Design and Application of Entrepreneurship Education Platform in Colleges and Universities Under the Background of Big Data

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Abstract. With the gradual deepening of education informatization construction, colleges and universities should adhere to the development concept of "data-driven entrepreneurship education", promote entrepreneurship education to achieve deep-seated changes in the underlying logic, development model and management mechanism, and build a teaching system of entrepreneurship education that meets social needs and national development strategies. In this regard, based on the problems existing in the current mode of entrepreneurship education in colleges and universities, such as lack of educational resources, lack of pertinence and lack of evaluation, this paper puts forward a set of construction scheme of entrepreneurship education platform in colleges and universities based on big data technology, and creates a new ecology of entrepreneurship education teaching in colleges and universities. The whole platform is B/S architecture, with Javaweb technology as the core to complete the design and development of front-end functional service interface and back-end server, and combined with Hadoop, the basic framework of big data, a comprehensive application program with online learning, personalized analysis, assessment and other functions is formed. Practice has proved that the system can not only meet the needs of students' teaching application, but also create students' user portraits to realize personalized analysis with the help of data mining models such as K-means, Pearson and FP-growth, which improves the pertinence and effectiveness of entrepreneurship education in colleges and universities and provides new ideas for the development of entrepreneurship education in the new era.

Keywords: Big data · Entrepreneurship education · User portrait · Data mining · Software application program

1 Introduction

At present, the new scientific and technological revolution and the tide of industrial transformation meet, and China's social and economic development has ushered in an important period in which opportunities and challenges coexist. In this context, China will firmly implement the innovation-driven development strategy, promote the development of entrepreneurial innovation to a higher level and higher quality, and inject kinetic

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energy of scientific and technological innovation into the full realization of Chinese modernization [1]. The key link in the implementation of innovation-driven development strategy lies in the cultivation of entrepreneurial talents in the new era. As the training platform and output position of entrepreneurial talents, colleges and universities should focus on entrepreneurship education throughout the whole university stage of young students, and enhance students' innovative consciousness and stimulate entrepreneurial enthusiasm from different dimensions [2]. However, in the process of entrepreneurship education at this stage, colleges and universities still follow the traditional teaching mode, and the lack of educational resources, pertinence and evaluation seriously restrict the effectiveness of entrepreneurship education, which leads to the lack of strong talent guarantee for implementing the innovation-driven development strategy in China. In view of this, this paper believes that in the era of digital intelligence, colleges and universities need to deepen the reform of entrepreneurship education with the help of the practical advantages of digital information technologies such as the Internet and big data [3]. The platform of entrepreneurship education in colleges and universities can rely on online education, virtual scene practice, public communication space, data analysis and evaluation and other functional services, reshape the whole process of entrepreneurship education practice in colleges and universities, and realize the digital and intelligent transformation and upgrading of teaching mode. In addition, the platform focuses on introducing the concept of "user portrait" under big data technology, which opens up new directions and new ways to improve the accuracy of entrepreneurial knowledge services in colleges and universities, and effectively helps contemporary college students take the first step in entrepreneurship. The construction of the platform further improves the entrepreneurship education system in colleges and universities, and provides necessary technical support for the innovative practice of cultivating entrepreneurial talents in colleges and universities in the new period.

2 System Construction

According to the actual application requirements of entrepreneurship education platform in colleges and universities, the overall development environment is configured and deployed. The content of system development is divided into two parts. One is to combine Hadoop and Javaweb, two complementary powerful tools, to build the structural framework of the system. The other is to develop and deploy various functional service modules, and determine the logical relationship between them to complete the packaging and release of the whole system.

First of all, Hadoop, as a basic development framework under big data technology, can support users to distribute large data sets on computer clusters using simple programming models [4]. Hadoop framework adopts cluster deployment, and the deployment scheme is determined by the actual data volume of the platform. This Hadoop framework needs three functional nodes, named Master1, Slave1 and Slave2 respectively. The hardware configuration of each functional node includes two 4-core CPUs with a main frequency of 2.5 GHz, 4 TB disk drives, 36 GB memory and Gigabit Ethernet connection to meet the distributed storage requirements of various types of data. In terms of software programs, Linux is selected as the bottom operating system of each node, and the version

is CentOS 7.5.1804 (Core), jdk1.8.0_171 is selected as the JDK version, and Hadoop chooses v2.7.3, which is installed in each node respectively, and the components such as Yarn, HDFS, Zookeeper, HBase, Kafka, Flume and Sqoop are also deployed in each node to form the basis of data information collection, transmission, storage and management [5].

Secondly, the platform takes Javaweb technology as the core, and completes the design and development of front-end interactive interface and background server. Java is the basic development environment of Web application, Eclipse V 2022-x64 is the integration tool, Tomcat 8.5.5 is the Web server, and MySQL 5.7 is the database server. Complete the configuration of Tomcat in the Preference option under Eclipse. Then, based on the SpringMVC architecture, the integration and encapsulation of the whole system are completed [6].

Finally, the online teaching, virtual time, communication, data analysis and other functional applications within the platform are developed, adapted and packaged, and then deployed in the background server, and the response of user requests is realized through the call and control of the business logic layer. In Hadoop cluster, there are many data analysis and processing algorithm models under each node, and they rely on MapReduce framework for operation. When the user sends a request, the Web server will call the MapReduce task class to which the algorithm model belongs, and transmit the necessary parameters through the JavaAPI, that is, complete the analysis and processing of data information.

3 Functional Implementation

3.1 Student Side

A. Entrepreneurship Education

The platform presents all kinds of teaching resources involved in entrepreneurship education courses in a centralized way. It mainly involves many aspects such as career development planning, entrepreneurship guidance, entrepreneurship foundation and practice, innovative thinking and training, enterprise management and research, etc., and the form is mainly network video courses, which is convenient for student users to choose their own learning. Entrepreneurship education makes up for the lack of classroom teaching content with a multi-dimensional and three-dimensional content system, and promotes the ubiquity of entrepreneurship education by online teaching [7].

B. Entrepreneurship Training

After entrepreneurship education and teaching, student users can carry out targeted training under this module. For example, student users can complete the preparation of business plans according to the entrepreneurial proposition issued by teachers, and the training process can be completed independently or in teams. A large number of practical scenes can not only broaden students' horizons, stimulate students' interest, but also effectively strengthen students' ability to integrate theory with practice [8].

C. Entrepreneurial Actual Combat

Compared with entrepreneurship training, entrepreneurship actual combat can support student users to experience the whole life cycle process of an enterprise from registration, establishment, investigation and planning, operation and management, development decision-making, decline and extinction. In the process, student users will play the role of founders to complete different drills of practical entrepreneurial projects at different stages, and fully perceive the pressure and value behind entrepreneurship, so as to achieve the purpose of cultivating entrepreneurial spirit and enhancing entrepreneurial ability.

3.2 Teacher Side

Under the platform of entrepreneurship education in colleges and universities, teacher users are mainly responsible for the organization and management of teaching practice. In addition, teacher users will also conduct data mining and analysis according to the online learning behavior of student users, and build a portrait of student behavior, so as to accurately obtain the personalized needs of student users for entrepreneurship education, and then improve the pertinence and effectiveness of platform entrepreneurship education.

The construction process of student behavior portrait includes data collection, preprocessing, feature selection, model construction, user portrait integration and other steps. Among them, the data collection objects mainly come from the learning behavior data of student users inside the platform, including structural data in the database and CSV file data of platform operation log. Data preprocessing mainly depends on Hive data warehouse under Hadoop framework. After data extraction, cleaning, transformation and loading, data information with uniform format, high structure, high data quality and good compatibility is formed, which paves the way for subsequent analysis and mining. The following is the ETL implementation code [9]. Feature selection is a process of selecting data from a large amount of data information that is helpful to describe the user's portrait. Table 1 shows the learning behavior characteristics of some students.

```
import java.io.IOException;
public class WebLogMapper extends Mapper<LongWritable, Text,Text, NullWritable> {
    @Override
    protected void map(LongWritable key, Text value, Context context) throws IOException, InterruptedException {
        String line = value.toString();
        String[] fields = line.split(" ");
        if (fields.length>11){
        context.write(value, NullWritable.get());
    }else {
        return;
```

Table 1. Students' learning behavior characteristics

Learning behavior characteristics	Observational indicators
Basic information *F1*	Student number, name, department, and grade
Entrepreneurship education F_2	Class time, play time, course completion degree and course completion number
Entrepreneurship training F_3	Training completion degree, training performance, and team participation
Entrepreneurship actual combat F_4	Actual combat completion degree, actual combat performance, actual combat feedback amount
Others F_5	Login time, cumulative time, and login frequency

According to the characteristics of students' learning behavior, the platform will adopt K-means clustering analysis model to classify the learning behavior characteristics respectively. Among them, the determination of the best K value needs the help of the calculation formula of sum of squares of errors (SSE). As shown in Formula 1, where C stands for category, p stands for data value, and m stands for centroid [10]. Table 2 shows the details of K values corresponding to each learning behavior feature.

$$SSE = \sum_{i=1}^{k} \sum_{p \in C_i} |p - m_i|^2 \tag{1}$$

During the platform simulation test, we selected the learning behavior data of 300 student users to input into the K-means cluster analysis model, and got the final classification results, as shown in Table 3. The final portrait of student users will be identified by FP-growth algorithm based on the results of cluster analysis to form a portrait of students' entrepreneurial education behavior, as shown in Table 4. The results show that students are also excellent in the extensive study of entrepreneurship teaching, entrepreneurship training and entrepreneurship actual combat characteristics, while poor performance of entrepreneurship training and entrepreneurship actual combat behavior will affect the overall effectiveness of entrepreneurship education.

In addition, the teacher port can also evaluate the learning effect according to the characteristics of students' learning behavior. The platform supports automatic evaluation of students' learning effect with fuzzy comprehensive evaluation model. The

Table 2. Optimal K-value of clustering of learning behavior characteristics

No.	Learning behavior characteristics	K value	Runtime
1	Entrepreneurship education F_2	3	0.3321 s
2	Entrepreneurship training F_3	3	0.2577 s
3	Entrepreneurship actual combat F_4	4	0.1148 s

Table 3. Cluster analysis results

Learning behavior characteristics	Cluster symbol	Cluster center	Behavioral label
Entrepreneurship education	A1	0.92	Extensive
	A2	0.81	Ordinary
	A3	0.68	Single
Entrepreneurship training	B1	0.56	Good
	B2	0.39	Better
	B3	0.18	Poor
Entrepreneurship actual combat	C1	0.48	Excellent
	C2	0.29	Good
	C3	0.17	Common
	C4	0.03	Poor

Table 4. Model table of students' behavior portrait in entrepreneurship education

Rule	Support degree	Confidence level	Lifting degree
$\{F_1, A1, B1, C1, F_5\}$	0.0735	0.3557	3.3151
$\{F_1, A2, B1, C2, F_5\}$	0.0545	0.3312	2.6257
$\{F_1, A3, B2, C3, F_5\}$	0.0651	0.3615	1.9268
$\{F_1, A2, B3, C3, F_5\}$	0.0624	0.4122	1.1064

evaluation criteria and simulation results are shown in Table 5. Among them, the formula for calculating the weight value of λ_{max} is shown in Formula 2. Each score is combined into a score judgment matrix, and each row element is normalized by column and then summed, and the obtained row vector is normalized twice to get the ranking weight vector W, and the corresponding weight value λ_{max} is calculated by sum product method [11]. The results show that the platform can realize the online evaluation of the learning effect of entrepreneurship education and make up for the previous technical gap.

$$M = \begin{bmatrix} m_{11} & m_{12} & m_{13} \\ m_{21} & m_{22} & m_{23} \\ m_{31} & m_{32} & m_{33} \end{bmatrix} \quad \lambda_{\max} = \sum_{i=1}^{n} \frac{(MW)_i}{nW_i} \tag{2}$$

Table 5. Evaluation criteria and simulation results

Target layer	Standard layer	Measures layer	Weighted value	Item score	Score
Learning evaluation	Instructional	Course completion degree	M1 = 0.095	80	7.600
		Training completion degree	M2 = 0.173	71	12.217
		Actual combat completion	M3 = 0.146	70	10.220
	Interactivity	Team participation	M4 = 0.047	69	3.234
		Actual combat feedback	M5 = 0.154	76	11.704
	Effectiveness	Training results	M6 = 0.071	73	5.136
		Actual combat results	M7 = 0.101	72	7.272
	…	…	…		

4 Conclusions

In order to promote the reform of the teaching mode of entrepreneurship education in colleges and universities, this paper puts forward a set of construction scheme of entrepreneurship education platform in colleges and universities based on many shortcomings faced by the traditional teaching mode. On the basis of meeting the needs of basic teaching practice, the platform introduces the concept of "user portrait" under big data technology, which strengthens the analysis and mining of students' learning behavior and is beneficial to improving the pertinence and effectiveness of entrepreneurship education. In the follow-up research, the platform will further enrich the construction of digital resources of entrepreneurship education, enhance the breadth of data analysis and application, and provide necessary technical support for the innovative practice of entrepreneurship training in colleges and universities in the new period.

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