

Research Article

Research on Flipped Classroom of Big Data Course Based on Graphic Design MOOC

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With the rapid development of the Internet, traditional teaching models can no longer meet the needs of talent training in colleges and universities, and reform is imperative. With the advent of the era of big data, the emergence of a large number of rich and diverse teaching resources, MOOC (Massive Online Open Course), microclasses, flipped classrooms, and other teaching models on the Internet has provided reform thinking and directions for teaching reform. This model divides the entire teaching design into two major modules: SPOC (Small Private Online Course) platform teaching activity design and flipped classroom teaching activity design, and applies this model to the actual teaching of open education, designing detailed teaching activity plans, in a real teaching situation. This study uses questionnaire surveys and interview surveys to investigate the basic personal situation of course learners, learning expectations, course participation, learning experience, and learning effects. It is planned to use the questionnaire star platform to issue and return questionnaires and use EXCEL and SPSS software to analyze the data and perform analysis and processing, combined with in-depth interviews with learners and professors for comprehensive analysis, so as to obtain the most true views of students and teachers on this model. In this process, we collect a variety of data from the SPOC platform and the flipped classroom platform, including feedback from students studying on the SPOC platform before class, observation of students' learning attitudes in flipped classrooms to display of students' results after class, and academic performance, summarize experience based on the analysis results, and optimize the teaching design plan. In classification algorithms, support vector machines (SVM) are widely used due to their advantages such as less overfitting and inconspicuous dimensionality of feature vectors. The traditional SVM algorithm is not suitable for processing large-scale data sets due to factors such as high time complexity and long training time. In order to solve these shortcomings, parallelizing the SVM algorithm to process large-scale data sets is an effective solution. On the basis of comparison, a SPOC-based flipped classroom teaching design model was constructed, and empirical application was carried out in the Open University, in order to promote the sustainable development of open education.

1. Introduction

Big data technology is gradually playing an important role in various fields; it is also promoting the integration of information technology and courses to a new level [1]. As a novel information technology platform, MOOC has been widely used in the subject teaching of colleges and universities. Flipped classroom is a new teaching model that has been enriched and developed in the past educational theory and technology in recent years [2]. The quality education of graphic design in colleges and universities is an indispensable part of quality education. In recent years, it has received more

and more attention from colleges and universities [3]. Graphic design quality education in colleges and universities is to comprehensively improve the aesthetic ability of college students in the graphic design culture so that college students can feel the power of humanistic care and absorb the rich cultural, historical, and creative connotations contained in graphic design, thereby enriching college students' humanities feelings, to construct a diverse knowledge system of college students [4]. With the continuous development of informatization, the integration of information technology and graphic design quality education in colleges and universities has continued to deepen. Big data will usher in a new

era of comprehensive and deeper integration of information technology, education, and teaching. Educational informatization is also facing the transition from IT (information technology) to DT (data technology) [5]. From now on to the future, mobile Internet has deeply integrated people's lives, including education. From the perspective of the development of educational concepts, the characteristics of information technology better meet the needs of teaching students in accordance with their aptitude, personalized teaching, and paying attention to the development of each student [6].

Big data is a 4V (large volume, fast processing speed, many types, and great value) information technology recognized by the academia and the industry [7]. The generation of big data comes from the rapid development of information technology and the extensive application of the Internet, mobile Internet, and the Internet of Things. People and objects are called nodes that can be recorded and tracked in the networked society [8]. It is information technology that continues to integrate into people's lives. People and even objects will leave data traces in the information system, such as the use of social media, e-commerce, and online learning [9]. Fast processing speed means that the processing speed of big data is higher than in the past. Since many fields require near real-time data analysis, the storage and computing capabilities of large data are required to be higher than the previous data processing methods, but the storage and computing capabilities are large. While increasing the range, it also requires lower cost than the previous information system. Therefore, in the field of big data technology, in recent years, a scheme based on the Hadoop technology system has appeared, which basically meets the requirements of big data storage and computing [10]. Many types mean that the current data generated by various information systems is more similar to unstructured or semistructured data such as video, audio, pictures, and text. Therefore, big data technology needs to deal with unstructured data [11]. However, due to the huge amount of data and various types of data, data mining is needed to realize the value of the data [12].

This article is based on clarifying the related concepts of big data technology, MOOC, and flipped classroom. The relationship model between the three is proposed, that is, big data is the technical basis, MOOC is the application platform, and flipped classroom is the theoretical basis. This paper uses the support vector machine algorithm and big data technology to study the parallel SVM algorithm based on the Hadoop platform, analyzes the massive learning data in the MOOC platform, and dynamically predicts whether the learner can finally obtain the certificate during the learning process to help learners understand their own learning status, and the MOOC platform can also provide learners with customized learning planning and guidance based on this indicator to increase the rate of MOOC certificate acquisition and promote the development of the MOOC platform. At the same time, this article also proposes a model of integrated development among the three, in order to promote the practice of graphic design quality education in colleges and universities in the era of big data. The model divides the entire teaching design into two modules: SPOC platform teaching activity design and flipped classroom teaching

activity design. We apply this model to the actual teaching of open education to design detailed teaching activities. With reference to the above-mentioned understanding of SPOC, flipped classrooms, and MOOCs, this research applies the improvement and reshaping of MOOC resources to small-scale specific groups of people, which is supplemented by SPOC lecture videos and online interactive evaluation functions in traditional campus classrooms, through learners' personalized learning methods, accepts knowledge and meaning to construct new knowledge and integrate the process of online and offline interactive communication between teachers and students, and explores a flipped classroom with adaptive learning as a service and "individualized learning" as the concept teaching mode and teaching activity design.

2. Related Work

In terms of the construction of instructional design model, the current domestic and foreign researches on the construction of SPOC-based flipped classroom instructional design model are still lacking. More scholars are concerned about the connotation, characteristics, and characteristics of SPOC. In terms of teaching methods and other issues, there is still a lack of research on the promotion of open education learning under the flipped classroom environment of SPOC [13]. At the same time, the flipped classroom was rated as one of the top ten educational technology events by the famous online education media in the United States. In recent years, the flipped classroom teaching model has become a hot topic in the field of higher education and educational technology at home and abroad [14]. Professor Hew [15] believed that the new teaching model based on the flipped classroom model technology may be another major innovation after the class teaching model. In the United States, some colleges and universities and scientific research institutions have also carried out research on the domestic and foreign flipped classrooms and national flipped classroom teaching practices. However, there is still a lack of research on the construction of SPOC-based flipped classroom teaching design models. Classroom instruction design mode is a relatively new research focus. To solve these problems, Decheng and Jinxin [16] proposed SPOC, which was a small-scale private online course. They believed that MOOC is only a supplement to classroom teaching and cannot completely replace traditional teaching. When MOOC is developed to be able to contribute to teacher utilization, student output, student self-learning ability, and learning participation, MOOC will develop into SPOC. Stephany [17] found that from MOOC to SPOC, it provided resources, environment, and ideological support for students to transform from external learning to internalized learning. SPOC surpasses MOOC in terms of operation mechanism, teaching format, teaching process, and teaching structure. In terms of operating mechanism, a "small-scale (less than 500 students)" and "exclusive access condition" mechanism is proposed for online courses, which greatly reduces the complexity of learner management; it stimulates independent learning motivation, enhances learning interaction,

and improves the course completion rate and learning effect; in terms of teaching format, SPOC is committed to developing blended learning, which is beneficial to deeply integrate the advanced ideas of MOOC with traditional teaching.

Domestic scholars have different opinions on its use in teaching. King and others [18] believed that flipped classrooms were not only conducive to the humanization of education but also promote the harmonious reconstruction of teacher-student relations. However, there are also scholars who say that flipped classrooms are useful. There are few applications in the classrooms of primary and secondary schools, and they believe that this teaching method is not binding on young learners. However, in higher education and open education, it is more widely used for learners with learning autonomy. By summarizing the opinions of relevant scholars at home and abroad, it can be considered that flipped classroom is a learning and teaching model suitable for students who have an active learning attitude willing to take up their spare time and have basic self-study capabilities and self-study equipment that can watch online videos. Wu [19] believed that the evaluation of flipped classrooms should be completed by experts, teachers, peers, and learners themselves. Flipped classroom not only pays attention to the evaluation of learning results but also pays attention to the evaluation of the learning process through the establishment of student files of students, so as to achieve quantitative evaluation and qualitative evaluation, formative evaluation and summative evaluation, and individual evaluation and group evaluation. Zhang [20] pointed out the problems encountered in the practice of flipped classrooms: objective factors include the school's current teaching facilities and subject adaptability and subjective factors include teachers' beliefs in educational reforms and teachers' professional capabilities, and proposed solutions [21].

3. Construction of a Flipped Classroom Platform for Big Data Courses Based on Graphic Design MOOC

3.1. Distribution of Graphic Design Modes. The flipped classroom teaching model is divided into four stages. The first two stages are guided by teachers, and the latter two stages are actively carried out by students. Experiential engagement: it uses interactive forms such as games and simulations, experiments, community activities, and artistic activities. Conceptual connections: it provides video and audio courses, rich websites, and online discussions. Meaning making: it uses blogs, experiential videos, audiovisual reflections, and quizzes to present ideas. Demonstration and application: it includes creative and personal activities and displays. Figure 1 shows a schematic diagram of the graphic design pattern distribution.

Suppose that in system s , input x and output y have some unknown relationship, that is, there must be an uncertain probability $F(x, y)$, and an optimal function can be found in the function set according to the training samples. R represents the probability of output between system S and learner LM , that is, the probability of classification error.

Calculating the joint probability $F(x, y)$, you can find the minimized expected risk R . Since the joint probability $F(x, y)$ is unknown, R cannot be directly calculated and minimized. However, using the theorem of large numbers, based on the known training sample set, an arithmetic average can be used.

$$A = \{(x(i), y(i)) \mid x(i), y(i) \in R\}, \quad i \in N. \quad (1)$$

When the dimension of the function set is relatively high, the empirical risk is small at this time, but the expected risk is not the smallest, which will make the generalization ability of the function set weaker, which is a phenomenon of overlearning. Principle of minimizing structural risk: we decompose the function set S into a sequence of function subsets, and then, the subset sequence has the following relationship:

$$f(x) - (a \times x(i) + b) = 0, \quad (2)$$

$$\begin{cases} \frac{\partial g(x, y)}{\partial x(i)} = 1, \\ \frac{\partial g(x, y)}{\partial y(i)} = 1. \end{cases} \quad (3)$$

For each subset, there is a certain confidence range, within which the function with the least empirical risk is searched. For different subsets, as long as the set with the smallest sum of the confidence range and the smallest empirical risk is selected, the subset of the function with the smallest expected risk can be obtained. Therefore, the principle of structural risk minimization refers to finding a balance between the generalization ability of the function set and the complexity contradiction.

$$|s(x, p)| = \sqrt[p]{x(1)^p + x(2)^p + \dots + x(n)^p}. \quad (4)$$

As the function subset continues to increase, its empirical risk continues to decrease, but the corresponding confidence range continues to grow. The structural risk minimization principle takes this situation into account so that the confidence range and empirical risk are selected in the function subset. In this way, the empirical risk is minimized and the best boundary is found, and the minimized expected risk can be obtained.

$$\begin{cases} t \times x(i) - r < 1, & i < t, \\ t \times x(i) - r > 1, & i > t. \end{cases} \quad (5)$$

Hadoop is a distributed system infrastructure, mainly centered on HDFS (Hadoop Distributed File System) distributed file system and MapReduce parallel computing framework. With the emergence of Hadoop, developers can use the advantages of clusters to write distributed applications that process massive amounts of data only by writing Map and Reduce functions, without needing to understand

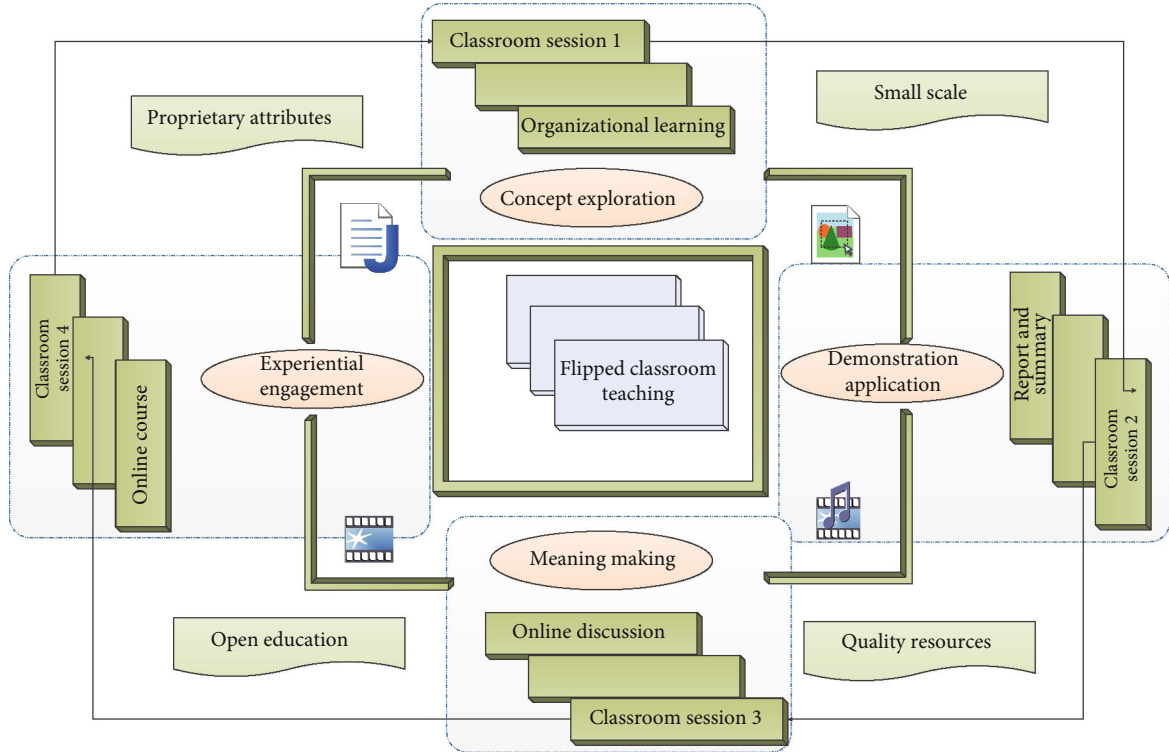


FIGURE 1: Schematic diagram of graphic design mode distribution.

the details of the underlying distributed network transmission and communication.

$$f(x(i)) \times (a \times x(i) + b) - 1 > 0, \quad \forall i = 1, 2, \dots, N. \quad (6)$$

Normally, the Secondary Node is in a dormant state. Once the Name Node goes down, the Secondary Node will be activated immediately and take over the Name Node to manage the entire cluster.

$$C = \frac{\sum_{i=1}^N \sum_{j=1}^N (a(i) - x(i)) \times (a(j) - x(j))}{\sum_{i=1}^N \sum_{j=1}^N (a(i) \times a(j))}. \quad (7)$$

Because the information of the Name Node changes dynamically with the entire cluster, the Name Node and the Secondary Node need to be synchronized to ensure that once a problem occurs on the Name Node, the Secondary Node can completely replace him. The actual operation of the client's data is to communicate with the Data Node through the TCP protocol. This design enables a Name Node to manage a large number of Data Nodes at the same time.

3.2. Cross-Validation of Big Data Algorithms. The curriculum system uses the machine learning method [22–24] of big data to understand the student's time schedule and arranges the graphic design courses inadvertently. It may be when eating in the cafeteria or between professional classes. Evaluation indicators are more diversified, and team learning has become an important part of the evaluation indicators. According to the student situation of the school,

the learning unit with strong relevance to the big data course is selected. The bottom layer of the framework is the Hadoop platform, including HDFS and MapReduce. The upper layer of the framework is the most commonly used classification, clustering, and association analysis algorithms for analyzing data. Classification analysis algorithms include support vector machines (SVM), decision trees, KNN and their corresponding parallel algorithms, and clustering analysis algorithms [25–27] including k -means; these algorithms include classic algorithms and the most popular new algorithms and have low time complexity and relatively good clustering results. Figure 2 shows the big data algorithm cross-validation flowchart. Each individual computing node still trains the subsample set separately. The difference is that the improved algorithm no longer merges the support vectors obtained from the corresponding training sample subset according to the two-by-two merge rule, but combines all nodes. The samples corresponding to the support vectors are extracted and combined, and then, the combined data set is divided into the number of computing nodes in the cluster and then handed over to all computing nodes in the cluster to train and learn individually. All subsequent layers follow the same rules. In this way, in the training and learning of each layer, the computing power of all nodes in the cluster is fully utilized, and no computing nodes are left in an empty state and because the data size after the block is compared with the previous SVM. All parts outside the first layer should be small, which also reduces the size of the corresponding data set, speeds up the training time of the SVM, and improves the convergence speed of the optimal solution.

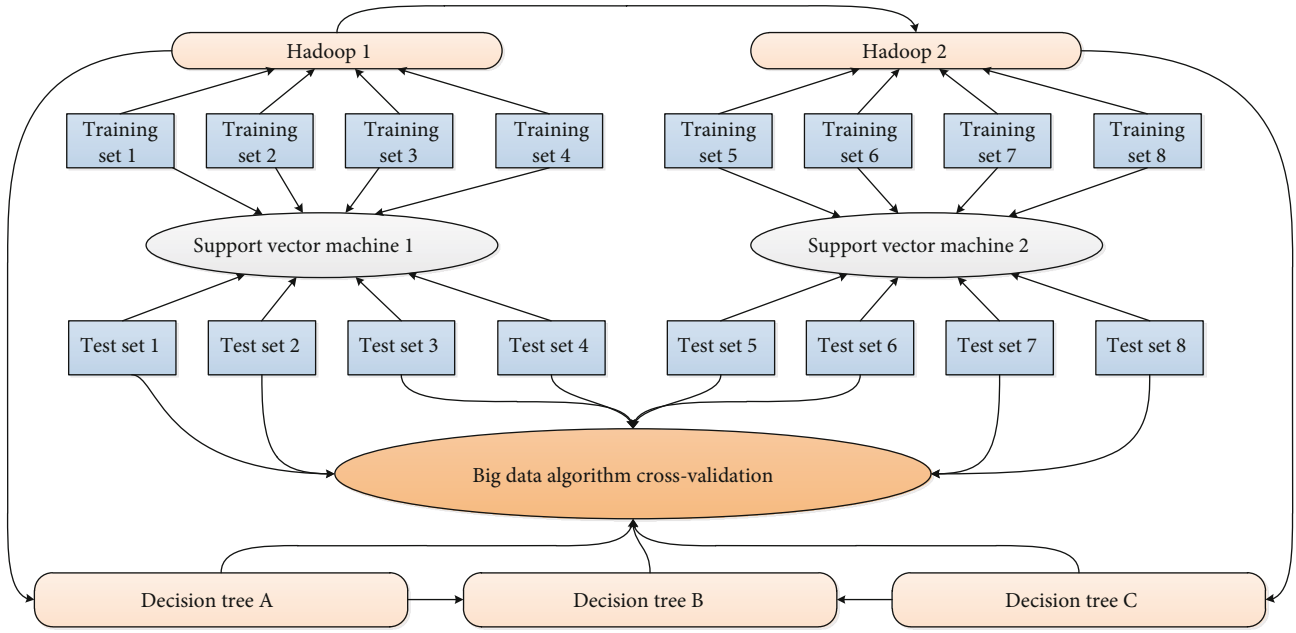


FIGURE 2: Big data algorithm cross-validation flowchart.

In order to improve the problems that exist when the number of positive and negative samples differs greatly, we adopt a weighted improvement method and use different penalty parameters for the positive and negative sample sets. This data set is mainly used to judge whether the learner can pass the MOOC exam and obtain the certificate of completion based on the 6 characteristics of the students' learning behavior on a domestic MOOC site. We can apply this predictive model to the entire learning process of MOOC learners and dynamically monitor the learning behavior of learners so that we can provide them with customized services during the learning process of MOOC learners. To remind and help them obtain the final study certificate, the main research content in this section is for the case where the SVM algorithm has a large difference in the size of the class sample in the two-class classification problem.

3.3. Optimization of Flipped Classroom Evaluation. In order to ensure the effectiveness of online courses, MOOC has made meticulous designs in all aspects of the course design. According to the design concept of MOOC, the scope of communication, the technology adopted, the applicable objects, and the design of teaching objectives, there are three main categories (cMOOC, xMOOC, and tMOOC). Among them, tMOOC adopts a task-based learning method, which is more suitable for graphic design quality education. The past graphic design quality courses such as graphic design appreciation and graphic design history are single and relatively boring. Using MOOC's task-based curriculum approach, graphic design appreciation can be transformed into learning team tasks, and the MOOC's more powerful platform communication capabilities can help each task group complete the learning tasks. In addition, during the learning task process, team and individual task reports and evaluations can be carried out in stages, and the primary

evaluation method can be transformed into a process evaluation method, which effectively guarantees the effectiveness of the curriculum. In the classroom, according to the pre-class online learning situation, teachers organize teaching activities in a targeted manner, answering questions and solving potential learning problems of learners and making innovative applications. Research shows that what students need most are not teachers' explanations of knowledge or concepts or colorful video learning, but when they encounter difficulties in practice, and flipped classrooms can solve this problem. Using the flipped classroom teaching model to focus valuable classroom time on active project-based learning, while the relevant knowledge and materials of the graphic design course itself require students to actively and autonomously learn after class, teachers use various informatization to learn independently and students can also fully interact on the information platform.

Figure 3 shows the histogram of the flipped classroom content design unit. The content design of video teaching includes two units: Hadoop platform construction (application part) and common algorithms for big data processing and analysis (theoretical part). The application part includes 8 videos, and the theoretical part includes 10 videos. The length of the video is between 10 and 15 minutes. When processing data, the data will be divided into multiple blocks according to the data to be processed and the function written by the developer, and then, a map task will be started for each block. After being scheduled by the MapReduce runtime environment, it runs on several nodes in the cluster. When all map operations in the cluster are executed, many intermediate key-value pairs will be generated. The intermediate key-value pairs will be redivided into multiple groups by a partitioner component. The MapReduce runtime environment will schedule a reduce task to calculate each one. After all reduce functions are executed, all calculation results

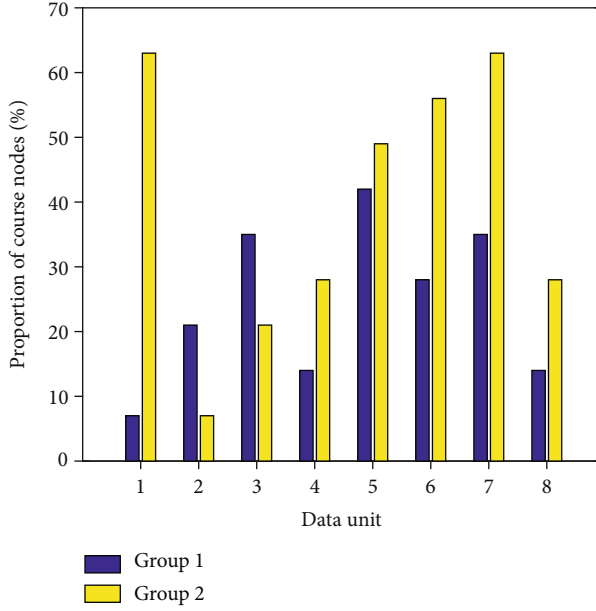


FIGURE 3: Histogram of flipped classroom content design unit.

will be output to the specified location on HDFS, and the client can read the calculation results from it. Usually, in a MapReduce cluster, the node that receives the tasks submitted by the client is called the master node, and there is a JobTracker process on the master node that is responsible for receiving specific tasks. The node responsible for executing map or reduce tasks is called the slave node, and there is a TaskTracker process running on the slave node that is responsible for executing specific tasks. The MapReduce program usually consists of mapper code, reducer code, and related configuration parameters.

4. Application and Analysis of Flipped Classroom Platform for Big Data Courses Based on Graphic Design MOOC

4.1. Graphic Design MOOC Index Processing. The experimental CPU model is Intel i3-3110M, the memory is Kingston 1333 Hz, the capacity is 2 G, and Matlab2012. The SVM algorithm used is the Libsvm-3.20 version toolkit. This toolkit has been since version 2.8. The SVM training algorithm uses an optimized SMO algorithm. Teaching evaluation is an important way to test the achievement of teaching results and course objectives, and it is also an important means to evaluate the teaching quality of big data courses. This data set is mainly based on 6 characteristics of students' learning behavior on a domestic MOOC site to determine whether a learner can finally pass the MOOC exam and get a certificate of completion. Figure 4 shows the level distribution of the flipped classroom evaluation pyramid. The six learning behavior features extracted in this article are as follows: total number of times to watch videos, total number of quizzes submitted, recording density, number of posts in forums, number of times to see posts on forums, and how many days to register before the start of

class course. The main extractions are data structure, machine learning [28–30], and advanced English writing three MOOC courses. The specific description of the data set is as follows: the number of sample points of the data structure course $m = 85302$, the number of sample points of the machine learning course $m = 75791$, and the number of sample points of the advanced English writing course [31, 32] $m = 61218$; the feature dimension of the sample points $n = 6$, the learners who have obtained the certificate are in the positive category, those who have not obtained the certificate are in the negative category, and the number of categories $s = 2$.

In this paper, different learning weights are assigned to the learning trajectory of students on the school network platform, combined with the characteristics of big data courses, and the teacher and students jointly score the learning situation of each student. For example, the construction of the Hadoop platform is scored by the teacher. The learning situation after class is scored by the students, and the total score of each student is calculated according to the weight as the usual score of the course and recorded in the student's score. A set of formative evaluation-oriented assessment methods are designed: class attendance rate 15%, online test 5%, group presentation 15%, analysis report 15%, and final exam 50%. Figure 5 shows the pie chart of the flipped classroom evaluation method.

The teacher team uploads the microvideos and other resources made by SVM to the network platform for students to download and watch. After the students complete their self-study, they complete the online self-test assignments. The size of the group is controlled within 5 people, and each group of students selects part of the content for design, and the time is 20 minutes. The SVM algorithm is more complicated, and the problem can be divided into several subproblems, such as discussing the main idea and implementation process of the SVM algorithm. As for the advantages and disadvantages, the students carry out division of labor and cooperation, and the teachers group to guide and communicate. According to the students' understanding of the main idea of the SVM algorithm, the SVM algorithm is realized through different programming languages. After the algorithm is completed, a representative is selected to explain the algorithm completion process and answer the teacher and other students' questions. In this way, the unity and cooperation between students and the communication between teachers and students can be enhanced. The integration of blended learning mainly includes preevaluation of the effectiveness of SPOC teaching resources, trial and evaluation of the comprehensiveness of the SPOC platform and teaching service system, recognition of teaching innovation, school incentive policies, and student evaluation system. After class, students will complete the SVM algorithm in the process of implementing the SVM algorithm on the school network platform and other members of the group. The weight is scored, and the teacher scores the learning situation of each student.

4.2. Flip Classroom Platform Simulation. Before implementing flipped classroom teaching, first we select teaching

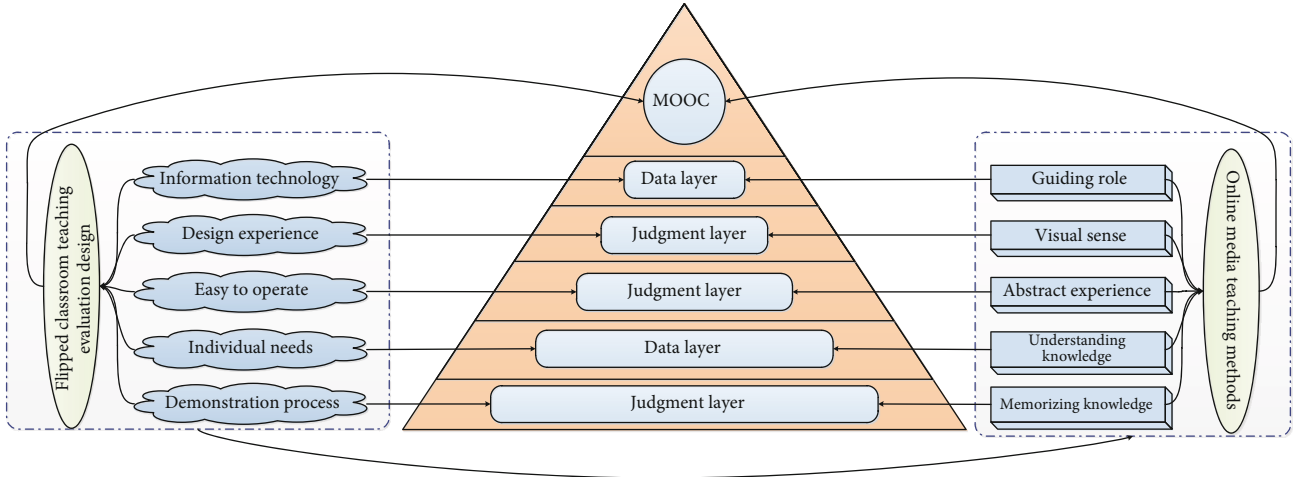


FIGURE 4: Flipped classroom evaluation pyramid level distribution.

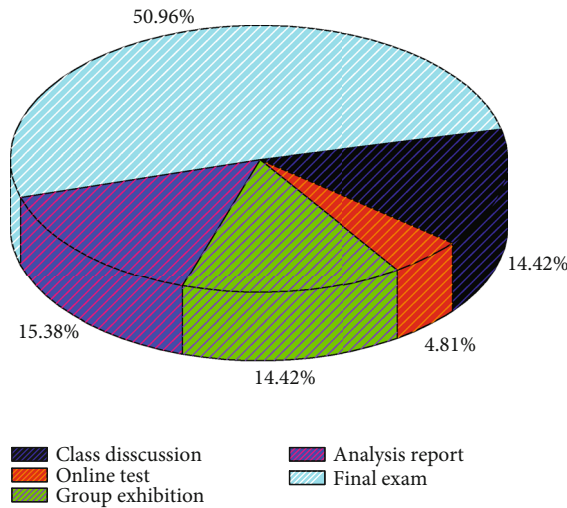


FIGURE 5: Fan-shaped chart of flipped classroom evaluation assessment method.

content, design questions and resources that can inspire students to explore, formulate a teaching list, and provide students with independent learning. In addition, two classes were selected for comparative teaching, hoping to see different teaching effects; representative content was selected for video teaching and related resources and questions based on textbooks and network resources. In addition, two parallel classes of 16 levels (45 students in each class) were selected to carry out comparative experiments. Among them, it adopts flipped classroom teaching, and another adopts traditional teaching mode. Figure 6 shows the division of design elements for flipped classroom teaching content.

Before the questionnaire was officially issued, the students were tested, some items were removed, and 19 formal items were finally determined, including changing concepts and the popularization and promotion of MOOC, hardware and teaching environment, establishing a high-quality MOOC teaching platform. The questionnaire consists of 5 aspects and is divided into 5 items. Each item uses a 5-

point scoring method, which is divided into “completely agree,” “relatively agree,” “neutral attitude,” and “disagree.” There are five levels of “complete disagreement,” which are divided into 1, 2, 3, 4, and 5 in turn. Figure 7 shows the evaluation results of the MOOC-based flipped classroom teaching process. According to factor analysis, the questionnaire is divided into 7 factors: establishment of a high-quality MOOC teaching platform, reform of education and teaching management system, teachers’ work before flipped classroom, classroom teaching of flipped classroom, teacher quality, students’ independent learning ability, and student information technology literacy.

This survey focuses on the students and teachers of adult higher education in the main and branch campuses of the college. In the end, 248 student questionnaires were recovered, 211 valid questionnaires were returned, and the effective response rate was 85%. 20 teacher questionnaires and 18 valid questionnaires were recovered, and the effective recovery rate was 90%. It can be seen that 46.4% of the students hope that the teacher will assign the learning tasks of the MOOC course before the MOOC-based adult higher education flipped classroom class; 59.2% of the students hope that the teacher will assign the learning tasks of the learning materials. The teacher assigned the most recommended books and materials to the students, reaching 68.7%; 52.1% of the students hope the teacher assigned to complete the basic homework. It can be seen that the students hope that the teacher can arrange and study MOOC courses, textbooks, recommended books, and materials and complete the basic tasks before class.

4.3. Example Application and Analysis. In the classroom session, the first is the configuration of the project environment, preparing multiple hosts for students to run HDFS. Each host needs to be installed: Linux operating system, Hadoop-2. 8.0, jdk-8u131-linux-64, and Hadoop Eclipse plug-in. The specific process includes connecting to the network, installing JDK, creating HDFS account, configuring password-free SSH access mechanism, installing Hadoop and configuring environment variables, modifying Hadoop

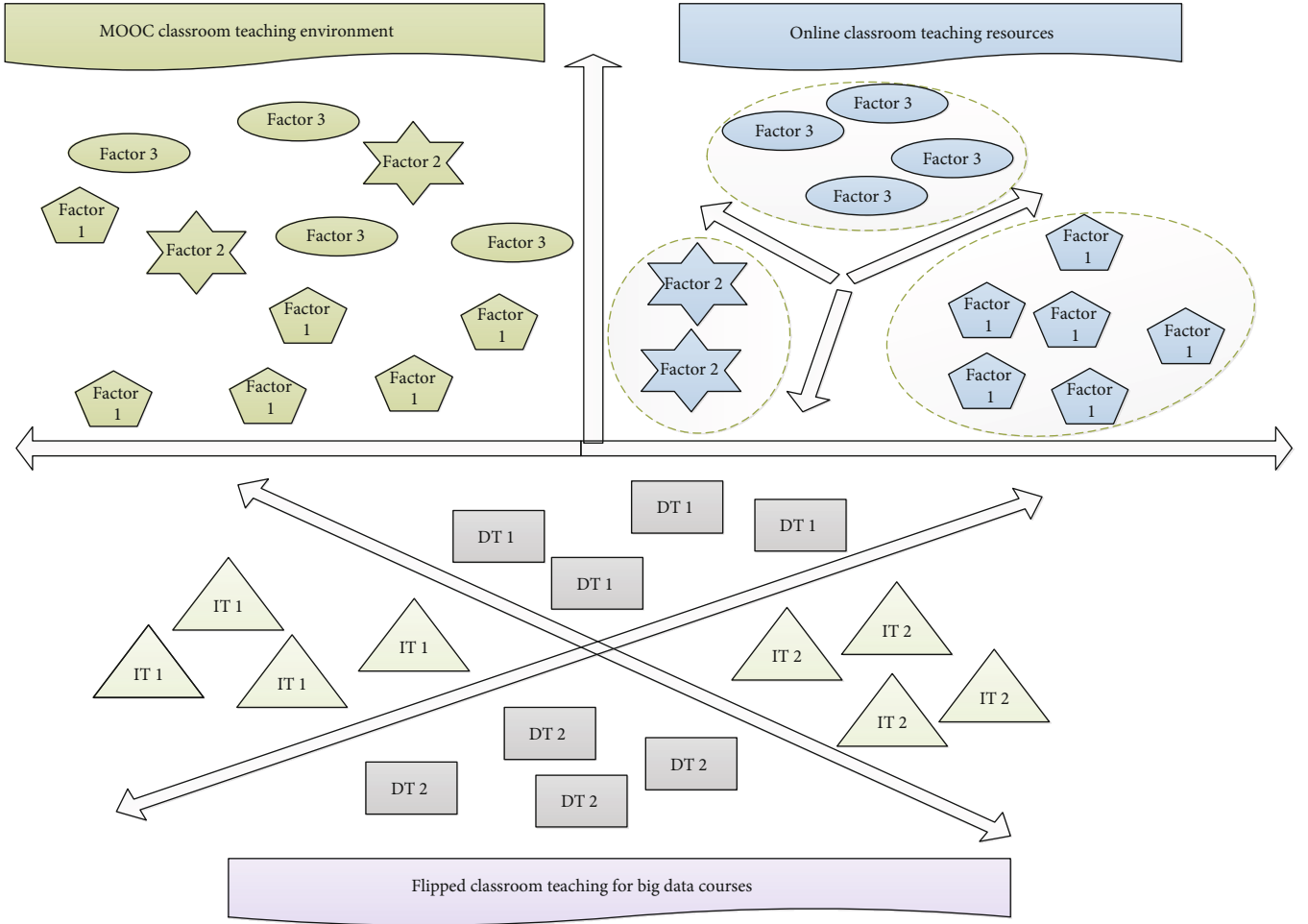


FIGURE 6: The division of design elements of flipped classroom teaching content.

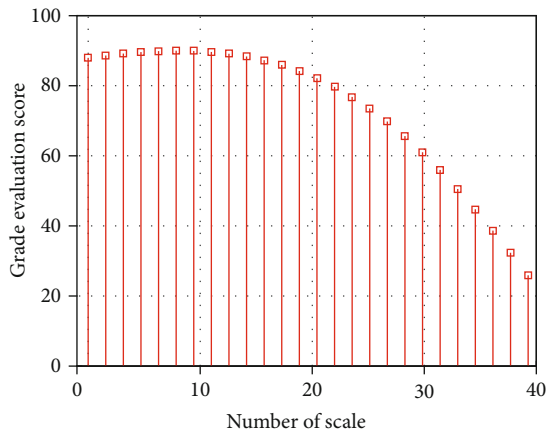


FIGURE 7: Evaluation results of the teaching process of the flipped classroom based on MOOC.

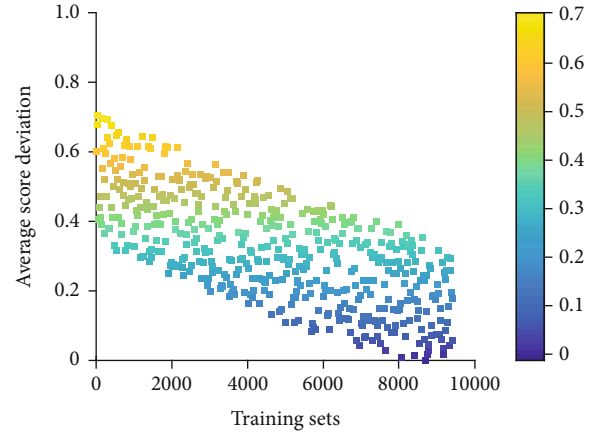


FIGURE 8: Two-dimensional scatter plot of weight score deviation under different training sets of the model.

configuration files on Name Node, and copying Hadoop system to all Data Node. The software and the construction process of the cluster environment are placed on the school network platform as teaching resources, and the students build the cluster environment in groups. For the problems encountered by the students during the environment con-

struction process, the group communicates with each other, and teachers can guide as needed. There are four ways to evaluate SPOC-based flipped classroom teaching effects: in-class test evaluation, homework evaluation, peer evaluation, and assessment evaluation. For learners, they are more inclined to use in-class test evaluation and comprehensive

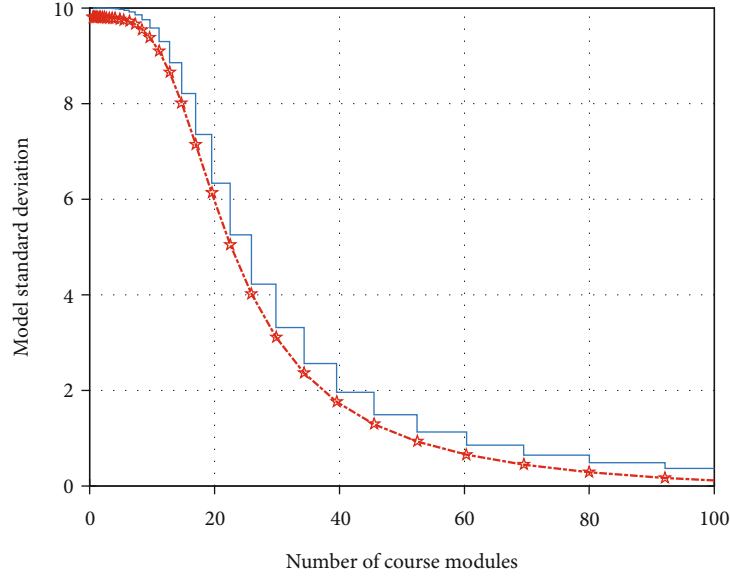


FIGURE 9: Model evaluation statistical standard deviation ladder diagram.

evaluation. The in-class test evaluation can more intuitively detect your own learning effect, and the comprehensive evaluation can more comprehensively understand your own learning effect. After class, teachers and students on the school network platform combined with other members of the team jointly score the performance of the HDFS construction process according to different weights. Figure 8 shows the weight scoring deviation of the model under different training sets' two-dimensional scatter plot.

The SPOC platform discussion area is divided into 3 submodules: teacher Q&A area, classroom communication area, and comprehensive discussion area. From it, we can see that the number of participants in the teacher's Q&A area is small, the number of people in a single day is basically below 100, and the daily number of people fluctuates widely. It shows the relevant situation of the top seven topics in the classroom exchange area. We can see that 3 of these 7 topics are attended by teachers, the number of views reached 4012, the number of replies was 4796, and 482 votes were voted. The seventh-ranked topic was Discussion 1, and the number of views reached 9474. The number of replies was 7937, and 193 votes were cast. The change reflects the enthusiastic discussion in the classroom exchange area, and the topic content is more inclined to the Internet.

Figure 9 shows a ladder diagram of the statistical standard deviation of the model evaluation. We can see that in terms of online learning, the highest score of students is 100 points, the lowest score is 4 points, the average score is 84.15, and the standard deviation is 5.661, indicating that the online learning scores of the studied student groups are quite different. Online learning is not a necessary learning link, it does not have much appeal to students, and it is optional and only part of the course videos is watched. Regarding online discussion, the highest score of students is 100, the lowest score is 75, the average score is 90.15, and the standard deviation is 5.161, indicating that the differences in the scores of online discussions among the stud-

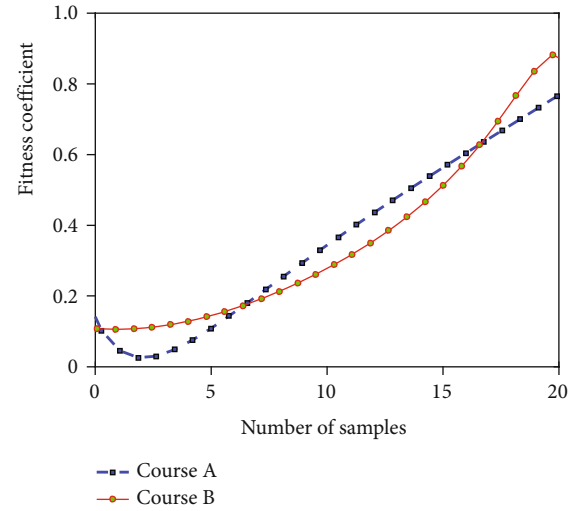


FIGURE 10: Curves of fitness coefficients of different courses.

ied student groups are small, which means that students generally like online discussions and are willing to invest more time to the online discussion. Otherwise, we can see that 76.03% of the students agree with "you like the flipped classroom teaching model used in this course," but only 8.57% disagree, which shows that this teaching model is very popular among students. From that, we can see that 68.79% of the students agreed with "this model can improve learning efficiency," while only 2.49% disagreed.

Figure 10 shows the fitness coefficient curves of different courses. We can see that as the number of samples increases, the value of the best fitness keeps increasing until the number of iterations exceeds 20 and the algorithm ends. As the number of samples increases, the average fitness shows a trend of substantial increase. The classification result of the training set is 85.1823%. According to the best parameters selected by genetic algorithm $C = 1.2871$, $g = 6.3459$, tested

in the test set, the classification accuracy rate obtained is 84.7671%. The average fitness also decreases slightly at the beginning of the algorithm and then gradually stabilizes. The classification result on the training set is 85.1531%. According to the best parameters selected by the particle swarm algorithm $C=9.6356$, $g=0.5471$, after testing on the test set, the classification accuracy rate is 86.0152%. Through the comparison of experiments, it can be seen that the classification accuracy of the particle swarm algorithm is slightly higher than that of the genetic algorithm on the training set and the test set. It can be seen that the number of people has shown an obvious trend of change with the development of the course. At the beginning, students are more motivated to learn, but gradually, the number of people watching videos is getting less and less, reflecting that students' learning initiative is getting weaker and weaker. The convergence speed of the algorithm is faster than that of the other algorithm.

5. Conclusion

This research combines MOOC and SPOC to promote the transformation of college classroom teaching mode in the form of flipped classrooms. This transformation enables MOOC to be implemented in college physical classrooms. At the same time, MOOC and SPOC provide high-quality preclass learning for the implementation of flipped classrooms. In this paper, combining the Hadoop platform that has been widely used in recent years, using the advantages of Hadoop's ability to effectively store massive data and natural support for parallel computing, a parallel SVM algorithm based on Hadoop is designed, which greatly improves the training speed of SVM and uses two heuristic parameter optimization strategies (particle swarm algorithm and genetic algorithm) to optimize SVM parameters so that the classification accuracy rate has been improved to a certain extent. Experiments have verified the effectiveness of the algorithm, and in view of the uneven characteristics of the sample data of the MOOC platform, a parameter weighting solution is proposed; the availability of the processing method is also confirmed in the experiment. Based on the results of SPSS software data analysis, this paper proposes that the implementation of MOOC-based higher education flipped classrooms requires comprehensive consideration of concept changes and in-depth analysis of the feasibility of implementing MOOC-based higher education flipped classrooms. The generalization ability of the classifier and the improvement of classification accuracy are obtained. This significantly improves the training speed of the SVM algorithm when processing massive amounts of data and at the same time ensures a better classification accuracy, and in view of its shortcomings, two suggestions for improvement are proposed and applied to processing large-scale data sets, which greatly improves the training speed of SVM.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The author does not have any possible conflicts of interest.

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