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Intelligent Platform for Educational Resources of Computer Basic Courses in the Digital Education Environment

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Abstract: Computer science is a highly practical professional foundation course, and its teaching purpose is to equip students with basic computer application skills and prepare them for future work. Due to the lack of clear goals in current computer foundation courses, teachers mainly adopt an "indoctrination" teaching method that only emphasizes theory and not practice, resulting in students becoming accustomed to "contact based" learning without applying theory to practice. Therefore, it is necessary to choose a scientific and reasonable teaching strategy based on the specific purpose of computer teaching and students' actual mastery, so that students can proficiently master and apply this knowledge in practice. On this basis, this article first described the main problems in the teaching of computer basic courses and the impact of digital learning environment on contemporary education models, thereby highlighting the necessity of building a computer basic course resource platform. After that, this article discussed a cloud service platform for computer basic course education resources. Finally, through experimental analysis and survey questionnaires, it was proven that the response time of the designed system was shorter than that of traditional systems; the accuracy of the system was superior to traditional systems, and 66.23% of respondents were satisfied with the system.

1. Introduction

In today's rapidly developing information technology, people's demand for information technology talents is increasing, and information technology education in universities must also comply with this requirement, using information technology in teaching to create an effective classroom. The digital teaching resource platform has been increasingly applied to the course of computer network foundation and has been explored beneficially.

An analysis was conducted on the issues and strategies of applying digital education resource platforms, and it was found that experts had already proposed relevant research on this topic. Dilmurod R was particularly concerned about how to apply artificial intelligence technology to higher education, and considered and analyzed the development trend of applying artificial intelligence technology in universities. The conclusion of the research report proved that artificial intelligence cannot compete with teachers, whether from an educational perspective or in evaluating the knowledge learned by students. Artificial intelligence is an assistant and a valuable tool that can be used to complete and improve various activities conducted in universities, thereby helping to improve teaching efficiency and facilitate necessary communication. Applying artificial intelligence technology to universities can select the optimal learning strategy for students based on their own abilities, needs, and labor market needs [1]. Sun Z combined intelligent modules with knowledge recommendation technology to develop a network classroom teaching system that is different from ordinary English online classroom teaching. He developed an online English intelligent teaching system based on deep learning, which can help students better learn English, better meet their mastery of knowledge, and better adapt to their personalities by building a modern tool platform. Sun Z established an implementation model for English teaching evaluation using decision tree algorithms and neural networks. It provided valuable information from a large amount of information and summarizes its patterns and data, assisting teachers in improving teaching and enhancing students' English proficiency. This system embodied an artificial intelligence expert system. Through practical application, it was proven that this system can effectively improve students' English learning effectiveness and enhance the relevance of teaching content. In addition, this system also provides a sample model that uses similar methods and referenced definitions [2]. The research goal of Barus I R G was to investigate the reading interest and level of students in key vocational schools. Cultivating interest in reading and online learning is greatly beneficial for enhancing one's cultural values and social skills. The "Popper model" he adopted consists of three stages: "exploration", "prototype construction", and "evaluation". Evieta software is software for online learning in vocational colleges, and it is expected to achieve the above goals. Educators hope to use such software to learn and lead reading and writing activities in schools. By testing the software, the importance of Evieta software has been proven and its practicality was demonstrated [3]. The above research on intelligent platforms for educational resources is relatively superficial and not in-depth enough.

From the current teaching methods, traditional classroom teaching and extracurricular training are not ideal for students' learning outcomes in the classroom. This article mainly explored the construction of a classroom education resource platform from the application of digital technology. After publishing the course content online, students can independently manage their time and learning progress; the system can automatically generate exercises and evaluate the effectiveness of the model during the learning process, which would be an ideal teaching form that can effectively increase students' learning time. In the process of practice and testing, an interactive approach was adopted, which increased students' interest in the test and enhanced its effectiveness.

2. Basic Computer Course Teaching and Digital Learning Environment

2.1 Main problems in the Teaching of Computer Foundation Courses

(1) Traditional and single teaching mode

In computer basic courses, teachers are the center to formulate teaching content and control the teaching process, while students passively accept and learn alone [4-5]. Although teachers can use the internet for teaching in the classroom, they can only do so in fixed classrooms and cannot support mobile learning, autonomous learning, fragmented chemistry learning, etc; Teachers still follow the traditional one-way teaching model of "teacher speaking, student listening" or "student asking, teacher answering", which emphasizes the goal of "memory, understanding, and application" and lacks a learning mechanism of "real-time interaction, analysis, evaluation, and innovation" [6-7].

(2) Students' lack of initiative in learning

Although there are also basic computer courses in high school, this is only one of many high-quality courses. Moreover, in this exam oriented teaching model, few students focus their attention on key exam subjects, which leads to low teaching quality of computer foundation courses [8-9]. In addition, there is limited training in basic computer skills during high school, resulting in knowledge that cannot be applied in practice, and students' computer application abilities have not been improved. Although the difficulty of computer foundation courses is smaller than that of other professional courses. However, in university education, students' interest in learning is not high, so their enthusiasm for learning is not high. Many university education students' basic computer skills and usage abilities are not high [10].

2.2 Formation Categories of Teaching Modes

In the digital learning environment, there are three main learning methods for students: autonomous learning, exploratory learning, and interactive learning [11-12]. Autonomous learning refers to learners taking various forms of autonomy as an important component of learning, including designing their own learning plans, selecting learning content, discovering and solving problems through peer dialogue, conducting self-assessment, etc., in order to repeatedly acquire knowledge. This learning method can fully tap into students' personalities and strengths, which is beneficial for improving their creativity [13-14]. Research based learning is an operation similar to an experiment, where the teacher asks a question and the students explore it themselves. It includes raising questions, collecting data, and constructing scenarios, enabling students to gain knowledge through mutual exploration. Interactive learning is a new teaching mode with strong application value and strong application value. Interactive learning mode is a learning mode that takes groups as a unit. Students determine research topics under the guidance of the teacher, then group them into groups and engage in collaborative learning within the group. During this process, the teacher should play a supportive role to help students achieve better learning outcomes. It is a teaching mode that takes groups as units and collective learning as units for the purpose of collective learning and cooperative learning [15].

3. Solutions for Resource Systems under Cloud Services

3.1 System Design Objectives

Firstly, it is necessary to provide teaching and practice for students majoring in computer science in universities, in order to achieve the goal of "one to many" teaching. Secondly, the role of "simulation" in computer teaching in universities has been achieved. In order to achieve the above goals, this article explored the construction of a cloud service based university computer foundation course resource library, achieving course implementation in terms of technology. This article discussed cloud computing platforms, providing technical support for the planning of distributed storage systems [16-17].

3.2 Software Data Processing Process

Online registration and evaluation are very important core features in the development process of the system. The system will based on the actual situation of the students, achieve the purpose of student internship conversion. Figure 1 show the resources and data flow designed for online testing binding [18-19].

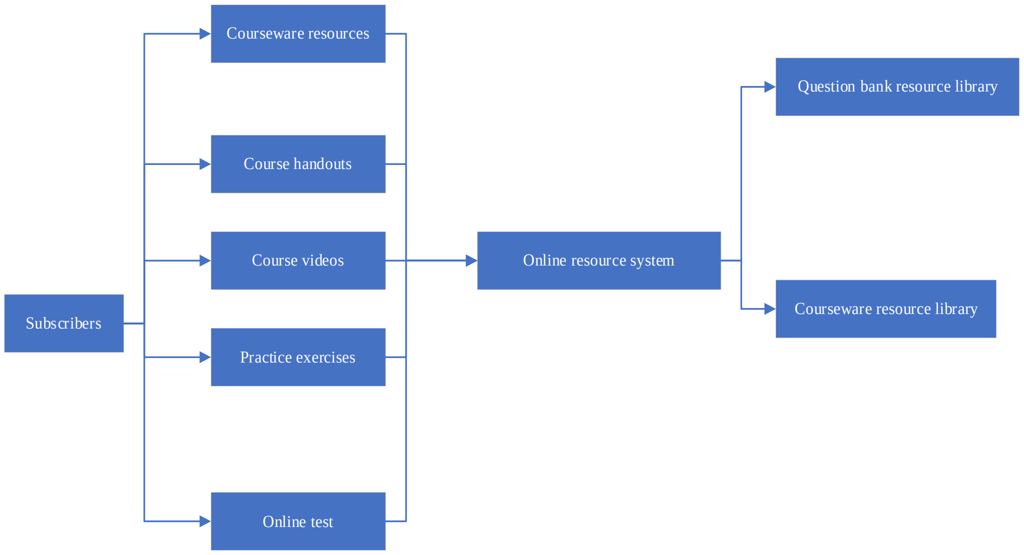

Figure 1: Resource Platform Data Flow Diagram

The server of the online learning material system is designed by relevant programs, and the server designs the corresponding source program based on the relevant program to ensure the normal operation of the system. During operation, the system server would save the learners' learning and living conditions as well as corresponding operation scripts. If there are abnormal situations such as program timeout, insufficient memory, or limited output data, the system would automatically execute the corresponding program immediately and compile the error time of the user program. Moreover, it would set up corresponding error specific operating procedures and provide corresponding prompt information to ensure the high-level intellectual property rights of the system [20].

3.3 System Key Technology

In universities, based on the three-layer MVC (Model View Controller) design pattern and the J2EE (Java 2 Platform Enterprise Edition) architecture, the pressure on system servers is alleviated by using two structures: "main client" and "browser". Students can make requests to users through the browser operating system and process Servlets to request system actions. After the processing is completed, the CPU (central processing unit) makes decisions based on the corresponding request content, and ensures the completion of the service by registering the next corresponding request server. In a server environment, instructions are processed through the underlying data storage to meet system requirements, while for high-speed memory application servers, it is necessary to search for resources to meet the requirements.

4. Intelligent Platform for Educational Resources in Computer Basic Courses

The experimental base was A University, with 850 students majoring in Computer Fundamentals, including 500 males and 350 females. The system developed in this experiment was used to evaluate the computer foundation courses in the university. The comparative systems were the Analytic Hierarchy Process based practical evaluation system and the mobile platform based practical evaluation system, denoted as Traditional System A and Traditional System B. The evaluation system configuration used for comparison was the same: Windows 2010, 16GB hard drive, and i5 processor. To ensure the effectiveness of the experiment, the configurations of the three systems were the same: Windows 2010, 16GB hard drive, and i5 processor. During the experiment, the scores, learning outcomes, and various evaluation indicators of 850 students were uploaded to the system's cloud platform. Then, as mentioned above, a detailed evaluation of the learning quality for each semester was conducted, and based on this, the results of the three systems were compared.

The experiment used evaluation residuals and average response time as evaluation indicators for three types of system performance. Firstly, residual testing was conducted, which can reflect the evaluation accuracy of the system. The calculation formula is:

$$r = (p - x) \times 0.01 \tag{1}$$

Among them, r represents the system evaluation residual; ρ represents the quality coefficient of practical training and teaching for computer basic courses output by the system; x represents the quality coefficient of practical training and teaching for actual computer foundation courses. The residual value calculated through Formula (1) is generally between 0 and 1. The larger the value, the lower the accuracy of the system evaluation. The experiment consists of 8 groups, and the evaluation residuals of 3 systems were calculated using Formula (1), as shown in Figure 2.

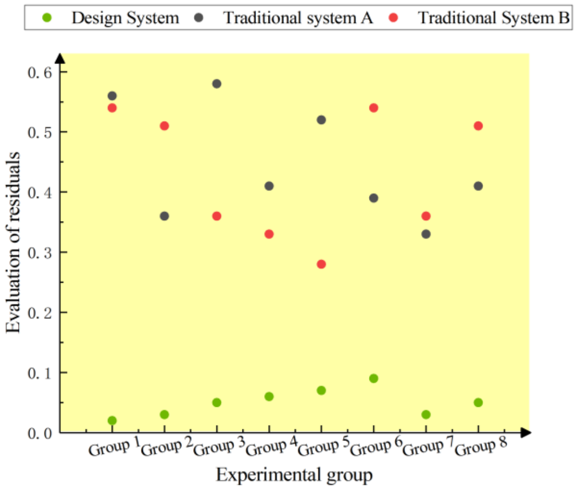

Figure 2: Evaluation Residuals of Three Systems

In Figure 2, the evaluation residual value of the design system was relatively low, with a minimum residual value of 0.02, a maximum residual value of 0.09, and an average residual value of 0.05. The residual value was relatively low and not significant, indicating that the evaluation results of the design system were basically consistent with the actual situation and have high evaluation accuracy. On the other hand, the evaluation residuals of the two conventional systems were relatively high. The minimum residuals of traditional system A and traditional system B were 0.33 and 0.28, respectively; the maximum residuals were 0.58 and 0.54, respectively, and the average residuals were 0.46 and 0.44, respectively, which were much higher than the evaluation results of the design system, indicating that the design system was superior to the conventional system in terms of accuracy.

In order to further verify the applicability of the designed system, the average response time of the system evaluation service was tested. The response time took the time when the system receives a request for teaching evaluation services as the starting time, and the time when the system outputs evaluation results as the ending time. The experiment used sample data as the variable and 1000 bytes as the base to measure the response time of three systems under different sample data sizes using OUFA software. The experimental results are shown in Figure 3.

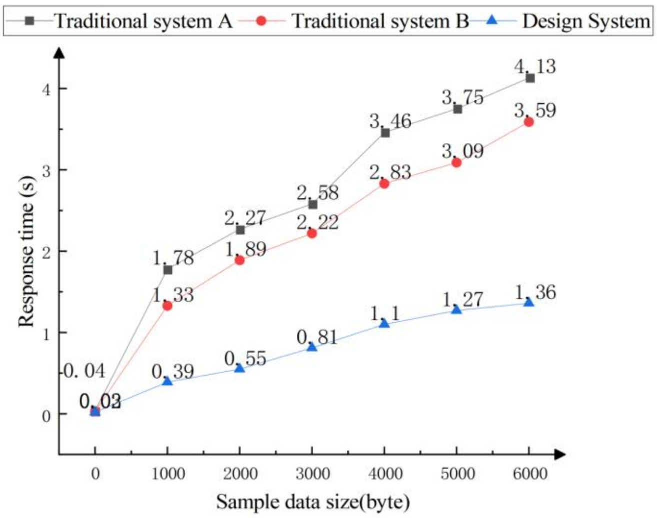

Figure 3: Comparison of Response Times of Three Systems under Different Sample Data Sizes

From Figure 3, it can be seen that the response time of the design system was relatively short and the response speed was relatively fast. Although the response time would continue to extend with the increase of sample data volume, the proportion of time growth was relatively small, with an average response time of 0.79 seconds. When the sample data volume reached 6000 bytes, the design system response time was 1.36 seconds, which could be controlled within 2 seconds; the response time of the two traditional systems was relatively long and would significantly increase with the increase of sample data volume, with an average response time of 2.57 seconds and 2.14 seconds, respectively. When the sample data volume reached 6000 bytes, the response time of traditional system A and traditional system B was 4.13 seconds and 3.59 seconds, respectively, which was much longer than the design system. The experimental results showed that the design system had obvious advantages in both accuracy and response time, indicating that the design system was more suitable for the evaluation of computer basic course training and teaching.

Table 1: Comparison of Resource Waste Rates (%) of Different Systems

Number of virtual requests	Design system	Traditional system A	Traditional system B
800	0.57	1.12	1.47
600	0.55	0.82	1.67
400	0.53	0.76	1.2
200	0.53	0.82	1.53

The formula for resource waste rate can vary depending on specific resource types and waste situations. The resource waste rate of the CPU can be calculated using the following formula:

$$\mathrm{R} = \frac{\mathrm{T_a} + \mathrm{T}_w}{T_t} \tag{2}$$

Among them, idle time T_a refers to the time when the CPU is in an idle state without any calculations; waiting time T_w refers to the time that the CPU waits for other resources (such as memory, hard disk, etc.) to complete the operation; the total time T_t refers to the total period of observation.

By calculating the resource waste rate, the utilization and efficiency of CPU can be evaluated, and the system's resource allocation and task scheduling can be further optimized to reduce resource waste.

From the trend of data changes in Table 1, it can be seen that the scheduling system described in this article can control the resource waste rate within 0.6% under various virtual requirements, and has good stability. The effectiveness of this method was verified through simulation experiments.

In order to further test the effectiveness of the design system, a questionnaire survey was conducted on the experience of using the design system among college students majoring in computer fundamentals at the university. A total of 850 questionnaires were distributed, with 810 valid feedback. The survey questionnaire consists of 8 questions, with a total score of 5 points for each question. The respondents rated each question based on their personal feelings. The survey questionnaires with effective feedback were summarized and analyzed, and the results are shown in Figure 4.

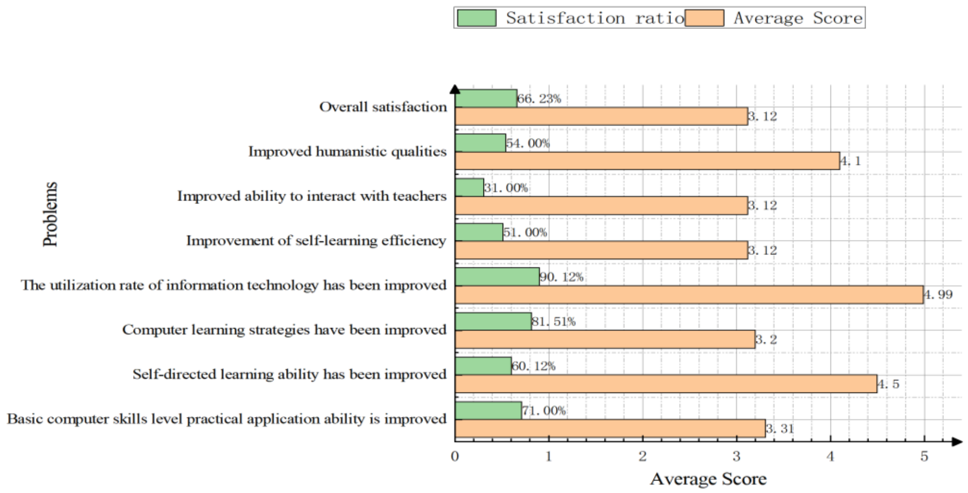

Figure 4: Student Satisfaction Survey on the Design System

From Figure 4, it can be seen that students were generally satisfied with the design system (with an overall satisfaction rate of 66.23% and an average score of 3.12), and the biggest feeling among students may be that the system improved the use of information technology in computer basic teaching courses (90.12% of students agree). 71% of students believed that their basic computer skills were improved in practical applications. This also indicated that the design system was conducive to breaking away from the previous teacher centered teaching mode and improving students' autonomy and practical level.

5. Conclusions

Building digital education is not only a new task for universities, but also a new opportunity. Digital education must actively adapt to changes and promote innovation, and the core computer curriculum reform of computer majors in universities must adapt to the needs of the times. Universities should actively build a digital education based computer core course resource platform for computer majors in universities to promote students' self-directed learning, and actively explore different disciplines to enhance their interest in course learning. This article explored the construction of a cloud service based education resource solution based on the above objectives, and set up the experimental base of the computer basic course education resource platform at A university. The experiment evaluated the learning outcomes of 850 students, proving the practicality of the computer foundation course education resource platform designed in this article.

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References

[1] Dilmurod R, Fazliddin A. Prospects for the introduction of artificial intelligence technologies in higher education. ACADEMICIA: an international multidisciplinary research journal, 2021, 11(2): 929-934.
[2] Sun Z, Anbarasan M, Praveen Kumar D. Design of online intelligent English teaching platform based on artificial intelligence techniques. Computational Intelligence, 2021, 37(3): 1166-1180.
[3] Barus I R G, Simanjuntak M B, Resmayasari I. Reading Literacies through Evieta-Based Learning Material: Students'Perceptions (Study Case Taken from Vocational School–IPB University). Journal of Advanced English Studies, 2021, 4(1): 15-20.
[4] Ibrahim A F, Attia A S, Asma'M B. Evaluation of the online teaching of architectural design and basic design courses case study: College of Architecture at JUST, Jordan. Ain Shams Engineering Journal, 2021, 12(2): 2345-2353.
[5] Yin J, Goh T T, Yang B. Conversation technology with micro-learning: The impact of chatbot-based learning on students' learning motivation and performance. Journal of Educational Computing Research, 2021, 59(1): 154-177.
[6] Nes A A G, Steindal S A, Larsen M H. Technological literacy in nursing education: A scoping review. Journal of Professional Nursing, 2021, 37(2): 320-334.
[7] Miller D. The best practice of teach computer science students to use paper prototyping. International Journal of Technology, Innovation and Management (IJTIM), 2021, 1(2): 42-63.
[8] Garcia M B. Cooperative learning in computer programming: A quasi-experimental evaluation of Jigsaw teaching strategy with novice programmers. Education and Information Technologies, 2021, 26(4): 4839-4856.
[9] Tian Y, Chen F, Zhang Y. Research on Strategies for Cultivating College Students' Network Information Security Literacy from the Perspective of Big Data. Advances in Educational Technology and Psychology, 2023, 7(8): 57-63.
[10] Lindqwister A L, Hassanpour S, Lewis P J.AI-RADS: an artificial intelligence curriculum for residents. Academic radiology, 2021, 28(12): 1810-1816.
[11] Decuypere M, Grimaldi E, Landri P. Introduction: Critical studies of digital education platforms. Critical Studies in Education, 2021, 62(1): 1-16.
[12] Gourlay L. There is no'virtual learning': The materiality of digital education. Journal of New Approaches in Educational Research, 2021, 10(1): 57-66.
[13] Tursunalievich A Z, Rahmat A. Challenges in Developing a Digital Educational Environment. Aksara: Jurnal Ilmu Pendidikan Nonformal, 2021, 7(2): 247-254.
[14] Maity S, Sahu T N, Sen N. Panoramic view of digital education in COVID-19: A new explored avenue. Review of Education, 2021, 9(2): 405-423.
[15] Decuypere M, Landri P. Governing by visual shapes: University rankings, digital education platforms and cosmologies of higher education. Critical Studies in Education, 2021, 62(1): 17-33.
[16] Alrikabi H T S, Jasim N A, Majeed B H. Smart learning based on Moodle E-learning platform and digital skills for University students. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 2022, 10(01): 109-120.
[17] Heidari A, Jafari Navimipour N. Service discovery mechanisms in cloud computing: a comprehensive and systematic literature review. Kybernetes, 2022, 51(3): 952-981.
[18] Alam T. Cloud-based IoT applications and their roles in smart cities. Smart Cities, 2021, 4(3): 1196-1219.
[19] Yathiraju N. Investigating the use of an Artificial Intelligence Model in an ERP Cloud-Based System. International Journal of Electrical, Electronics and Computers, 2022, 7(2): 1-26.
[20] Tabassum N, Ditta A, Alyas T. Prediction of cloud ranking in a hyperconverged cloud ecosystem using machine learning. Computers, Materials & Continua, 2021, 67(3): 3129-3141.