Construction of College Students' Adaptive Learning System Based on Knowledge Map

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Abstracts: The individualized learning method of teaching students in accordance with their aptitude is the ultimate pursuit of education. The outbreak of the COVID-19 has prompted online teaching to quickly become a hot spot in current education. The existing online teaching mode has formed a good foundation in teaching resource sharing and basic teaching activities. However, compared with the traditional face-to-face teaching, there are also some problems, such as the teaching efficiency is not high enough and students' personalized learning can not be well satisfied. Firstly, this paper analyzes the current situation and advantages of online education, and according to the characteristics of private college students, takes the core courses of electronic information major as an example to build a personalized adaptive learning system model to provide a basis for the continuous development of online education.

Keywords: Knowledge Map; College Student; Adaptive Learning; System Construction

1. Introduction

With the rapid development and popularization of information technology, artificial intelligence, big data, mobile Internet and other technologies, online education, as a supplement and extension of traditional education, has become an important part of the education field.

Although the current online education provides many potential advantages for learners' autonomous learning, due to the lack of many supporting conditions, online education cannot provide effective personalized learning guidance for learners like traditional education. At the same time, due to the lack of basic theoretical research on online education, data collection is not comprehensive enough, and its existing recommendations are based on static statistical information and specific knowledge maps. Incomplete construction of teaching data will inevitably lead to inaccurate personalized recommendation. Online education not only brings convenience to learners, but also brings many problems. First, long-term fragmented learning is difficult to build a systematic knowledge structure for learners, affecting the development of students' logical thinking; Second, there are many online education resources with good and bad quality. Due to the lack of students' own knowledge accumulation, it is easy for learners to fall into "network trek" and "cognitive overload"; Third, most of online education is still a traditional education model, which only has simple data statistics and testing functions, so it is difficult to teach students in accordance with their aptitude in a real sense; Fourth, the knowledge content in the current paper-based textbooks is presented in a static form, and the semantic relationship between knowledge is not clear. From the perspective of teachers, with the popularization of higher education and the increase in the number of students, online education provides a more convenient teaching environment, but its evaluation system is difficult to fully reflect the learning situation of students, resulting in its inability to help teachers better supervise the learning process of each student and provide personalized guidance to students. Teachers need the system to give suggestions according to the characteristics of students, to develop personalized teaching programs.

Therefore, a better understanding of the online education environment from the basic theory, a better construction of education big data, a better realization of personalized and intelligent online education system, and effective and accurate personalized recommendations for both learners and teachers can make better use of the current online education resources in the field of education, which is of great significance to improve the teaching quality of online education.

2. Current situation and advantage analysis of online teaching for college students

According to The Statistical Report on China's Internet Development released by CNNIC, by June 2020, the scale of online education in China had reached 380million, accounting for 40.5% of the total Internet users. The scale of online education users has increased on a large scale than before, which can reflect the growth of users' demand for online education services. Yuanjingyi and others found that the online learning habits of college students have improved significantly, reaching 52.19%. The average daily online learning time of the respondents increased significantly, and 35.71% of the students studied online for 2-5 hours a day. Most students like content-based platforms, such as China university MOOC, Netease open class and other products, accounting for 51.69%. The use of live broadcast platforms such as Tencent classroom and Dingding has also been significantly improved. In addition to the above public resources, our school has also set up rain class online courses according to the characteristics of our students. At present, we have built two of the first batch of national first-class undergraduate courses. As of November 2020, 503 students have registered and studied online for 2950min/ student, and the online learning completion rate is more than 96%. In addition, focusing on the requirements of first-class curriculum construction, our school has built a trinity curriculum construction system of "excellent courses", "key courses" and "one teacher and one excellent course". The main advantages of online teaching are: flexible and free learning methods, rich teaching interaction, automatic evaluation and personalized learning.

3. Construction of adaptive learning platform based on knowledge map

3.1 System architecture

By sorting out the knowledge points of 10 specialized courses in electronic information engineering, and taking advantage of the powerful computing and storage capabilities of cloud computing, an adaptive learning platform of "learner centered" based on the knowledge map is built. The platform can provide users with a unified standard and adaptive open access portal, and support users with different identities such as learners, teachers and content service providers to log in and access through mobile or wired terminals, obtain personalized learning services, teaching content / data, and domain knowledge transformation and other services respectively. The self-adaptive learning platform based on knowledge map is divided into four logical levels from bottom to top, including:

3.1.1 Infrastructure support layer.

This layer provides cluster distributed storage service interface based on cloud storage and cluster resource management service interface based on cloud computing for system development and operation, and also includes various sensing devices, mobile Internet and computer i/o devices.

3.1.2 Education big data resource layer.

This layer provides data support and data archiving management services for the upper adaptive learning core business, and mainly stores the portrait data of college students, subject knowledge map, teaching model, test question library, test paper library, online course library, score analysis, learning log, learning path, etc.

3.1.3 Core business layer.

This layer is the implementation layer of the core business of the adaptive learning platform, which mainly includes domain knowledge model, college student model, teaching model, adaptive evaluation model and adaptive teaching engine module. Taking the adaptive engine as the data interaction hub and driver, it realizes the automatic creation of domain

knowledge model, the dynamic generation of college student model and the adaptive decision-making and modulation of teaching model; At the same time, it can provide visual interfaces and services for the upper layer.

3.1.4 Visual presentation layer.

This layer is the input interface and output presentation of the adaptive learning platform, and the interactive interface between college students, teachers, knowledge providers and the system. The visual presentation layer provides users with self-adaptive learning, teaching data retrieval, operation and other visual interface services in the form of Web2.0 or mobile terminal app, and provides operation and maintenance management service interfaces for platform managers.

3.2 Construction of curriculum knowledge map

The top-down knowledge spectrum construction method is adopted to build ontology and create instances, including the hierarchical structure of knowledge concept classes, and obtain curriculum ontology instances and their relationships, so as to provide data for curriculum knowledge sharing and personalized adaptive platform. During the construction of curriculum knowledge spectrum, the relationship between knowledge should be divided reasonably according to the design requirements of personalized adaptive platform system architecture. A course is mainly composed of chapters and knowledge points. There are three relationships between them: inclusion, parallel and sequential.

3.3 Learner process model

Researchers or educators analyze learners' learning behavior, environment, content and process, and intervene and predict learners' learning, so as to promote and optimize learners' personalized learning. Therefore, based on the perspective of learning analysis, the interaction between students and personalized adaptive learning platform will cause the system to generate certain control and guidance for learners. The platform analyzes the learning behavior and path characteristics of learners according to the log files generated by learners' information base and behavior, and provides suggestions, help and tips for them. Then, the platform assigns task commands to virtual agents, the process of virtual agent interacting with learners and the interaction between learners and the system will lead to new data generation, which is a process of continuous updating.

4.Conclusion

At present, the platform has been put into trial operation in all grades of electronic information engineering, with more than 305 registrants, 328 intelligent test papers, 4210 personalized teaching plans, 45110 personalized student tracking data, 134230 lines of student learning records, forming a large number of professional database materials.

The platform can track the interaction between learners and the system at any time, supervise and guide learners' learning process, and provide learners with personalized guidance and incentive mechanism, in order to give personalized tips and suggestions according to learners' problems and participation. When the learners construct the cause and effect diagram, the system will automatically analyze the matching degree between the cause and effect diagram constructed by the learners and the expert diagram, and the learners will test their performance. The interactivity of learning process can enhance learners' self affirmation and sense of value, and promote learners' personalized adaptive learning.

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