

Application of Data Mining in Network Instructional platform of "Modern Educational Technology" for Different Teaching

Qiuxiang Shi¹, Jianying Li² and Liying Wang³

^{1,2,3}Department of education, Hebei Normal University of Science & Technology,
Qinhuangdao, Hebei, P.R. China, 066004
¹26870628@qq.com, ²308017808@qq.com, ³40400149@qq.com

Abstract

The problem of difference teaching is solved by that the data mining is used in network instructional platform of "Modern Educational Technology". This paper introduces difference teaching and data mining, analyzes learning elements and data in network instructional platform, elaborate the realization of the difference teaching by the application of data mining. Practice shows that the application of the data mining in network instructional platform of "Modern Educational Technology" which pays attention to the difference between learners, provides different resources and interactive strategy from curriculum resources recommended and assisting teachers to make decision, promotes each student's full development.

Key words: Data Mining, Different teaching, Network instructional platform, Modern educational technology

1. Introduction

In recent years, "the reform of basic education" and "the training for educational technology" are still the hot topics in the field of education. With the development of educational informatization and the reform of basic education unceasingly thorough, the educational technology quality of primary and secondary school teachers has become an important factor which will affect the overall reform of education. The State Council of the Central Committee of the Communist Party of China pointed out: "Modern educational technology is a commanding height and the breakthrough of modern education reform" in "The decision of the deepening education reform and enhancing the quality education comprehensively". The capability of educational technology is one of the basic qualities of modern teachers. its core is the information instructional design ability which contains reasonable use of new technologies (mainly the multimedia and network technology), scientific and specific planning of the teaching process, teaching activity and teaching step based on the teaching theory and learning theory, promoting the cultivation of innovative talents [1]. In order to speed up the construction of the educational informationization for teacher, the country published "primary and secondary school teachers in modern teaching ability standard (Trial) " standard and "national medium and long-term educational reform and development plan (2010-2020)", launched and implemented the construction plan of educational technology ability and the national training plan of primary and secondary school teachers. National educational technology standards for teachers used to measure the level of teacher's pre service training in USA. The foothold of educational technology standards for primary and secondary schools teachers is the continuing education of teachers in China. Normal universities set public course of "modern educational technology" which is a public compulsory course for training normal students' teaching ability of information technology.

Through teaching practice in many years, we found that the difference is an important factor to influence teaching effect, knowledge and skills transfer. Along with the rapid

development of computer network technology, E-Learning breaks of the limits of time and space in the traditional teaching, pro-vides a flexible learning environment and many chances for more and more people to learn new knowledge and techniques. E-Learning developed widely and quickly with the improvement of the acceptance of E-Learning. "Modern educational technology" is in the initial stage of public courses and its curriculum is reforming. Many normal colleges and universities pay attention to the development of network instructional platform. "The basic education curriculum reform outlines(Trial)" required respects on students' personalities in teaching procedure, pay attention to individual difference, and inspire students' study enthusiasm by creating educational environment that can lead to attendance of students, so that to promote students' fully development. The starting point of different teaching is the individualized teaching. Its main idea is to find differences, respect for differences, use difference to realize personalized learning, and promote all-round development of students. [2] The problems must to be solved in the development of network instructional platform process problems to be solved that how to realize the difference teaching and how to make the difference teaching concepts into the normal school students' educational technology ability.

The data mining is a wide, crossed and new subject, involving databases, artificial intelligence, mathematical statistics, visualization, parallel computing and other fields. It is a procedure of distilling implicit information and knowledge which people do not know in advance but potentially useful from a large, incomplete noise, ambiguous and random data. More and more information data exist with the increasing use of the network instructional platform of "Modern Educational Technology". The applications of the data mining in the network instructional platform of "Modern Educational Technology" will undoubtedly have practical significance. The knowledge can be found in the large amounts of data can enhance the intelligence of Web-based course, help teachers to complete a higher level of decision-making, timely adjustments to the network structure and the improvement of the content of courses, and have a better guidance for distance learning. In that case, the learning effectiveness of the modern educational technology course will be improved.

In order to cultivate pre service teachers who meet the requirement of "primary and secondary school teachers in modern teaching ability standard (Trial) ", we establish the network instructional platform of "modern educational technology". It is a part of stereoscopic teaching material of modern education. The data mining is used in network instructional platform for different teaching. The reform of modern technology will promote the development of the future teachers' professional ability and the reform of basic education. The study result is useful for the integration of information technology and curriculum, to enrich the theory and practice of individualized learning, promote the informatization construction in primary and secondary schools in China, and provide a theoretical basis and practical reference for the public course of "modern education technology".

2. Different Teaching

2.1. The Definition of Different Teaching

In recent years, along with the people to the education and teaching theory, personalized education has received more and more attention from all walks of life, different teaching has emerged. Different teaching is now playing very important role in teaching practice. American famous different teaching expert Carol Ann Tomlinson pointed out that difference teaching should have the following characteristics in his book "different teaching of multi-ability in classroom". Teachers focus on the students' differences in the process of instructing; (2) Different teaching pay attention to more

quality than quantity. (3) Different teaching is based on evaluation; (4) Provide multiple choice of learning content, process and results; (5) Take the teaching as the center; (6) Different teaching is the combination of collective instruction, group instruction and individual instruction; (7) Different teaching is the organic combination of teaching and learning.[3] American scholar Diane Heacox pointed out:" the implementation of the difference teaching means that teachers change their teaching speed, level or type in order to adapt to the needs, learning style or learners' interest " in his book "difference teaching so that each student success."[4] Professor Guodong Hua believes that "different teaching means to meet the individual needs of students based on the differences between students and students in class teaching in order to promote the development of students."[5]

Based on the research results of previous scholars, the author gives the following definition. Different teaching is refers to that the individual differences of students are pay attention and use in the teaching activities, and promote each student to obtain the full development based on the original cognitive structure, so as to promote the all-round development of students in teaching.

2.2. The Characteristics of Different Teaching

Different teaching pays attention to the individual differences between students and students, teaches students in accordance with their aptitude on the basis of the differences, and promotes the development of each student. Different teaching has two basic characteristics of diversity and dynamic. It has several characteristics such as fostering strengths and circumventing weaknesses, sharing differences, evaluation of the dynamic production and different evaluation.

2.2.1. Different Teaching Pays Attention to Individual Differences. It is one of the theoretical basis of differences in teaching that multiple intelligences theory of Howard Gardner. The theory of multiple intelligences emphasize people is to have a variety of intelligent, specifically include linguistic intelligence, logical - mathematical intelligence, spatial intelligence, music intelligence, body movement intelligence, interpersonal intelligence, intrapersonal intelligence, *etc.* There are differences between learners, including the character, specialty, hobbies, learning ability. [6] Different teaching emphasizes differences between learners because the difference is objective existence in the teaching process. These differences not only exist in activities of students, but also affect the teaching activity of teachers. In the teaching process, teachers should fully understand and respect the individual differences of students, foster strengths and circumvent weaknesses, encourage students to develop advantages, realize the personalized development. At the same time, teachers will be differences as an important teaching resources and wealth, make up for the insufficiency and limitation of individual students knowledge view through sharing differences.

2.2.2. Different Teaching uses a Variety of Teaching Strategies. The position of students will be as the subject of study. In order to promote the full development of students in the original cognitive structure, different teaching requirements to build a variety of teaching strategies to meet the needs of students on the basis of respecting of differences between students. In the teaching process, different teaching emphasizes the construction of the system of teaching strategies from the teaching target, teaching content, teaching process, teaching methods, teaching organization and teaching evaluation on the basis of considering the students' individual difference [7]. For example, the teaching goal of the public course of modern educational technology has the difference, because that the process of setting teaching goal considers the different learning needs of varying degrees (College and University), students from diverse backgrounds studying and the development of the neighboring region of students. Teaching content should be optional. All the students have a common learning content, set up different learning content with

professional features at the same time. In addition, the course sets some elective content according to the different learning interest and style of students. On the basis of the three-dimensional teaching material, the flexible teaching methods were used in the process of course teaching, such as teaching, demonstration, the group cooperation teaching method, task driving method, situational teaching method *etc.*

2.2.3. Different Teaching should be Available to all Students. It pursues the unity of general character and individual character. In order to face all the students, Teachers should respect each student, pay attention to individual differences and meet the students' needs in the teaching process. In the process of implementing public courses of educational technology, teachers should pay attention to the training of students' ability of using educational technology, and improving students' information literacy based on combining with professional features students and student interest in learning. Create a variety of learning situations, encourage independent learning, cooperative learning, stimulates the students to study the educational technology courses enthusiasm, and apply educational technology to solve professional problems. In the process of teaching content, finish the teaching case design by using the method of task driven as a group combining with "adolescent mental health and counseling" in the professional courses of students who learn applied Psychology. In the process of learning this content, students can be improved at the original level. Students made their own contribution to the task of solving, get the collective sense of honor and ability to work with others by developing strengths and avoiding weaknesses based on their interests and strengths.

2.2.4. Different Teaching Requires Implementation of a Variety of Teaching Evaluation. The purpose of different teaching is to develop the potential of each student. The assessment of teaching is no longer a single level evaluation or survival of the fittest type selection, but to provide high quality education for every student, satisfy the learning needs of students and promote the development of students' personality as much as possible through evaluation truly. The evaluation system of modern educational technology curriculum is the multiple evaluation system of self-evaluation, student evaluation and teacher evaluation which based on formative evaluation. Formative evaluation records the history of the development of students, promotes the development of students and inspires students' potential through finishing a series of task in course of modern educational technology.

3. Data Mining

With the rapid development of information technology, people know what to do who are facing the complicated huge amounts of information at a loss, a number of important knowledge requires people to dig. Cambridge professor James Lighthill criticizes artificial intelligence because that artificial intelligence does not solve the actual problem in the 1870s. During this period, the focus of a number of researchers who dedicated to machine learning research, were shifted to areas with a background in industrial and commercial applications, and ultimately to establish and develop data mining techniques. [8]

3.1. Overview of Data Mining

Data mining is to extract or dig knowledge. From a statistical point of view, data mining is the process of finding unknown relationships between credible data and providing understandable, novel and useful data for owner of data by analyzing observed data. From the perspective of the database, the data mining is the process of discovering interesting knowledge from massive data which is stored in databases, data warehouses, or other information in the repository. Data mining is a procedure of distilling implicit

information and knowledge which people do not know in advance but potentially useful from a large, incomplete noise, ambiguous and random data [9].

Data mining is regarded as a process of "data clustering" or "data generating" in order to extract useful information. The process can be described as Figure 1. It finds the relationship between model and data in massive data through the use of a variety of analytical tools. These models and relationships can be used to make predictions.

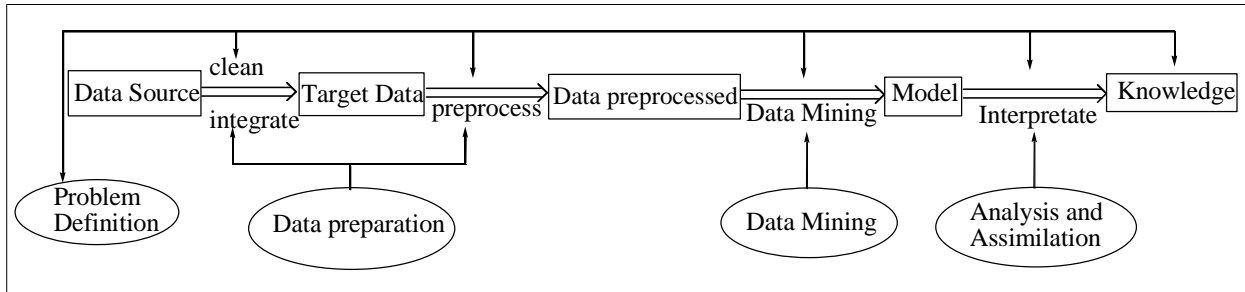


Figure 1. The Process of Data Mining

Data mining is mainly carried out in databases, data warehouses, Internet, text and other information sources. Data mining process generally consists of problem definition, data preparation, data mining, the results analysis and the assimilation of knowledge. The process of discovering valuable knowledge from large data source can be summarized as follows: first, to extract data of interest from the data source, and organize it into suitable organization for mining; then, call the corresponding algorithm to generate the required knowledge; finally, evaluate the generated knowledge models, and integrate the valuable knowledge into the business intelligence system.

3.2. Classification of Data Mining

Data mining is divided into association rules mining, classification rules mining and clustering rules mining according to the mining tasks.

3.2.1. Association Rules Mining. Association rules were proposed firstly by Agrawal *et al.*, in 1993. Then many researchers have done a lot of research on it. In a word, association rules are given a set of projects and a record collection, deduces correlation between the projects by analyzing the records collection [10]. Market basket analysis is a typical application of association rules mining. This application is based on the business transaction database, which recorded every business transaction in a sales point. In Wal-Mart supermarket in the United States, there is an interesting phenomenon that diapers and beer was put together to sell. They have absolutely nothing to do with each other. Through mining massive transaction data and analyzing its result, people can found an association rule: {Diaper} → {Beer} (support=10%, confidence=80%). This association rule means that 10% of customers buy beer and diapers, 80% of customers who buy diapers are sold beer. The discovery of association rules can prompt the store staff to timely adjust the shelf.

Association rules can be defined as follows: set a collection $I = \{i_1, i_2, i_3, \dots, i_n\}$, a transaction database is A , a collection of data items is T , and $T \subseteq A$. Assume that X is a collection of items, if $X \subseteq I$, then A support collection X . The implicit association rules are as follows: $X \Rightarrow Y$, where $X \subseteq I$, $Y \subseteq I$, and $X \cap Y = \emptyset$. It follows that "if X , can derive Y also established". [11] The key of association rules method is to find all the confidence and support of more than a given value of the rules. It is generally used for mining large amount of data. Apriori algorithm is the most widely applied in association rules. It gets the data item sets by the method of circular scanning database, and completes mining the original data. [12]

Association rules are used to push learning resources for students, provide the basis for the construction of teaching content in network course and network curriculum structure in network instructional platform of "Modern Educational Technology".

3.2.2. Classification Rules Mining. Classification method is widely used in the process of data mining. Data classification is to analysis a group of objects in the database, identify their common property and divide these objects into different categories according to the classification model [13]. At present, the classification algorithms commonly used are decision tree classification, bayesian classification, genetic algorithm, rough set algorithm and fuzzy algorithm. Data classification process mainly includes two steps [14]: establish a category or concept model which describes known data set and use the obtained concept model or category to classify. In network instructional platform of "Modern Educational Technology", data mining classification rules can be used in various conditions, such as intelligent judging, analyzing performance of learner, forecasting learning situation of learner, learning navigation.

3.2.3. Clustering Rules Mining. The applications of clustering rules are too varied to enumerate. Clustering is one of data mining models. It can find separately the deep information which distribute in the database, summarize the characteristics of each class. It can also be used as preprocessed data in other data mining preprocessing. Clustering classified a set of physical or abstract objects to several categories according similarity. Its purpose is to make the distance between objects in the same category only may be small, while the distance between different classes of objects as large as possible [15]. Clustering algorithms can be divided into partitioning methods, hierarchical methods, density-based methods, grid-based methods, model-based methods. In network instructional platform of "Modern Educational Technology", clustering rules can be used to distinguish different groups of learners, and summarize the characteristics of each group, find the characteristics of a potential population, provide different service for different groups, realize the different teaching.

4. Analysis based on Network Instructional Platform of “Modern Educational Technology”

Network Instructional platform is the construction of three-dimensional learning resources. It is instructional contents reform based on different teaching in course of "Modern Educational Technology".

4.1. The Analysis of Study Factor in Network Instructional Platform of "Modern Educational Technology"

The study Factors consists of learners, teachers, network instructional platform and online course support system in Network Instructional platform of "Modern Educational Technology".

4.1.1. Learners. Learners are the core elements in network learning [16]. Network course of "Modern Educational Technology" is used for many classes undergraduate such as liberal arts, science and art in Hebei Normal University of Science &Technology. Different students will affect the behavior of online learning. But their common point is to have mastered the basic information technology, had certain technical support, been very familiar with network, have strong divergent thinking and willing to use network course learning.

4.1.2. Teachers. Teachers include subject professors, tutors, curriculum developers and technical support staff. Subject professors and tutors come from educational technology

department and teach relatively fixed class. They are familiar with students, can effectively construct personalized curriculum integration activities and enhance the application of education technology in the different subject teaching. Curriculum developers and technical support staff consists of teachers and postgraduates. Curriculum developers are responsible for the development of the network system and the curriculum resources. Technical support staff is responsible for the maintenance of the network course, diagnosing, finding and solving the technical problems which are encountered by learners in the learning process, management of web course background database, providing technical references for the students.

4.1.3. Network Curriculum Resources. It is consist of course resources, expand resources, media resources and joint construction resources. Course resources describe the theoretical system of educational technology. Its characteristics are comprehensive content, existence of graphic, image, luxuriant, and WMV format video in the classroom. Expand resources introduce the forefront of educational technology theory, such as IT papers, educational technology network resources *etc.* They update frequently and enrich students' knowledge. Media resources contains multimedia courseware, video and virtual teaching environment. Joint construction resources are generated by teachers and students.

4.1.4. Online Course Support System. Online course support system includes authentication and allocation of management rights, resource management and maintenance functions, instructional management features, online learning monitoring and recording functions, discussions and exchange of Q & A guidance function, online learning evaluation functions. As a result, there are many detailed records of network learning activities of learners, and it can monitor network learning behavior of learners, convenient support for learners' network learning.

4.2. Data analysis in network instructional platform of "Modern Educational Technology"

The basis of data mining is detailed information of network programs running. When the network instructional platform of "modern educational technology" was used, a large number of real information and complete online learning records were produced, such as user information, score information, course content information, counseling and resource information, learning activities information, interactive information. Efficient Mining of this information provides strong support for the different teaching in educational technology courses.

5. Application of Data Mining in Network Instructional Platform of "Modern Educational Technology"

There are various applications of data mining in network instructional platform of "modern educational technology", such as curriculum resource recommendation and assisting teachers to make decision.

5.1. Data Mining Application in Curriculum Resource Recommendation

5.1.1. Application of Association Rules Mining in Curriculum Resource Recommendation. Learning resources will generate a lot of learning behavior information in the network course. The analysis of this data by using association rules mining algorithm, will find frequent access to resources and recommend curriculum resources for students. After student login network instructional platform of "Modern Educational Technology", the log file will be produced when they learn the related

resources. These log files are recorded in the student's personal record in database. The platform will recommend resources for students when find the relevance between resources by data mining. When students learn a resource, the information accesses will automatically be stored to resource access information table in the database. Resource access information is showed in the Table 1. The resource transaction table is generated by using resource access transaction recognition algorithm (Table 2) to identify resource access information table. Resource access transaction recognition algorithm and resource transaction are shown in the Table 2 and Table 3.

Table 1. The Resource Access Information

User ID	Resource ID	In-time
1812100109	A501815	2013-10-21 9:03:05
1812100210	F102805	2013-10-21 9:13:15
1812100109	C00085	2013-10-21 9:46:20
1812100302	F102805	2013-10-21 9:50:10
1812100109	G401800	2013-10-21 10:46:20
1812100210	M12045	2013-10-21 10:50:06
1812100109	J00345	2013-10-21 11:20:40
1812100302	Q12098	2013-10-21 11:10:46
1812100210	A501815	2013-10-21 11:30:08
1812100302	A501815	2013-10-21 11:40:28

Table 2. The Resource Access Transaction Recognition Algorithm

Algorithm	Input	Output	Description
The resource access transaction recognition algorithm	The resource access information table	The resource transaction table	While(No identification record) If(User ID does not exist) If(ResourceID does not exist) Courses will be joined resource access course sequence of the corresponding user else Create a new transaction records to username

Table 3. Resource Transaction

Resource access transaction	User ID	Resource ID access sequence
A1	1812100109	C00085,A501815,G401800,J00345
A2	1812100210	A501815,F102805,M12045
A3	1812100302	F102805,A501815,Q12098

Frequent set mining resources is found by association rules mining of Apriori algorithm based on resource transaction set in the transaction table. If minsup=40% and minconf=70%, then the frequent set {F102805, A501815} can be found from the transaction table fragments, the rules can be showed: {F102805} → {A501815}. The corresponding resources identified are definition and application of educational technology according to resource number. The rules can be explained more than 70% of students concerned about network courses, performance, *etc*, definition of educational technology pay attention to its applications. So if a student learns the definition of educational technology, we can recommend him to learn or review the application of educational technology. The recommended curriculum resources, provides the different teaching content for learners, can meet the needs of different learners. It is an application of different teaching in the network instructional platform.

5.1.2. Application of Clustering Rules Mining in Curriculum Resource Recommendation. Different curriculum resources are recommended for learners in network instructional platform of "modern educational technology". First, according to the level of interest in the different resources, learners are divided into different clusters through cluster analysis. Then, look for a learner who is the greatest similarity of target learners in the same cluster. Resources are recommended to target learners based on the basis of the learner's interest of different courses. Different resources are recommended to different learners through the platform which is mainly based on collaborative filtering recommendation technology with clustering, so as to realize the personalized recommendation.

(1) Collaborative filtering recommendation technology with clustering. Recommendation technology is the key to the system of recommendation, largely determines the performance of the recommendation system. Collaborative filtering recommendation technology was first applied in recommender systems and one of the most successful technologies. It generally uses nearest neighbor technique. The distance between users preferences is calculated by the history information of user, the target user's preferences for a particular commodity is predicted by the weighted evaluation values of product of the nearest neighbors of target user value, so as to recommend product to target user. Collaborative filtering recommendation technology with clustering refers to divide users into different clusters by the clustering analysis technology according to the similarity principle, and recommend the user evaluation information to the target user in the same cluster synergy. The intersection, of the product interested in by customers who belong to the same cluster, is often more larger. Therefore, it will have a very high efficiency and accuracy to find the users to meet the requirements in the same cluster. For example, a cluster of customers, who are lady married with kids, purchased mainly toys, children's food in electronic shopping; another cluster of customers, who are high-income earners, purchased expensive imported goods mainly.

(2) The curriculum resource recommendation system with collaborative filtering based on clustering is divided into three steps: data collection and pretreatment, collaborative filtering and resource to push. The flow chart of the system is showed as Figure 2.

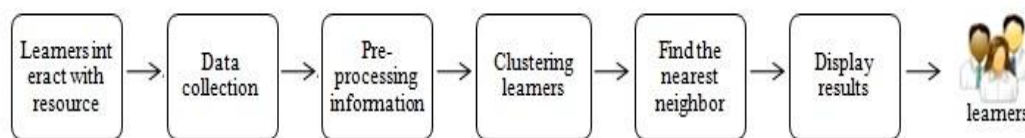


Figure 2. The Flow Chart of Curriculum Resource Recommendation System

In the stage of data collection, when learner can access the curriculum resources, the system will automatically record the interactions between learner and resource, such as user ID, resource ID, and this interactive mode. There are three kinds of interactions: browsing, collection and customization, denoted respectively by 0, 1 and 2. The different interaction represents the level of learners' preferences to learn this resource. The extent of the learner's preferences of learning this resource is gradually increased In accordance with the order: browsing, collection and custom. Curriculum resource information is stored in the resource information table. The resource information is showed as Table 4. When a query is sent by the learner, the result is returned to the learner in the form of metadata.

Table 4. The Resource Access Information

The field name	Meaning	Type
ResourceID	Identity of resource	BIGINT
Resource name	The title of resource	STRING[[]]
Subject	Tip content of resource	STRING[[]]
Class	Type of resource	STRING[[]]

How to obtain the degree of learner's interesting in a resource? On the one hand, if the certain resource is customized by learners in the teaching platform, so that he have a very high interest in the resources. On the other hand, the level of interest in learner viewed resource information is obtained by analyzing the website log files.

Learners' evaluation of resources is divided into the explicit evaluation and the implicit evaluation. The explicit evaluation requires specialized questionnaire investigation, is usually assess certain resource in numerical form by learners. If learners want to obtain help from recommend system, you need to submit his evaluation on some resources to the system. The implicit evaluation usually is derived from the data resources, through the analysis of the implicit preference information, and finally to map the information for the explicit evaluation information. For example, one of the implicit preference information is the analysis of learner's browsing time or analysis of the learner's custom record in each page. The evaluation information can be mapped to a evaluation form which is showed as Table 5.

Table 5. Learners' Evaluation Information of Course Resources

	user_1	user_2	user_3	user_4	user_5
resource_1	0	1	2	1	0
resource_2	5	0	1	2	5
resource_3	3	2	1	0	3
resource_4	1	5	4	3	1
resource_5	5	3	5	4	?

The numbers in table5 refer to learners' evaluation value of resources. The higher the value, the more like the resource that the user. It is found that the learning preference of user_1 and user_5 is consistent. Therefore, we can judge the user_5 would like resource_5.

After get the learner's interaction information with the platform, these information will be preprocessing. The process of preprocessing information is that the new information obtained in data collection stage and old information are combined and stored together. In order to save storage space and speed up the system of running speed, a learner's information is stored to a record in a database. Each learner information is represented a one-dimensional string. This string only contains the resource ID and the weight value of resource which is interacted with the user, ignore those resources which are existing in system but there is no interaction with the learner's resources. Every element in the string, are expressed the degree of learner's like in the resource, is also known as the weight of learners interacting with resources. The process of preprocessing new information obtained in data collection stage is known as the weight adjustment process.

There is a mass of learners in network instructional platform of "mode educational technology". It is impossible that find a neighbor of learners one by one in all the learners in all learners by calculating similarity. In order to narrow the scope of the search neighbor, reduce the time complexity, the system will cluster for all learners before finding neighbors. It is the purpose of clustering analysis that learners have similar behavior model are gathered in a cluster. In generally, two identical learners with learning preference rarely exist. Learners are taken as neighbor users who have similar preference with the target learners by quantitatively calculating similarity degree of preference

between user_5 and other users. There are two kinds of methods used to find neighbors. The first method is center-based neighborhood that a number of nearest neighbors are selected to the object user. The second method is aggregate neighborhood. First, select the nearest neighbors of the object user. Second, the center of the neighbors is set. Then choose the nearest neighbor of the center of neighbor collection, and repeat step 2 until a sufficient number of neighbors are selected for the object user. When the neighbor list of the users is got, resources are recommended to user in accordance with the neighbor list. The table of resources recommend is used most frequently in the resources recommend process, and is a most important table. It is used to store the required data and the result produced in the process of resource recommended. The structure of the table of resources recommend is showed as Table 6.

Table 6. Learners' Evaluation Information of Course Resources

The field name	Meaning	Type
ID	Identity of learners	BIGINT
ItemData	Interactive data of learners	STRING[][]
Recommendlist	Tip List of resources recommended	VARCHAR(300)

When a learner logs in the platform, the content of the "RecommendList" field in the record corresponding this learner will be served as recommend resources to this learner, which are displayed in the form of a hyperlink. The recommended result is showed as Figure 3. The result is displayed to the learner for navigation resources for learners.

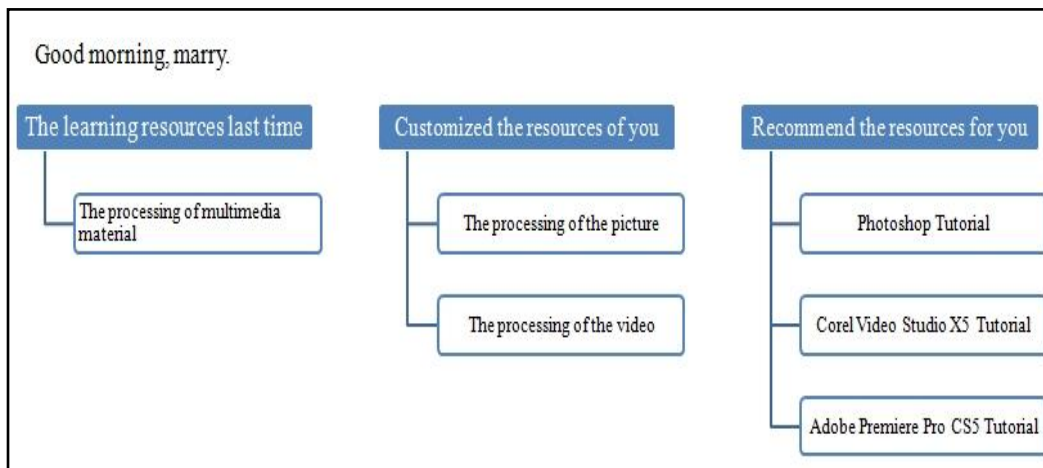


Figure 3. The Flow Chart of Curriculum Resource Recommendation System

5.2. Data Mining Application in Assisting Teachers to Make Decision

In network instructional platform of "modern educational technology", the module of supporting decision can provide the analysis of the content related with learners for teachers, for example, registration information of user, learning activities, learners job and evaluation of learners, etc. It can also provide information about the analysis of resource used for teachers. Data mining is a process of supporting decision. It extracts, transforms, analyzes and process modeling on a large amount of data, in order to extract the critical data of auxiliary decision. In network instructional platform, the learning situation learner was obtained through statistical analysis and association rules analysis.

5.2.1. The System Structure of Analyzing Learners' Information. The system of analyzing learners' information mainly consists of three modules: data collection module,

statistical analysis module and association rules mining module. The system structure of analyzing learners' information is shown as Figure 4.

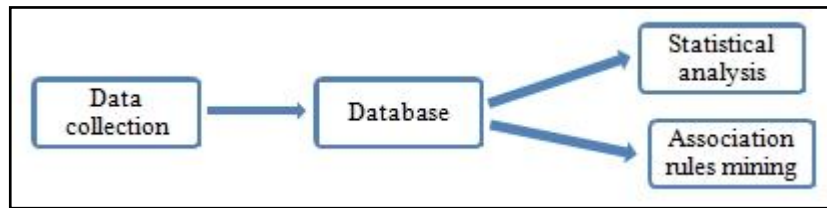


Figure 4. The System Structure of Analyzing Learners' Information

5.2.2. Data Collection Module. The module of data collection is mainly responsible for tracking and recording online learning situation, the collection and quantification of learning information and storing information in a database. The information of learners consists of learners' registration information, resources learned and the information of discussion in BBS. Three tables, such as Student.dbf, S_study.dbf and S_forum.dbf, were defined in order to collect and record data. The learners' professional characteristics are known from Student.dbf. The time length of learning resource is recorded in S_study.dbf. The activity of the forum is concerned about is stored in S_forum.dbf.

5.2.3. Statistical Analysis Module. The module of statistical analysis is responsible for extraction and processing data in database, providing a graphical interface to realize the real-time statistical analysis of online learning behavior. On the one hand, the overall condition and details of online learning are counted in the module of statistical analysis. The function is helpful for more comprehensive and more considerable understanding and mastery the learners' learning process and learning rule. The online learning situation of Ming Li is shown as Figure 5. The learning progress of Ming Li is known by analyzing his learning records from the statistical chart. It is useful for teachers to give targeted guidance for learners. On the other hand, the situation of the resource learned by all learners is counted, such as statistics of the resource being accessed. The function is helpful for understanding the situation of the resource which is learned by learner to adjust teaching content. The log information of the resource accessed of "instructional system design" is shown as Figure 6. It is found that who visited the resource in a day and degree of resources be concerned was analyzed from statistic log. The statistic log of the resource is useful to understand the situation of the resource accesses for teachers for better arrangement of course content.

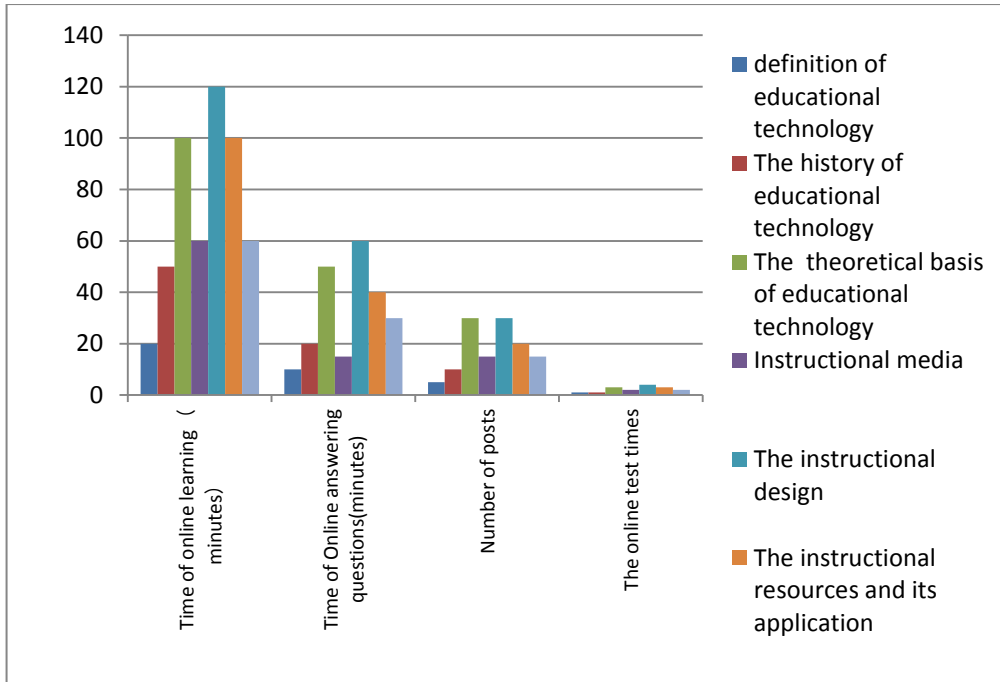


Figure 5. The Statistical Chart of Online Learning Situation of Ming Li

Resource name	Users	Time	Activities
Instructional desi	All users	All	All columns
Total 126 records			
Users	IP	Time	Columns
Ming Li	121.28.15.17	15/08/2013 08:26am	Notice
Min Wang	121.28.15.13	15/08/2013 08:27am	Course learning
Jing Lin	121.28.15.101	15/08/2013 08:29am	Test
Yueling Li	121.28.15.07	15/08/2013 08:29am	Notice
Mingming Shi	121.28.15.12	15/08/2013 08:32am	BBS
Mengjia Zheng	121.28.15.16	15/08/2013 08:33am	Notice
Ning Yun	121.28.15.11	15/08/2013 08:33am	Notice
Hui Wang	121.28.15.27	15/08/2013 08:35am	Test
Qian Liu	121.28.15.28	15/08/2013 08:36am	Notice
Yang Zhang	121.28.15.18	15/08/2013 08:36am	Notice
Hong Zhou	121.28.15.06	15/08/2013 08:38am	BBS
Hai Zhou	121.28.15.05	15/08/2013 08:38am	Course learning
Jing Zhou	121.28.15.03	15/08/2013 08:36am	Notice
Ning Ouyang	121.28.15.26	15/08/2013 08:36am	Course learning
Yuan Yuan Gu	121.28.15.26	15/08/2013 08:36am	Notice

Figure 6. The Log Information of the Resource Accessed of "Instructional System Design"

5.2.4. Association Rules Mining Module. The task of association rules mining module mainly is find related rules by operation of the relevant data through using association rules mining method. The application is similar with the application of it in curriculum resources recommended. This module can dig the potential relationship between the learners' basic information properties by the use of apriori algorithm, such as the type of learners, gender, educational background, the landing time and the total number of posts, etc. In order to help teachers better understand learners and guide the learner's learning, the potential relationship between learners' basic information and learning situation is analyzed through association rules obtained.

6. Conclusion

This paper creatively realizes the different teaching ideas and network curriculum integration through application of data mining in the development of network instructional platform of "Modern Education Technology". By different teaching concept promotes construction of network courses. First, data mining is applied in network course in order to solve different teaching. Then, introduces different teaching and data mining, analyzes network instructional platform of "Modern Education Technology". Last, describes the method of data mining application from the curriculum resource recommendation and assisting teachers to make decision in network course.

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Authors



Qiuxiang Shi, she received her bachelor's degree of education in Hebei Normal University, Shijiazhuang, Hebei. (2004) and received her master's degree of computer technology in Yanshan University, Qinhuangdao, Hebei. (2009). Now she is a lecturer in Hebei Normal University of Science & Technology, Qinhuangdao, Hebei. Her current research interests include educational technology, information technology and vocational education.



Jianying Li, she received her bachelor's degree of education in Hebei Normal University, Shijiazhuang, Hebei. (2005) and received master's degree of computer technology in Yanshan University, Qinhuangdao, Hebei. (2010). Now she is a lecturer in Hebei Normal University of Science & Technology, Qinhuangdao, Hebei. Her current research interests include educational technology and vocational education.



Liying Wang, she received her bachelor's degree of education in Hebei Normal University, Shijiazhuang, Hebei. (2004) and master's degree of education in Tianjin normal university, Tianjin (2008). Now she is a lecturer in Hebei Normal University of Science & Technology, Qinhuangdao, Hebei. Her current research interests include educational technology, data mining and vocational education.

