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Design of a Teaching Process Monitoring and Management System

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Abstract

To solve the emerging problems in network courses, we propose the design of a teaching process monitoring and management system, based on the education technology related theories, such as cooperative learning, environment learning, etc. Through the interaction between the monitoring, management, evaluation, and feedback, the system is able to increase the utilization rate of the network course, improve the learning interest and efficiency. Finally, the teaching management and quality are maximally improved.

Index Terms: process monitoring; management system; evaluation system; teaching system style

1. Introduction

The quality of undergraduate education is the lifeblood for university development. This poses higher and newer challenges and requirements for teaching management [1]. The central question is how to improve the teaching quality, particularly for the web-based courses, which are very popular in domestic middle schools. However, the utilization rate is very low and students' learning interest and effectiveness is not satisfactory. Recently, many domestic universities start to investigate the teaching process management system, but unfortunately, most of them are theoretical-oriented.

How to compensate these drawbacks? In this work, we propose a teaching process monitoring and management system to improve the teaching and learning efficiency, as well as the overall teaching quality for universities and colleges.

As a new teaching platform, the web-based teaching process monitoring and management system incorporates the management, evaluation, and monitoring systems involved in traditional courses. Based on the cooperative learning theory and the constructivism theory, this system provides the teachers and students an online learning and management environment [2]. Process monitoring is targeted for improving the online learning efficiency for the students. The functions of management and evaluation help the teachers design the curriculum conveniently, and maximally reduce the problems involved in online courses. Finally, the teaching quality can be remarkably improved. This is actually what the system and emphasizes and aimed at [3].

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2. Ideation of the system

2.1 Design Ideas

Strength the monitoring and management during the learning process is an effective way to improve the teaching quality. The process monitoring system makes full use of the computer technologies, investigates key technologies involved in process monitoring, and traces every student's learning behavior. It is a system that is capable of analyzing and monitoring the learning process of each student.

One should analyze the teaching process monitoring and management system according to the network learning evaluation, teaching evaluation, and other related indices. A data model which corresponds to the system functions is then established. Basic function module is designed according to different requirements. After testing each module, compact software is established by unifying all these components.

2.2 Data Model

The data of the entire system consists of three parts: course initial data set/exchange, learning process monitoring and data sampling, as well as learning effectiveness data analysis.

At the beginning of the course, teachers make the basic settings for the courses, including course contents, monitoring parameters, and etc.

Process monitoring and data sampling means the data collection of each student during the time that he/she stays in the system, and recording each step according to the sampling standard. This provides specific data for learning effectiveness analysis.

Learning effectiveness data analysis offers teachers the basis of evaluating the learning results and course data settings. The data model for teaching process monitoring and management system is displayed in Fig. 1.

3. Design of the system

3.1 Hierarchical Structure

In the field of software design, the hierarchical structure is the most important and commonly used one. There are usually three layers: User interface (UI) layer, business logic layer (BLL), and data access layer (DAL). Such a structure has the advantage that it can achieve the following targets: spread focus, loose couple, logical reclamation, and standard definition [4]. According to the system demand, an asynchronous JavaScript and XML (AJAX) layer will be supplemented in the UI layer. It can realize the tasks of asynchronous updating, reducing network data flow, and lower client configuration requirement. Most importantly, it is capable of providing friendly interface display.
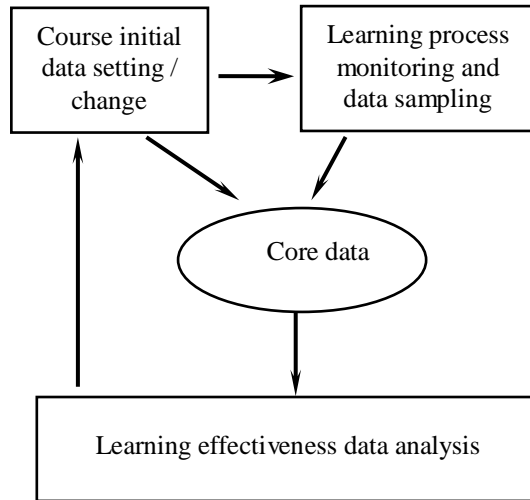
Fig 1. Data model for teaching process monitoring and management system

- User interface (UI) layer: This is the layer that direct connects with the users, and provides the interface to display or receiver the user's data. It includes user interface display and system processing result display, which adopts pure html files.
- Business logic layer (BLL): This is the core part of the system, which includes the realization of different business and access to various data. This layer is packaged by Servlet and Javabean. It provides UI layer business interface, and select corresponding manipulations (Javabean) according to UI layer's different businesses.
- Data access layer (DAL): It offers the method of access to different databases, i.e., select link according to different databases. It provides BLL a unified database operation method, such as Select, Insert, Update, Delete, and so on [5].

3.2 Function Analysis

The main function of each part in the three-layer structure is now specified. The system adopts a modularized design to meet different course requirements. Each module sets up related monitoring measures to supervise the students learning status in real time. The teachers will efficiently obtain the feedback from the students, which help the teachers arrange and improve the teaching schedule in time. According to specific teaching evaluation indices, the key modules can be classified to: course operation module, test module, communication module, desktop monitoring module, and learning effectiveness analyzing module.

3.3 Module Design

- Course operation module. The learning process is designed according to the importance and logic of the chapters. A pass barrier is inserted between each chapter, such that students have to get across the barrier before entering the next chapter. In this way, the learning quality can be maximally guaranteed. On the other hand, the teachers set logical relation between chapters according to the curriculum plan. Meanwhile, the usage of the learning material and quality of the homework is recorded by the system, so that it provides useful information for analyzing the learning effectiveness.

- Test module. A quiz will be provided after each chapter to test what the students have learned. The system will automatically record the test time and remind how much time is left. The result and evaluation of the test will be available right after the exam. The students are allowed to try more than one time. Each time the system will take a back-up quiz paper randomly.
- Communication module. This module provides a platform for learners to communicate with each other, and that with the teachers. By recording the topics of the students, as well as the number of the citation of the topics, the system can supervise the learning activity of each student.
- Desktop monitoring module. It includes learning status monitoring and learning contents monitoring. The former one is used to monitor whether the student is in the study status by tracing the position of the mouse. The latter one supervises the contents that the students are learning by installing a keywords extracting software.
- Learning effectiveness analyzing module. This is the main module to evaluate the effectiveness of the monitoring system. According to the data collected from the learners during the learning processes, the system will analyze the overall situation of the course, and each student as well. It basically includes: learning process, homework and quiz grades, learning efficiency and activity. Furthermore, the system allows each student to check his/her learning progress, and to be reminded of their learning status. Therefore, the system enables the students efficiently adjust their learning plans.

4. Characteristics of the system

4.1 Monitoring and Management of the Learning Process

It includes staged learning effectiveness monitoring and management and real-time learning effectiveness monitoring and management. These two mechanisms will affect each other, and mutually supervise the learners' learning status and finally improve their learning effectiveness.

For the monitoring and management of staged learning, it first records the data of learners' each operation, and then combines them in a certain period of time. The learning effectiveness during that stage will be embodied in their homework, quiz, activity, resources utilizing rate, etc. Finally, the system will manifest the staged learning effectiveness in the form of figures, which then are forwarded to the teaching evaluation and feedback system.
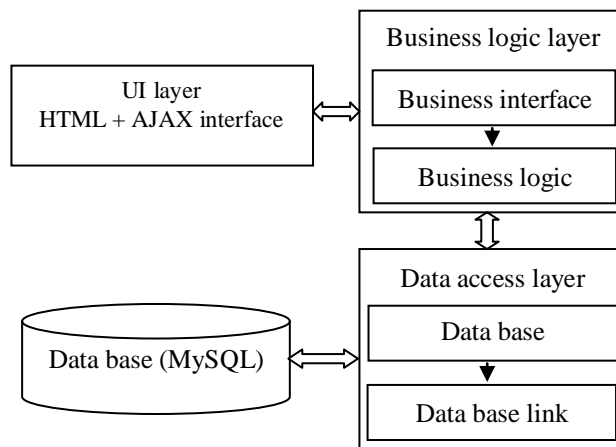

Fig 2. Fig.2 Diagram of layered system structure.

The monitoring and management of real-time learning system supervises the online status of each student based on the learning interface. It consists of mouse positioning and learning contents pertinence. The former one can trace the learning status and remind the learners to improve learning effectiveness, while the latter is to prevent the students from playing computers games during the learning time.

4.2   Evaluation and Feedback of Teaching

The teaching evaluation is comprised of learner's self-evaluation, teacher's impersonal evaluation, and system automatic evaluation. The first one, i.e., learner's self-evaluation, focuses on the learning notes. The students record the hard portions during the learning process, which can greatly improve their learning effectiveness. The second one, that is teacher's impersonal evaluation, concentrates on the evaluation of the homework and quizzes. The last one-system automatic evaluation, calculate the learning efficiency of the learners according to specific evaluation standards.

Teaching feedback is established on the basis of teaching evaluation. It is composed of the staged teaching feedback and real-time teaching feedback. Through the former one the teachers will be aware of the overall learning situation, such that proper modifications of the course schedule can be made efficiently. For the latter, a desktop supervision module will be installed to remind the students. In addition, automatic evaluation and answer analysis for the quizzes are also provided in this module.

4.3   Communication and Discussion

During the learning process, each student is allowed to use the communication and discussion module to launch topics. All the other students can join the discussions. Furthermore, each student can ask teachers or other students questions in order to obtain a satisfactory result [6].

4.4   Learning Competition

The system will provide each student his/her learning effectiveness as well as that of the entire group. This forms a competitive atmosphere, which will excite each student's learning motivation. Finally, their independent study capability and learning enthusiasm will be remarkable improved [3]

5.   Summary

Through the interaction between monitoring, management, evaluation, and feedback of the system, the drawbacks of the network teaching can be maximally compensated. In modern network education management, this system embodies the principle of students-centered spirit. Furthermore, it offers technological support for various network course constructions, reduces the construction workload, upgrades teaching management efficiency, and eventually improves the overall teaching quality.

Acknowledgment

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