



Personalized Recommendation Method of Nursing Multimedia Teaching Resources Based on Mobile Learning

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Abstract. Due to the variety and quantity of nursing multimedia teaching resources, the resource recommendation method has the problem of low recall rate. To this end, a mobile learning-based nursing multimedia teaching resource recommendation method was designed. First of all, this paper identifies the law of learning needs, annotates the keywords of teaching resources, and collects the data of students' learning records, so as to improve the recall rate of the recommendation results. Build a user interest preference model, improve the nursing multimedia teaching resource recommendation process, and optimize the mobile learning personalized recommendation model. The experimental results show that the recall rates of the proposed method and the other two methods are 78.627%, 70.615% and 70.200%, respectively, indicating that the proposed method has a high recall rate.

Keywords: Mobile learning · Nursing · Multimedia teaching resources · Personalized recommendation · Learning needs · Information resource system

1 Introduction

In the new century, the rapid updating of nursing knowledge and skills not only requires clinical nurses to have critical thinking ability and strong self-learning ability, but also good communication ability and cooperation ability to cope with the pressure from all aspects, which is also an inevitable trend in line with the requirements of higher nursing education. As the backbone course of nursing specialty, "Nursing Fundamentals" is also the core professional basic course of nursing specialty. It plays a role as a bridge between the preceding and the following in the subject system of nursing, and its practical training course has a strong operability and practicality. As a qualified nurse, you must master and be able to flexibly use the knowledge and skills of Basic Nursing. Due to the age, educational level and other factors, nursing college students may be inferior to nursing college students and postgraduates in theoretical knowledge, comprehensive ability and operating skills. In order to understand the principle, mechanism, nature and reason of nursing in theory, we should combine it with basic medicine and clinical medicine.

At the same time, require students to nursing skills, to achieve accurate, standardized proficiency. This course has higher requirements for the quality of practical training teaching, teacher-student interaction and students' ability to learn independently. Basic nursing is an introductory course for students majoring in nursing. It is a subject that studies the basic theory, knowledge and skills of nursing. It plays a very important role in nursing education. Because of the limitation of teaching conditions, laboratory management and students' insufficient attention, there are many problems in the basic training teaching of nursing. Both from hospital feedback and students' point of view, there are lack of professional skills mastery and proficiency of clinical interns, leading to heavier work burden of clinical teachers, poor clinical adaptability of students, increasing the incidence of occupational injuries and operational errors. Under the guidance of the concept of holistic nursing, the students should have strong practical skills and basic knowledge of nursing, integrate theory with practice, cultivate the ability of observation, comprehensive analysis and problem-solving, critical thinking and innovation, and be able to make use of the knowledge and skills learned to serve the nursing objects. In order to improve the efficiency of nursing learning and improve the recommendation accuracy of teaching resources. This paper proposes a personalized recommendation method for nursing multimedia teaching resources based on mobile learning. This paper identifies the law of learning needs, marks the keywords of teaching resources, and collects the data of students' learning records. Based on this, the user interest preference model is constructed, and the mobile learning personalized recommendation model is optimized.

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2.1 Identify Learning Needs

In the law of learning, the progressive requirement of learning needs, information search is the first step of learners through the use of knowledge and information search. Firstly, learners can find useful information and resources through information search, and in the process of searching knowledge information, they can understand the scope of knowledge information resources more directly, deepen their understanding of knowledge information resources and select the knowledge information they need. Then learners will have to search the knowledge of the necessary additions and reductions and integration of information, many additions and reductions and integration of the final formation of their own concepts. Finally, learners fully digest and assimilate the integrated knowledge and information through search. Therefore, in the process of recommendation, educational resources and subject types need to be corresponding. The diversification of learning needs is mainly embodied in the diversification of learners and the diversification of information content.

Now learners are no longer a single existence of a certain industry and field, can be said to involve different fields of different industries, so the urgent need for information diversification, diversification. Whether rational research or empirical research, it is easy to find that learners' needs are the precondition of learning needs, which requires systematic service institutions to provide personalized knowledge and information environment and pay attention to communication and interaction with learners. Keywords of

resource characteristics, resource retrieval and resource information sharing need to be tagged with Keywords. According to the learner's learning path and learning interaction to create a corresponding information environment, targeted, distinctive, comprehensive information resource system, to provide learners with a quick, easy learning effective access to learning information.

Different learners are not the same regardless of whether they are educated or have already acquired knowledge. For example, learners who graduated from the same school have different degrees of use of existing knowledge and different degrees of demand for new knowledge. How to choose various multimedia teaching resources and make multimedia teaching resources personalized recommend this modern scientific and technological means to serve school teaching, to improve teaching quality [1–3]. Keywords can reflect the important expression of the content of resources, in addition, the weight information of the keywords of resources, also can reflect the importance of the keywords in the resources. The learning needs pattern is shown in Fig. 1:

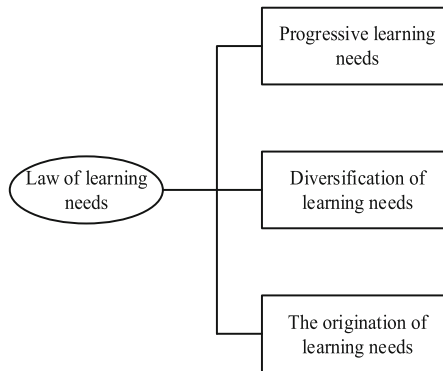


Fig. 1. Structure diagram of learning requirements

As can be seen from Fig. 1, the rules of learning needs mainly include: the progressive nature of learning needs, the diversity of learning needs and the initiation of learning needs. It is of great importance that how to introduce multimedia network technology into teaching so that teachers can deliver more, more intuitive and more accurate information in a specific time and space. The study difficulty descends, thus causes the classroom instruction effect to have a qualitative leap, realizes the multimedia network resources in the teaching optimized design [4].

Another example is that learners with low knowledge base mostly want to learn some universal knowledge, while learners with high knowledge level may pursue some high-level knowledge. Therefore, for learners, the existing knowledge base and level will also have an impact on the hierarchy of knowledge needs. The most objective difference between learners is their age, gender and other natural attributes. If two learners are not the same age, their needs for knowledge are necessarily different. Compared with an old person and a young person, their needs for learning are also completely different. The old person needs less knowledge and the young person needs more knowledge. Of course, the reason for this result has a lot to do with their age.

2.2 Build User Interest Preference Model

User preference information comes from User data, and User data basically includes: User basic information, User learning data, User behavior data. The earliest collection of user preference information is mainly based on user display data, such as: scoring, voting, forwarding, favorites, comments and so on, these data called display score. User's interest, user's characteristic, user's historical behavior and natural attribute are all part of the data feature in the system. After collecting the data, we need to extract the characteristics of the model data from the data. Later, with the development of technology and the need of recommendation precision, the recommendation based on data mining technology is widely studied and used. Through click-through rate, buying behavior, page stay time and so on, the implicit data is obtained, and it is weighted into the user's rating of resources, called implicit rating.

At present, the most popular classification is: explicit information extraction and implicit information extraction. Explicit information collection is a process that requires the active participation of users. Users will actively choose or provide the information they are interested in, such as the evaluation of information items, the sharing, recommendation and collection of resources, and the natural attributes of users. The former is more intuitive, can accurately reflect the user's preference for resources, the latter through the relevant data indirectly access to resources scoring, to make up for the lack of real data sparsity. A feature is an abstract result of an object or of the properties of a set of objects. A feature is a term used to describe a concept [5, 6]. The process of collecting user interest information is very intuitive and reliable, which is very helpful to the interest model. But this way requires user participation, and there is a certain user cost. And research shows that only a few users are willing to provide reliable, explicit information. For example, on a movie website, users often watch action movies and war movies, then the user's interest characteristics are action and war, indicating that the user's preference for movies is action and war movies. User interest characteristics are affected by many factors, such as gender, age, occupation, and behavior. User characteristics can be described in Fig. 2:

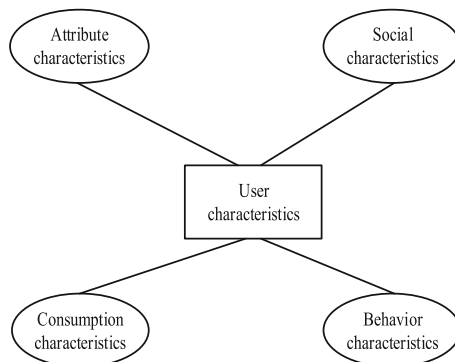


Fig. 2. User characteristics

As can be seen from Fig. 2, user characteristics mainly include: attribute characteristics, social characteristics, consumption characteristics and behavior characteristics. In order to effectively meet the personalized learning of students, personalized recommendation. User attribute features, which are collected from the students, include grade and interesting tags. These data are the basic information that users fill in when registering a website. This will have a certain impact on the establishment and optimization of the whole model, and directly affect the quality of the recommendation. Implicit information extraction process does not require the user's participation in the user's use of the system is automatically collected, there is no user cost. Popular technologies now generally use Web-side technologies such as Ajax or JS, and in the process of working with business logic, the user's behavior is also gathered.

User behavior characteristics is from the user login system, record every time the browsing records, purchase records, click records, collection records and other behavior data. In this system, the number of clicks on the course, the length of stay on the course page and the collection record are collected as behavior data. For example, user browsing, user collection, sharing, mouse trajectory and so on. Compared with explicit information extraction, implicit information extraction has obvious advantages, users do not have to participate in, reducing user costs.

At the same time, the information collected is generally not fabricated by the user. The quality of recommendation is closely related to the quality of user's interest model. User's learning characteristics, which are similar to the consumption characteristics mentioned above, is to collect the data of students' learning records, including the names of courses, grades of course resources, subjects to which the courses belong, and teachers' data.

User Interest Preference Model is the representation of a student's User Interest Preference, which mainly includes two types of features: attribute feature and learning feature. The contents of the attribute features are: students' current grade and interest tag. The contents of learning characteristics are user's curriculum preference, user's learning scope preference and teacher's preference. The quality of the user interest model directly determines the satisfaction of the recommendation results. In practice, user interest model is a kind of data structure. Using the traditional information retrieval technology, user interest model is expressed as a data structure that can be calculated and can also reflect the real interest of users.

2.3 Improved Recommendation Process for Multimedia Teaching Resources in Nursing

The essence of teaching resources recommendation method is to effectively organize the personalized information of users [7]. From the perspective of learner groups, learners' personality characteristics, knowledge background, emotional psychology and learning needs are different. For individual learners, their knowledge background, emotional psychology and learning needs develop dynamically in the process of cognition. Therefore, the student model should include students' static learning characteristics and dynamic changing knowledge structure, emotional psychology and learning needs. Learning process is a complex and continuous process, involving many factors such as psychology, emotion, cognition and so on. The core competencies of nursing students should include six aspects, as shown in Fig. 3:

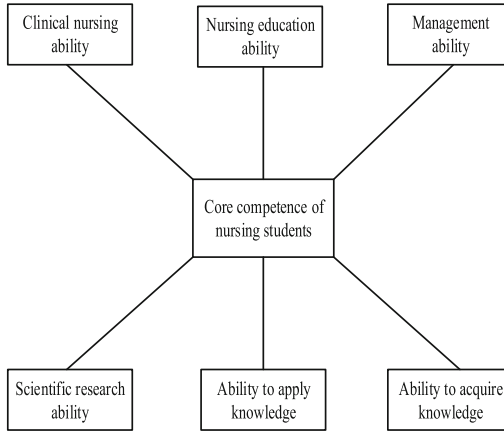


Fig. 3. Core competencies of nursing students

As can be seen from Fig. 3, the core competencies of nursing students mainly include: clinical nursing competency, nursing education competency, management competency, scientific research competency, ability to use knowledge and ability to acquire knowledge. But judging from these six core competencies, it is difficult to categorize them as soft or hard skills. In addition to defining the nurse’s knowledge, competencies, and skills, it also covers individual characteristics, but core competencies also cover skill elements. Therefore, each kind of student model has its suitable scene and category.

On the one hand, the student model must be able to accurately express the characteristics and needs of students, and at the same time facilitate the technical implementation. In view of this, from the perspective of learners’ style (mainly including: media preference, information processing method, cognitive personality style and learning tendency) and students’ knowledge background (mainly including: existing cognitive level and ability level), as well as students’ basic demographic information, students’ model is constructed, and social annotation is adopted to enable learners to participate in the process of learners’ model construction and increase the accuracy of recommended methods. The self-regulated learning ability of nursing students with high professional identity is higher than that of nursing students with low professional identity. Based on the practice of developing teaching resources, the teaching resources in various forms are characterized from the following aspects: serial number, name, brief introduction, keywords, subject attribution, applicable object, editor, creation time, media format, file size, etc. Among them, the educational resources of graphic image format add some technical attributes, such as preview file, resolution, scan resolution, color number and so on. Audio education resources add emotional type, sampling frequency, quantization digit, number of vocal tracks, playing time and other technical attributes.

The educational resources of video format add preview file, emotion type, frame number, frame specification, playback time, sampling frequency, sampling format and other technical attributes. Therefore, in order to improve the students’ autonomous learning ability, we should strengthen their professional identity, encourage them to fully use modern information technology to acquire knowledge, change their teaching concepts,

and make them change from passive receivers of traditional knowledge into active participants. The educational resources of animation format have added some technical parameters such as preview file, emotion type, frame number, frame specification and so on. Added for the network course script word number, image number, audio number, video number, animation number, page number and other technical attributes. For the question bank, the description of the type of question, knowledge points, difficulty, discrimination, cognitive classification, test requirements, reference answers, scoring criteria, suggested test time and other educational attributes are added.

2.4 Mobile Learning Optimize Personalized Recommendation Mode

In the process of mobile learning, the server can be used to actively push learning resources to provide students with a coherent and systematic mobile learning experience, improve the effectiveness of mobile learning, meet the needs of learners for timely access to resource services, and alleviate the problems such as easily interrupted learning and learners' distraction in the process of mobile learning. With the rapid development of mobile technology and wireless communication technology, ubiquitous learning and lifelong learning have penetrated into our daily life and changed our understanding and understanding of learning. Learner's cognitive level is the basis of the choice of learning starting point and learning resource difficulty coefficient. Learner's cognitive level reflects his mastery of current learning content. Individualized adaptive learning resources are based on the original knowledge of the learners, and the analysis of the original knowledge of the learners is conducive to the smooth follow-up learning.

In terms of network technology, resource pull mode adopts point-to-point transmission mode. When multiple users need a piece of information, it may lead to network congestion, prolong the time for users to obtain information and reduce the efficiency of users to obtain information. Moreover, because the server does not serve the users actively but passively, the timeliness of the information obtained by the users is poor. If the learner has no new knowledge, the recommended method should provide the knowledge in the previous section. If the learner has grasped the basic knowledge, then may enter the next node the study, simultaneously may provide certain expansion knowledge for the learner. Users in the resource pull mode must actively send out information requests and search for information on the server, which is a typical "people looking for information" way of information acquisition.

Therefore, in order to obtain information, the user must maintain a real-time connection with the server. But the network information is updated frequently. In order to obtain the latest information in time, the user must pay attention to the latest information in real time. Therefore, the adaptive learning resources provided by the method should be in line with the best development area of the learners, and the learning content is not available for the learners. Otherwise it will be too difficult to let the learners lose interest, too easy to let the learners without a sense of achievement, not conducive to the development and growth of learners. According to the behavior characteristics of the network learning behavior, some controllable behaviors can be selected to statistic behavior attributes.

User click-through rate and length of stay can reflect interest preference information from a certain angle, but the accuracy is not accurate enough, if the user clicks to view

a course for 4 times, but each stay time is less than a few seconds, it can not reflect the strong interest motivation, the collection can reflect the interest preference of users more than the first two. The formula for calculating the user's curriculum preference is as follows:

$$W = \frac{P}{Q} + \frac{\beta}{\eta} \quad (1)$$

In formula (1), P represents the current number of clicks, Q represents the total number of clicks, β represents the length of stay, and η represents the total length of stay. User knowledge range refers to the stage and ability range of a user's current knowledge level. The expression formula is as follows:

$$\varphi = \frac{G \times \mu}{\gamma} \quad (2)$$

In formula (2), G represents the current course level, μ represents the number of levels of knowledge, and γ represents the total number of courses taken. The teacher is also one of the factors that affect students' interest in learning. Good teachers are knowledgeable and experienced in teaching, and students will love a course because of the teacher's teaching style. Teaching teachers also affect students' interest in learning one of the factors. Good teachers are knowledgeable and experienced in teaching, and students will love a course because of the teacher's teaching style. The calculation formula of users' interest preference for teachers is as follows:

$$\sigma = \frac{H \times \mu}{\gamma} \quad (3)$$

In formula (3), the H represents the teacher's scoring coefficient. Compared with the resource-pull technology, the resource-push technology is favored by users for its high efficiency, low cost and high timeliness. Information active push technology follows the preset technical specification or protocol standard to push the information that the user may need in real time and actively. Users can read the information directly or offline after receiving it. Through the statistics of behavior attributes and data, we can not only grasp the information characteristics of learners better, but also select more suitable learning resources for learners. Finally, the behavioral attributes and data are stored in the learner behavior characteristics database to prepare for the recommendation of later learning resources. The recommendation of digital resources is closely related to learners' learning behavior, learning style, cognitive level, knowledge level and learning goal. The server actively works for the user, which greatly reduces the time cost, energy cost and economic cost for the user to obtain information. Therefore, in many fields and environments, the demand for active service is becoming higher and higher.

Active push of information resources is a user-centered information service mode, which comes into being when intelligent technology develops to a certain stage. Active push of information resources involves the selection and dissemination of information resources. Without the dissemination of information resources, there will be no use of information resources, and it is difficult to form the value increment of information

resources. Through judging the characteristics of learners' learning behaviors and learning styles, we can find the corresponding resource forms in the attributes of the resource bank, and then present the learning interface and navigation that learners are interested in according to their needs. The choice of information resources is the basis of information resources communication, it is to achieve the promotion of information resources communication efficiency.

Active push of information resources We shall, based on users' personal characteristics, historical behaviors and actual situations, analyze and mine users' needs, select content services and products consistent with users' needs, and make use of recommendation systems and automatic push technologies to provide users with resources and services in a timely and appropriate manner. At the same time, by testing the cognitive level, knowledge level and learning goal of the learners, we can find the content description of the resources in the resource database, and then recommend the learning content that the learners are interested in or the learning resources that are suitable for the current learning level of the learners.

Recommendation system is generally composed of user, project and scene. It mainly depends on data, algorithm and system. It pays attention to the user's character and scene, and recommends the most suitable project. The basic idea of resource recommendation is to use machine learning techniques to analyze new resources according to the student's evaluation of the resources he or she accesses. Currently, most resource recommendation services use traditional machine learning techniques. Individualized information proactive service can make different individuals have equal access to high-quality digital resources, integrate push technology into personal library expansion plan, push information to users via email by librarians to provide targeted information to meet user needs, strengthen the interaction between librarians and customers, and explain the importance of pushing effective information to users.

3 Experimental Test

3.1 Experimental Preparation

This experiment uses Eclipse integrated development environment, uses Java language coding to realize database operation, uses JavaScript to display the front-end interface and uses MVC and SSH framework technology. The crawling of educational resources is a combination of Python Beautiful packets. The environment of personalized recommendation method consists of a database server, an application server and a client. Database server to store permanent data, including the user's account information, all teaching resources data, etc. The database is MySQL version, in which data extraction, transformation, calculation and program deployment are written in Java language and data mining analysis module in Python. The final recommendation of personalized educational resources for the experiment was implemented on Tomact's server. Installs server-side application software on the application server. Users can access the system data after logging on through the client's computer.

3.2 Experimental Results

Selecting the method of personalized recommendation of multimedia teaching resources of nursing based on cluster analysis and the method of personalized recommendation of multimedia teaching resources of nursing based on genetic algorithm, and comparing with the method of personalized recommendation of multimedia teaching resources of nursing in this paper, the recall rates of the three methods are tested under the condition of different marked resources. The experimental results are shown in Figs. 4, 5, 6 and 7:

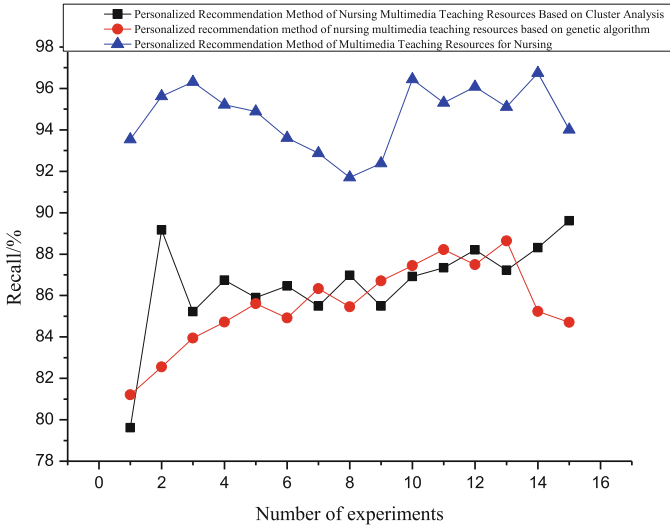


Fig. 4. Tagged resources 100 recall (%)

As can be seen from Fig. 1, the recall rates of the personalized recommendation methods of multimedia teaching resources for nursing, and the other two methods are 94.658%, 86.577% and 85.543% respectively; as can be seen from Fig. 2, the recall rates of the personalized recommendation methods of multimedia teaching resources for nursing, and the recall rates of the personalized recommendation methods of the other two methods are 83.44%, 75.430% and 76.103%; as can be seen from Fig. 3, the recall rates of the personalized recommendation methods of multimedia teaching resources for nursing, and the personalized recommendation methods of the other two methods of multimedia teaching resources for nursing, are 74.053%, 64.916% and 64.427% respectively; as can be seen from Fig. 4, the recall rates of the personalized recommendation methods of multimedia teaching resources for nursing, and the personalized recommendation methods of the other two methods of multimedia teaching resources for nursing, respectively, are 62.354%, 55.34% and 54.27%.

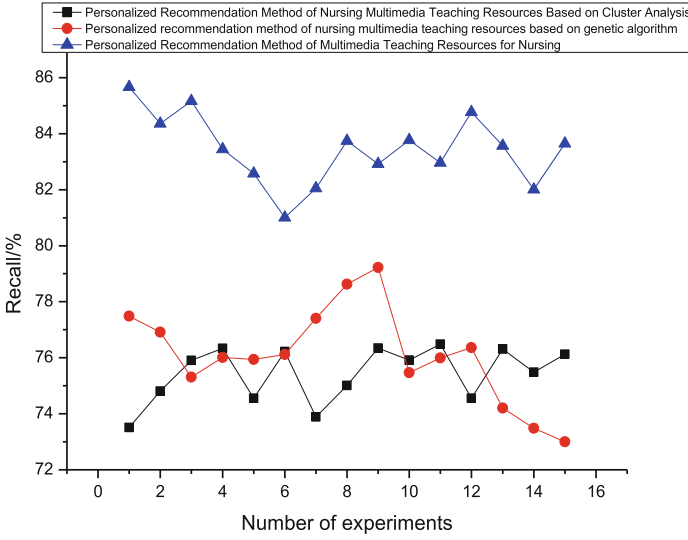


Fig. 5. Tagged resources 200 recall (%)

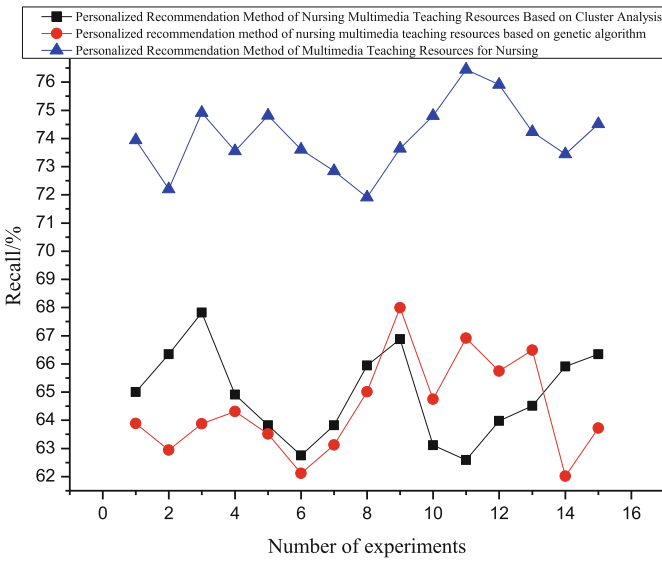


Fig. 6. Tagged resources 300 recall (%)

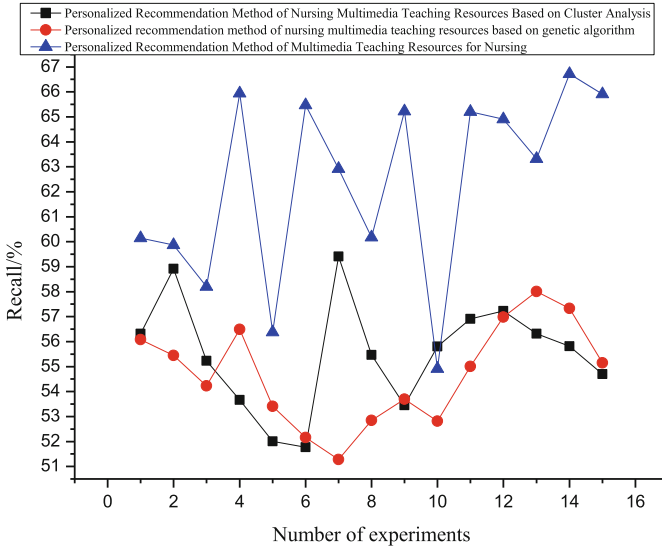


Fig. 7. Tagged resources 400 recall (%)

4 Conclusions

The design of personalized recommendation method, directly service-oriented individual learning situation, can better meet the user diversity, personalized needs, personalized learning for the possibility. Also causes the network teaching system from take “the resources” as the center to take “the student” as the center, to the network service higher level development. The most suitable information resources should be given to the most needed learners to maximize the use of resources, improve the quality and utilization of information resources, and accelerate the flow of knowledge, evolution and regeneration and value added. Later research will consider introducing a hybrid kernel function method to further improve the performance of teaching resource recommendation.

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