position of the candidates' scores in a certain group
8	Ranking frequency	Ranranking frequency indicates the frequency of each ranking in the current group

Table 2: Educational indicators commonly used to evaluate the difference ratio

Code	Index	function
9	standard deviation	To describe the discretized differences between the scores
10	coefficient of variation	When the mean difference between the two groups of data is large, and it is difficult to objectively reflect the difference, the difference coefficient is more real and accurate
11	skewness	When the mean difference between the two groups of data is large, and it is difficult to objectively reflect the difference, the difference coefficient is more real and accurate
12	kurtosis	The larger the kurtosis coefficient indicates that the data distribution is more gentle than the normal distribution, indicating a more uniform data distribution
13	percentage	Represents a number relative to the other in the hundreds

(4) Evaluation Methods of Education Quality

Education quality evaluation is the main work before the education quality evaluation. Through the evaluation of the relevant content, it evaluates the training strategies of each school, and completes the

collection of the relevant education quality evaluation data.

## 2.2 Big Data and AI Technology

Entrepreneurship education is not only to stimulate college students to carry out independent entrepreneurial activities, but also to cultivate college students' entrepreneurial thinking and entrepreneurial management skills. The deep integration of artificial intelligence and economic growth brings many opportunities to the labor market, as evidenced by the reduction of traditional jobs, the increase of new jobs, and the urgent need for a large number of innovative talents. New industries are in urgent need of entrepreneurial talents, especially highly skilled talents who can solve practical problems and high-level innovative talents who can overcome difficulties. Universities must train talents to be innovative and entrepreneurial to meet the new challenges. Therefore it is necessary to support the development of AI, strengthen the cooperation between industry, academia and research, focus on interdisciplinary paradigm shift, and promote teaching and faculty incentive mechanisms. Diversifying teaching strategies labor supply and demand for students from different disciplines is conducive to improving the cultivation of students' innovation and entrepreneurship [24].

Big data contains a large number of data sets. With the development of new technologies, in the new century, especially in recent years, big data has brought essential changes to people's way of life. At the same time, because of its openness and fluidity, these data have the possibility of being reused and regenerated at every moment, so that more regenerated data will be generated based on the original data.

## 3. Evaluation of the Quality of Entrepreneurship Education for College Students

### 3.1 Relevant Evaluation Calculation Method

#### (1) Evaluation of Big Data Association Rules

Assuming that the two subsets of the data set D are M and N, and the correlation between the two sets is represented by the support degree S and the confidence degree C, then the percentage formulas are:

$$S(M \rightarrow N) = \frac{P(M \cup N)}{DS} \quad (1)$$

$$C(M \rightarrow N) = \frac{P(M \cup N)}{P(M)} \quad (2)$$

DS is the amount of data.

#### (2) Analysis of Main Indicators

Suppose the sample matrix is x, which represents the evaluation score, and:

$$x = (x_1, x_2, \dots, x_m)^T \quad (3)$$

Normalized to get:

$$x' = \frac{x_{ij} - \bar{x}_j}{s_j} \quad (4)$$

and the average of them is:

$$\bar{x}_j = \frac{\sum_{i=1}^m x_{ij}}{m} \quad (5)$$

The standard deviation of the data is:

$$s_j = \sqrt{\frac{\sum_{i=1}^m (x_{ij} - \bar{x}_j)^2}{(m-1)}} \tag{6}$$

For the relevant parameters of  $x_i$  and  $x_j$ ,  $u_{ij}$  in the matrix can be calculated:

$$u_{ij} = \frac{\sum x'_{pi} x'_{pj}}{m-1} \tag{7}$$

### 3.2 Experimental Evaluation

This paper investigates the entrepreneurial information of college students including junior colleges, undergraduates, 211 colleges and 985 colleges, and also investigates internships in college students' entrepreneurial enterprises and participation in young entrepreneurs' associations. Questionnaires were distributed in the form of online questionnaires, face-to-face and email, and collected. The basic content of the questionnaire is shown in Table 3.

Table 3: Questionnaire survey content

Items	content	number
1	The total number of questionnaires issued	300
2	Questionnaire recovery	220
3	Number of people surveyed	Boys:164 girls:56
4	Specialist	51
5	Undergraduate	101
6	211 colleges	38
7	985 colleges	30

In addition, the evaluation indicators selected in this paper include 4 dimensions and 12 items, as shown in Table 4. The four dimensions are represented by Eb, Sg, Ib, and Iv, respectively.

Table 4: Selected Evaluation Metrics

Dimension	Index	Express
external benefits:Eb	Perceived pleasant guest satisfaction	u11
	Annual annual tax payment of enterprises	u12
	Job creation	u13
Survive and Grow:Sg	Perceived employee satisfaction with the staff	u21
	Entrepreneur satisfaction	u22
	Annual average orchid reporting rate of total investment	u23
Internal benefits:Ib	The proportion of the enterprise technology development fund investment in the total investment	u31
	The proportion of research and developers in the employees	u32
	Number of invention patent applications	u33
Innovation:Iv	Team member turnover rate	u41
	Employee number growth rate	u42
	Sales growth rate	u43

Questionnaire test: 1) Reliability test is to enable the questionnaire to measure that the investigators can obtain the same statistical results using the same test in different time periods under the same conditions, and maintain the internal consistency of the results. Through reliability analysis, the

unbiased degree of measurement tools for measurement content and the reliability of sample data were tested. The Cronbach's coefficient obtained in this paper was above 0.8, indicating high reliability. 2) Validity test: Validity test refers to the degree to which the measurement tool correctly measures the characteristics of the research project, that is, whether the questionnaire items can cover all the variables to be analyzed, and the degree to which the measurement tool can effectively measure the content, function and characteristics to be measured. Whether the measurement method actually measures what is "wanted" or "right", that is, the validity of the test results. The KMO value obtained in this paper is above 0.8, and the sig value is less than 0.001, indicating high validity.

**3.3 Experimental Results**

With the goal of spreading knowledge and cultivating talents, all institutions of higher learning should naturally shoulder the responsibility of cultivating innovative talents for the country and society. Figure 3 shows the overall quality index of college students' entrepreneurship in various dimensions obtained according to the questionnaire survey. As can be seen from the figure, the mean values of the question items in the dimension of survival and growth and the dimension of internal benefit are 3.173 and 3.079 respectively, and the mean value is above 3 points, which belongs to the upper-middle level, indicating that the survival and growth of the company and the internal benefit obtained by the college students' entrepreneurship are relatively good. The mean values of the question items of the innovation dimension and the external benefit dimension are 2.836 and 2.529 respectively, and the mean value is lower than 3 points, which belongs to the lower-middle level, indicating that the level of external benefits and innovation obtained by the company in the college students' entrepreneurship is at the lower-middle level. The average score of the overall quality of college students' entrepreneurship is 2.904, which is lower than 3 points, indicating that the overall quality of college students' entrepreneurship is low.

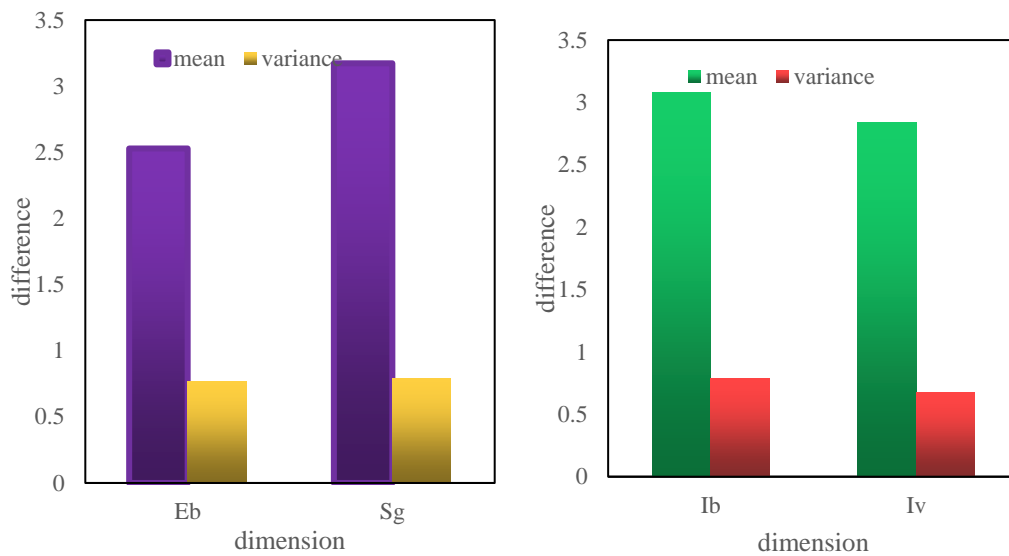


Figure 3: Overall Quality Index of College Students' Entrepreneurship

In addition, this paper analyzes individual factors according to the gender, personality, educational background, and average annual income of the respondents, and it obtains the validity sig value according to the AI algorithm, as well as the correlation coefficient of these individual factors to the overall quality of college students' entrepreneurship, as shown in Figure 4.



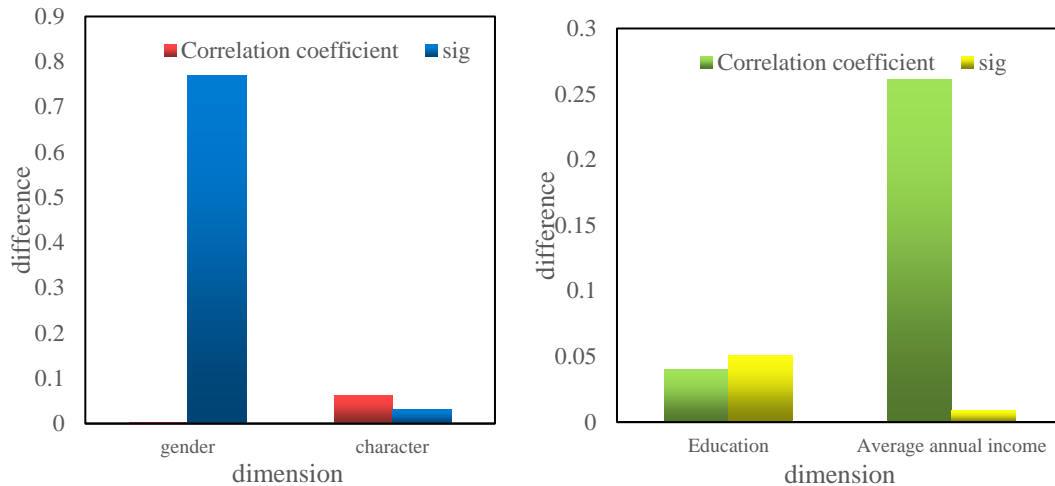


Figure 4: Correlation between individual factors and the entrepreneurial quality of college students

As can be seen from Figure 4, the sig coefficient of the gender independent variable is 0.002,  $P > 0.05$ , indicating that there is no correlation between gender and the overall quality of college students' entrepreneurship, and the sig coefficient of the gender independent variable is 0.061, with a positive direction, indicating that personality is related to the overall quality of college students' entrepreneurship. There is a positive correlation at the 0.05 level. The sig coefficient of the independent variable of education is 0.04, and the direction is positive, indicating that education is positively correlated with the overall quality of college students' entrepreneurship at the level of 0.05. The sig coefficient of the independent variable of annual average income is 0.261, and the direction is positive, indicating that the average annual income is positively correlated with the overall quality of college students' entrepreneurship at the level of 0.01. Entrepreneurship education in colleges and universities can promote the employability of college students, and graduates have a good evaluation of entrepreneurship education, but think that entrepreneurship education is not strong enough. Therefore, it is urgent to increase the investment in entrepreneurship education and expand the coverage of entrepreneurship education.

#### 4. Conclusions

Under the support of 5G network and environment, education has undergone major reforms and changes. As the 5G environment can mainly provide high speed, high bandwidth, low latency, fast cache and other services, more and more educational scenarios have been applied, such as "interactive" teaching. This paper first gave an overview of the overall content of the full text, and then introduced the concepts and characteristics of big data and AI in the introduction. The current situation of the content summarized the research process and innovation points of this paper. Then in the theoretical research part, it first introduced the entrepreneurship education of college students, including the research status of entrepreneurship education quality evaluation, the research significance of vocational education quality evaluation and the content of entrepreneurship education quality evaluation, etc.. Then it introduced big data and AI technology, including its definition and characteristics, etc. The big data evaluation method of this paper is introduced. Finally, according to the survey results, it is concluded that the overall quality of college students' entrepreneurship is low, so gender has nothing to do with entrepreneurial quality, and personality, education, average annual income and entrepreneurial quality have a certain positive correlation. To establish a mature and effective evaluation system of innovation and entrepreneurship education quality as soon as possible is an important direction of innovation and entrepreneurship education research.

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