

Research on Personalized Learning Path of Distance Education Based on Data Mining Technology

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Abstract: This paper starts from the research status of distance education personalized learning at home and abroad, combines the latest theoretical and practical research, integrates the traditional learning support service with the concept of personalized learning, builds a personalized education learning support service model suitable for distance education students, and studies the personalized learning path. The purpose of learning behavior monitoring, learning preference identification, learning ability identification, personalized learning path optimization and learning resource recommendation is achieved through the construction of personalized learning model. The multi-mode fusion intelligent algorithm is applied to customize learning plans for each student according to the learning path, key and difficult points, learning preferences, ability matrix and other information, and provide personalized learning path navigation. Maximize the learning effect.

1. Introduction

With the deepening of distance education research, distance education researchers increasingly realize that comprehensive and systematic learning support services are the core elements to maintain the success of distance education. Compared with full-time distance education students, distance learners are confronted with the following three difficulties in learning under the premise of taking into account both work and life: (1) Interaction difficulties. One of the characteristics of distance education is that teachers, distance education students and teaching institutions are separated geographically, and the process of teaching and learning depends on various media and media to complete, so there is a lack of timely and effective communication and exchange between teachers and distance education students, and between distance education students and distance education students. (2) Lack of learning skills. The success of distance education requires not only the development and provision of well-designed and diverse learning resources by educational institutions, but also the learners' high autonomous learning ability and time management ability. Secondly, distance education is mainly based on online autonomous learning, so it requires learners to have certain computer skills and information technology foundation. (3) Lack of time. Distance learners need to balance work, study and life, and can only study in leisure time and holidays, so they need higher learning efficiency. Once the distance education students encounter difficulties, they will have corresponding needs. If the needs are not met, these difficulties will lead to the loss

of interest in the course, the gradual loss of learning passion, the disordered learning arrangement and plan, and finally the failure.

An important way to solve these difficulties is to develop and provide perfect and systematic personalized learning path service for distance education students. As a bridge to maintain distance education institutions and learners, personalized learning path construction refers to the development of various services to meet the needs of distance education students, help distance education students solve learning difficulties, provide them with learning navigation, information consultation, resource search, facilities and technology, learning evaluation and other services to help them overcome various difficulties in pre-school, school and post-school. To meet their emotional, academic and social needs and help them successfully complete their studies. Individualized learning path construction is the basic guarantee of distance education quality and success, and plays an important role in distance education teaching practice.

Therefore, this study uses Internet technology to enable education and artificial intelligence methods such as data mining and machine learning to conduct personalized learning research, so as to provide distance education students with personalized learning path navigation that ADAPTS to their knowledge background, learning preference, cognitive ability and learning goals, so as to effectively motivate and maintain the learning motivation of distance education students. The purpose of improving students' academic performance and promoting their development.

2. Research Status of Distance Education Personalized Learning at Home and Abroad

Foreign studies on personalized learning in distance education started earlier, mainly focusing on the design and construction of learning platform or system, and emphasizing that technology is an essential factor for the development of personalized learning. According to the difficulty of course content and the difference of distance education students' level, researcher Rasch designed and constructed an electronic system of personalized learning based on item reflection theory [1]. Conlan, a researcher, provides different learning supports for different distance education students from the perspective of teaching strategies, and relies on E-Learning system for practice [2]. Of course, some researchers design learning systems to meet the needs of personalized learning from the perspective of decision tree technology and data mining technology. Obviously, the research on personalized learning abroad shows an obvious technical tendency, and the research focus is from intelligent learning guidance system to adaptive learning system. Although, foreign researches on individualized learning in distance education have achieved some quality academic achievements, especially in the aspects of learning theory and technology construction of learning system. However, how to construct the personalized learning model and how to apply it to the classroom practice of specific disciplines needs to be further enriched.

With the development of technology represented by big data and artificial intelligence, the field of education technology puts forward the personalized learning enabled by technology, and carries out theoretical thinking and exploration around this. Chinese scholar Kong Jing et al. comprehensively analyzed the background, concept and characteristics of personalized learning, selected foreign classic cases for introduction, and proposed that technology-supported personalized learning is a new trend to promote the development of distance education students [3]. He Kekang pointed out that the core theory to promote personalized learning was learner modeling, and the key technologies included artificial intelligence and educational data mining [4]. Mou Zhijia reshaped the theory of personalized learning in the environment of artificial intelligence and proposed a one-centered and three-oriented view [5]. In other words, technology-enabled personalized learning is moving towards data-supported large-scale personalized learning, which is the evolving trend of classroom form.

3. The Basis and Design of Distance Education Personalized Learning Path Construction

With many years of theoretical and practical research, foreign learning support services have formed mature theories and models. Many distance education institutions, led by the Open University in the UK, have built the ARCS model learning support service system. ARCS model starts from learners' own needs and holds that all services should be learner-centered, with the purpose of improving students' individual reflective, emotional and cognitive abilities and promoting their systematic development. Therefore, in practice, foreign open universities attach great importance to providing personalized learning services for learners, aiming to meet the learning needs of each student, such as one-to-one tutor system, diversified evaluation services, flexible examination system and so on. However, the realization of personalized learning depends on a large amount of capital, personnel and facilities investment, which is difficult for domestic distance education institutions to achieve.

Although domestic scholars also consider the learning needs of learners when constructing the model, they pay more attention to the content and quality of services from the institutional level, and focus on how to enrich and improve the construction of personnel, facilities and resources, adapt to the group differences of students as much as possible, and solve the common problems that hinder the success of distance learners. Among them, the learning support service model proposed by Ding Xingfu (2002) aims to eliminate communication and interaction barriers caused by geographical separation. Therefore, the model focuses on creating and delivering rich and diverse learning resources, as well as increasing the construction of communication equipment and communication tools [5]. In 2008, Zhang Weiyuan refined students' learning difficulties, proposed diversified solutions for each problem, and built a learning support service model based on students' problems. At the same time, this also leads to the fact that the essence of the service provided is the teaching and learning strategy centering on the learning process of students, while the basic personnel, facilities, resources and other services of distance education are ignored [6]. In 2011, Chen Renrong investigated and summarized the current situation and characteristics of distance education learning support services in nine colleges and universities, and built a learning support model based on teaching process and teaching elements. This model involves all aspects related to distance learning, such as personnel, equipment, resources and learning process, with wide coverage and comprehensive functions. It is formed on the basis of empirical research and has extremely high practical application value [7]. However, this model still provides unified services for all students at all levels and in all regions, and does not consider the individual needs of students.

Now, the personalized learning service of online education based on big data technology, on the basis of avoiding a large amount of capital and equipment investment, has met the personalized learning needs of learners to a certain extent, and has the potential of large-scale application, laying the foundation for the personalized learning support service of distance education in China.

This study focuses on the needs of learners and integrates the human and material resources, information, advice and counseling support, emotional support and other services that students need. And try to integrate the personalized learning function into the learning process support service module provided by the network teaching platform. On the basis of the traditional service function, the decentralized and single personalized learning service is integrated with the learning process support service, so as to design a continuous and multi-angle personalized learning support service system for distance education. To provide students with individualized course selection guidance, course learning process guidance, consulting services, multidimensional evaluation and other services, to create a personalized network learning environment for students, to solve all kinds of difficult problems encountered in the learning process. The system mainly includes four modules:

management service, information and consultation service, resource service and learning process support service.

The system mainly provides personalized learning services for students with different learning states through the network teaching platform. Dynamic recognition of students' personality characteristics is a prerequisite for personalized learning. In the network learning environment, the system can intelligently identify students' learning state, learning attitude, cognitive level, learning style and other characteristics by analyzing and mining students' learning process data and behavioral data, so as to provide them with adaptive learning services. Moreover, according to the data feedback of students in the network learning environment, institutions can timely adjust the management services and resource services provided.

4. Build Learning Process Support Service Modules

The goal of the learning process support service module is to promote and help students develop their self-learning ability and self-management ability, and to provide students with personalized course selection, path navigation, resource selection and comprehensive evaluation through web-based personalized teaching services, so as to meet their personalized needs in the learning process and improve learning quality and efficiency. By analyzing relevant information of learners through data mining technology, a personalized learner characteristic model with individual attributes, cognitive ability, learning style and learning attitude as the basic elements is constructed, which provides the basis for realizing adaptive and personalized learning functions. The learning process is divided into three stages: pre-school, middle school and post-school. The existing support functions and personalized learning functions of the platform are integrated to build a continuous and systematic personalized learning process support service model for students. This paper mainly studies how to provide appropriate resources to students in appropriate ways at appropriate time, how to provide effective route navigation services for students' learning process, how to make students adapt to networked learning methods, and how to make students use network resources separately to improve learning efficiency.

The realization of personalized learning support service cannot be separated from the existing teaching resources, teaching management and teaching environment, etc. It should be kept organically combined with these elements. On the basis of integrating and sorting out the existing teaching and management services, it is clear what personalized learning services learners need, what degree of learning support institutions can provide, and what services need to be improved. There are two special points to pay attention to. One is the recognition of learners' individual differences. At present, the distance education management and teaching system stores a large number of demographic information, learning performance, learning process, learning logs and other data of learners. Relying on data mining technology, learners' characteristic patterns can be extracted from the massive data related to learners, so as to accurately identify the characteristics of learners. Secondly, it provides targeted learning support services for learners with different characteristics. Learners of different majors, ages and styles have different demands on learning styles, teaching guidance and learning resources. Therefore, different learning support services can be provided at different learning stages according to the characteristics of learners. It mainly includes: (1) preschool: setting appropriate learning goals according to students' prior knowledge and learning level; Recommend personalized learning path, course sequence and learning activities according to learning behavior pattern and learning style. (2) Learning: Recommend learning resources and content of different types and difficulty levels according to learning style and cognitive level, and provide knowledge retrieval and intelligent question answering functions. (3) After school: provide comprehensive and diversified learning evaluation. The personalized learning

support service system should be "adaptive", which requires timely detection of the change of demand according to the change of students' learning state so as to improve the learning support service.

5. Distance Education Personalized Learning Path Construction

The construction of personalized learning path model, the learning characteristics or styles of learners have been roughly determined, and the prediction of learning behavior characteristics of learners in a certain period of time has been basically realized, but these are just the construction of personalized learning model in theory and technology, and the most key and most prominent value step is to realize the service function of personalized learning path navigation. It directly determines the application and extension value of the model. In fact, in the application process, when users have different learning habits and preferences, in order to realize personalized learning path navigation service, it is necessary to match and associate the learning characteristics of users with the characteristics of knowledge base. In other words, to build personalized learning path recommendation rules, it is necessary to find the contact point with existing data and establish a knowledge base or learning resource library, otherwise the earlier data will eventually be meaningless. In fact, knowledge base construction should precede data association. The management and maintainer of the platform should classify and summarize all learning materials in advance. Here, the author uses the knowledge classification theory to divide learning knowledge into three categories, namely verbal information, wisdom skills and cognitive strategies, and then divides learners' learning objectives into three areas, namely cognition, emotion and motor skills, according to the classification theory of teaching objectives. Moreover, knowledge is divided into six levels: cognition, understanding, application, analysis, evaluation and creation. In this way, a tree-like knowledge structure sequence pattern is formed. At the top of the tree is the most basic knowledge point, and each kind of knowledge point is marked accordingly. At the same time, related parent category and sub-category are marked, so that users can identify which knowledge point stage they are in according to the node value state. Then, according to the similarity matching calculation, the learning path, state, style and related learning groups of learners are determined. Finally, relevant possible resources are presented and pushed to learners, so as to realize personalized learning path recommendation service.

6. Conclusion

On the basis of summarizing the research status of distance education personalized learning at home and abroad, this paper designs a continuous and multi-angle personalized learning support service system for distance education by integrating traditional service and personalized service. In order to integrate the traditional learning support service with the concept of personalized learning, a personalized education learning support service model suitable for distance education students is constructed, a personalized learning path research is conducted, and a personalized learning path navigation based on data mining technology is constructed, so as to explore how to provide multi-angle and continuous personalized learning process support services for learners.

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