Research on Online Physical Education Micro Course System Based on Improved Machine Learning

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Abstract. At present, there are some problems in online physical education micro course system, such as the teaching effect is not ideal and students' performance is low, so it is necessary to design a new online physical education micro course system based on improved machine learning. The hardware of the system consists of three interactive modules: information display unit, information processing unit and terminal interactive unit. The system software is composed of system user module, course management module, independent learning module, database module and online examination module. In the database module, six groups of information parameters, such as administrator information, course information and announcement information, are set. Using the improved machine learning method to design the online examination module. Through the combination of hardware and software, the online physical education micro course system is designed. The comparative experiment shows that the teaching effect of the system is better than that of the traditional system, and the sports performance is improved significantly.

Keywords: Improved machine learning · Online physical education · Teaching micro course system

1 Introduction

Information technology has constantly infiltrated into the field of education. Many educational researches begin to think that in the process of education and teaching, modern information technology based on computer and multimedia and information technology based on network communication need to be applied more comprehensively. The phenomenon of promoting education reform is "education informatization" [1]. Under the condition of educational informationization, the focus of educational field is no longer the only knowledge that is taught to students in books, but also the opportunity to create comprehensive learning for students. Under the guidance of the idea of "health first, people-oriented", physical education in Colleges and universities plays an important role. However, the traditional classroom physical education teaching mode has some

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limitations, which hinders the all-round development of students' individual personality. With the emergence of network courses, more and more learners can choose their favorite courses to study without going out of their homes. However, there are many existing network courses with various contents and less emphasis [2].

How to make learners quickly position themselves on the Internet according to the content they want to learn, or learn short and concise teaching films and classroom teaching with outstanding emphasis in the classroom is a new development trend. In this case, micro courses should also be applied [3]. However, due to the current online sports teaching micro course system teaching effect is not ideal, resulting in low physical performance of students. Therefore, an online physical education micro course system based on improved machine learning is designed.

2 Design of Online Physical Education Micro Course System Based on Improved Machine Learning

2.1 Design of System Hardware Interaction Module

Because online physical education teachers and students communicate with each other in an all-round way through the network, the design of interaction module is particularly important. The interaction module consists of three parts: information display unit (two interactive electronic whiteboards and two short focus projectors), information processing unit (computer), terminal interaction unit (electronic induction pen and electronic voter) [4]. In this module, the electronic induction pen operates on a double electronic white board. The electronic whiteboard collects the position and movement track information of the electronic induction pen, and transmits the information to the information processing unit (computer) through the data line. At the same time, the electronic voter can also transmit the operation information to the wireless signal receiving device, which then transfers the information to the information processing unit. When the information processing unit receives the information, it will process the information and convert it into the operation of computer programs and internal objects. The calculation results are transmitted to the display interface and the video signal is transmitted to the projector through the line [5]. Finally, the projector transforms the video signal and projects it to the electronic whiteboard for information sharing. The interaction flow of the interaction module is shown in Fig. 1.

The information display unit mainly includes two interactive electronic white boards and two short focus projectors, which is the main part of the whole hardware. The double electronic whiteboard is an electromagnetic induction type whiteboard. The electromagnetic induction coil is embedded in the whiteboard as a stroke sensor to form a stroke receiving device for writing whiteboard. By pressing the tip of the electronic induction pen to contact the surface of the whiteboard, the stroke is captured in the induction area [6]. Short focus projector is a kind of projector that can project about - inch picture in a short distance (generally about one meter). Due to the short projection distance, the projector is installed directly above the interactive electronic whiteboard, which can not only avoid the direct projection of the projector light to the eyes of the speaker, but also

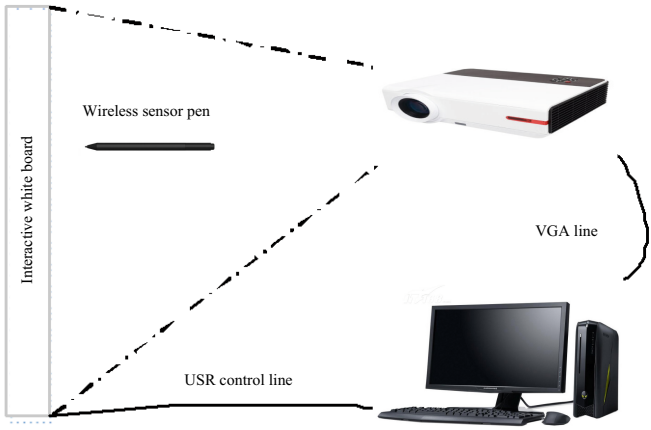


Fig. 1. Interaction flow of interaction module

avoid the shadow of the speaker being transmitted on the screen to block the screen. The combination of double interactive whiteboard and double short focus projector forms a set of interactive system with super information receiving ability and display ability. It can realize double track display, that is, when the left board presents text materials, the right board synchronously displays relevant pictures, animation and video materials. At the same time, it presents a variety of learning resources to provide basic guarantee for the continuity of students' learning process and the efficiency of knowledge coding.

Information processing unit is a computer with interactive "double board" teaching system software, which is an important part of the whole hardware.

Terminal interaction unit refers to electronic sensor and electronic voter. The electronic induction pen is mainly used to operate, write, annotate and draw on the interactive whiteboard interface, so as to indirectly operate the computer (the pen tip is equivalent to the left mouse button, and pressing and holding the red button is equivalent to the right mouse button) And to transfer, modify and adjust learning resources so as to "write everywhere, write at any time", so as to promote the deep interaction between teachers and students and the interactive "double board". The electronic voter is a real-time feedback tool for students to respond to teachers' questions and classroom tests, which is mainly aimed at the problems with options. Through the above two functions, students can immediately convey their own independent thinking or discussion conclusions with other students to teachers. On this basis, teachers summarize and comment on students' views and share them with students, so as to promote the interaction between new and old ideas of students.

3 System Software Design

3.1 Design of System User Module

There are three kinds of users: students, teachers and administrators. Its structure is shown in Fig. 2.

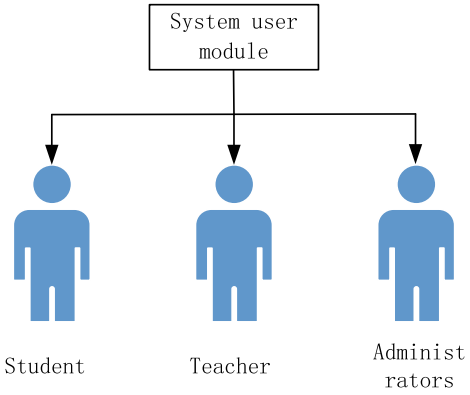


Fig. 2. Composition of user module

Students are the main users of the system, through the system to complete sports knowledge learning [7], after logging in the system, you can view and modify personal data, change password, view course video. You can practice, test, ask questions online and interact with other users. After logging into the system, teachers can view personal data, change password, release learning tasks, upload teaching videos and exercises, manage test questions, answer questions online, evaluate student reports, etc. The administrator is responsible for user information maintenance, class creation, etc.

User login of the system user module: when a user accesses the system through a network address, he/she needs to authenticate, and only legal users can use the system. When logging in, students, teachers and administrators enter user names and passwords, and the system will judge user categories based on user names, passwords and user types. If the matching with the database data is successful, the login is successful; otherwise, the login error will be prompted. After the user logs in to the system, the corresponding function modules are displayed.

User management of system user module: the administrator manages the class, teacher and student users. You can add, modify, and delete students.

3.2 Design of Course Management Module

The curriculum management module is designed and developed for teachers. In this module, teachers manage the PE micro curriculum. The creation of sports micro course is completed by teachers. After the course is created, teachers can view the course information, add chapters for sports micro course, or modify or delete chapters. The

teacher is responsible for uploading the video for the corresponding chapters of the sports micro course. The first mock exam is designed for each session, and uploaded to the server in this module for learning and practicing.

3.3 Design of Autonomous Learning Module

Autonomous learning module is designed for students to learn the content and practice of physical micro course online. According to their own needs, students choose PE courses and enter corresponding PE micro courses. The corresponding sports course name, introduction and chapter link will appear in the sports micro course learning interface [8]. Students choose the section they want to study. The videos watched by the students are generally short, with pause and playback functions. After watching the video of each section, students will do the exercises corresponding to the current section on the same page.

In the autonomous learning module, the online learning discussion function can be realized. Online learning discussion is a way of multi-person communication. Teachers and students can participate in the discussion, similar to the public forum. Online discussion can be carried out on a certain topic. You can freely express your opinions and collide with each other's thoughts, which is conducive to in-depth learning and exchange [9]. When students watch the video of each section and do the corresponding exercises, they can discuss the content of this section, and other students and teachers can participate in the reply. Teachers can manage all discussion topics and delete some inappropriate topics or replies. Under the video page, there is a window for learning and discussion. Students can express their opinions by inputting the specific content of the comments. Show the content, author, and time of the discussion in the discussion list.

3.4 Design of Database Module

The database module has created 6 tables, including 'Admin', administrator information table; 'Course', the course information table; 'news', the announcement information table; 'Student', the student information table; 'Teacher', the teacher information table and data information table. The design results of each table are as follows (Tables 1, 2, 3, 4, 5 and 6):

Table 1. Administrator information table

Serial number	Name	Type	Length (character)
1	id	int	4
2	name	nvarchar	50
3	Password	nvarchar	50

Table 2. Course information table

Serial number	Name	Type	Length (character)
1	id	int	4
2	courseID	nvarchar	50
3	courseName	nvarchar	50
4	TeacherId	nvarchar	50
5	teacher	nvarchar	50
6	credithour	nvarchar	50
7	term	nvarchar	50
8	classname	nvarchar	50
9	Address	nvarchar	50
10	BeginTime	nvarchar	50
11	xueyuan	nvarchar	50
12	zhuanye	nvarchar	50
13	zhuanyeid	int	4
14	xueyuanid	int	4

Table 3. Announcement information table

Serial number	Name	Type	Length (character)
1	id	int	4
2	title	nvarchar	50
3	contents	Text	–
4	addtime	nvarchar	8

3.5 Design of Online Examination Module

Design online examination module based on improved machine learning [10]. Using Moodle quiz plug-in, teachers can easily make use of Word template to make Moodle XML test questions in the process of writing test questions library. And set some simple technical parameters for each link of the test. After the examination, the students submit the examination papers and use the improved machine learning to grade the examination questions. The structure of online test module is shown in Fig. 3.

Table 4. Student information table

Serial number	Name	Type	Length (character)
1	id	int	4
2	UserName	nvarchar	50
3	xuehao	nvarchar	50
4	Sex	nvarchar	50
5	chushengriqi	datetime	8
6	Ds	nvarchar	50
7	emal	nvarchar	50
8	pwd	nvarchar	50
9	xueyuanId	Int	4
10	XueyuanName	nvarchar	50
11	zhuanyeId	Int	4
12	ZhuanyeName	nvarchar	50

Table 5. Teacher information table

Serial number	Name	Type	Length (character)
1	id	int	4
2	UserName	nvarchar	50
3	xuehao	nvarchar	50
4	Sex	nvarchar	50
5	chushengriqi	datetime	8
6	Ds	nvarchar	50
7	emal	nvarchar	50
8	pwd	nvarchar	50
9	xueyuanId	Int	4
10	XueyuanName	nvarchar	50
11	zhuanyeId	Int	4
12	ZhuanyeName	nvarchar	50

Table 6. Data information table

Column names	Explain	Type (Length)	Remarks
Id	number	Int (4)	Cannot be empty, primary key
TitleName	Name of data	Varchar (50)	No space allowed
FileDs	Data description	text	No space allowed
FilePath	File address	Varchar (20)	No space allowed
Addtime	Adding time	datetime	No space allowed
FileName	File name	Varchar (50)	No space allowed

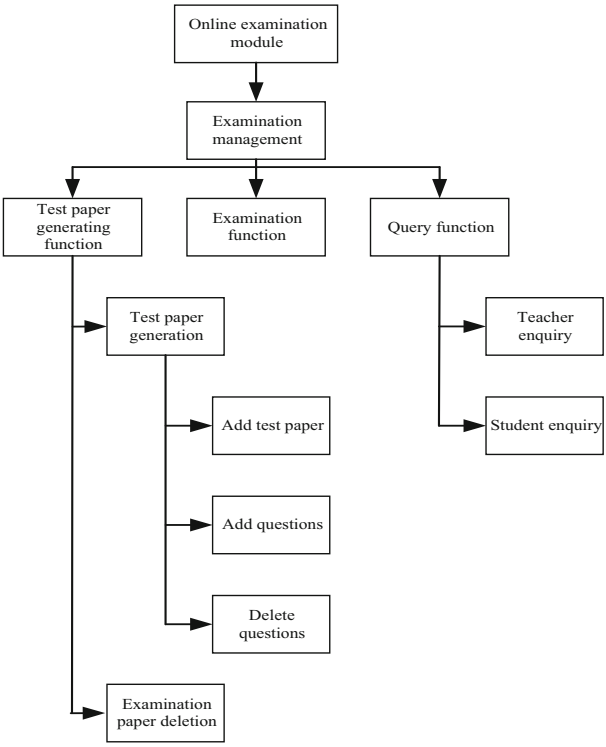


Fig. 3. Construction of online examination module

4 Experimental Results and Analysis

4.1 Experimental Environment

Using the designed online physical education micro course system based on improved machine learning to carry out the experiment. First, the simulation experiment platform of online physical education micro course system is designed, and the hardware structure of the platform is shown in Table 7.

Table 7. Hardware structure of the platform

Serial number	Name	Configuration
1	CPU	Intel Core I3 CPU m 390 @ 2.67 GHz (dual core 4-thread)
2	A main board	HP 1667 (Intel HM55 (ibexpeak-m DH))
3	Memory	2 GB, DDR3
4	Graphics card	Intel HD graphics (ironlake), 256 MB
5	Hard disk	WDC wd5000bevt-60a0rt05400 rpm, 500 GB
6	Monitor	LG Philips LP140WH1-TLC6
7	Network card	Ruiyu semiconductor RTL8101/2/3 family fast Ethernet NIC
8	sound card	Intel 5 Series/34 × 0 chipset PCH - high definition audio device controller

The software structure of the platform is shown in Table 8.

Table 8. Software structure of the platform

Serial number	Name	To configure
1	system platform	WindowsXP
2	Web server	Apache
3	database server	MySQL
4	Database management tools	SQL Manager for MySQL and phpMyAdmin
5	Development tools of web application	Dreamweaver

Other tool software configured for the platform is shown in Table 9.

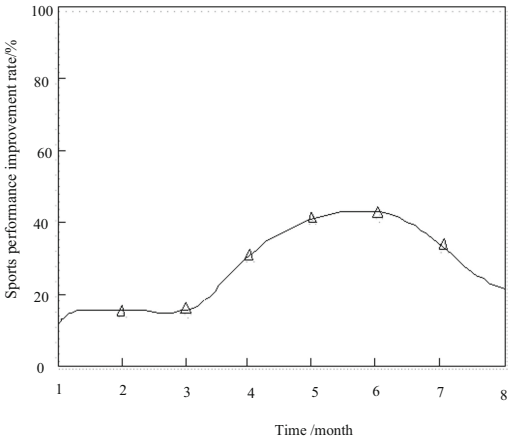
Table 9. Other tool software configured by the platform

Serial number	Name	To configure
1	Web art and image processing	Adobe Photoshop
2	System diagram drawing tool	Microsoft Office Visio

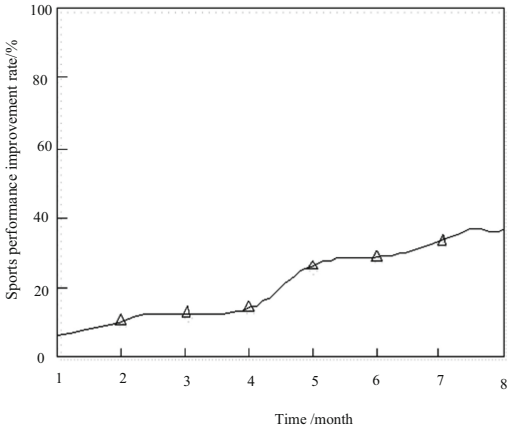
Based on the simulation platform, an online physical education micro course system based on improved machine learning is deployed for Windows server. Through the installation of IIS components to configure the system server parameters, the core database

of the system is built with Windows SQL Server 2008 software to use the system for online physical education.

In order to ensure the contrast of the experimental results, the traditional online physical education micro class system includes the online physical education micro class system based on Web, configuration software and human-computer interaction, and the online physical education micro class system designed in this paper is compared with the online physical education micro class system based on improved machine learning. Compare the teaching effect of each online physical education micro course system. The basis of judging the teaching effect is to use different systems to improve the students' physical performance after online physical education. The higher the promotion rate is, the better the teaching effect is.

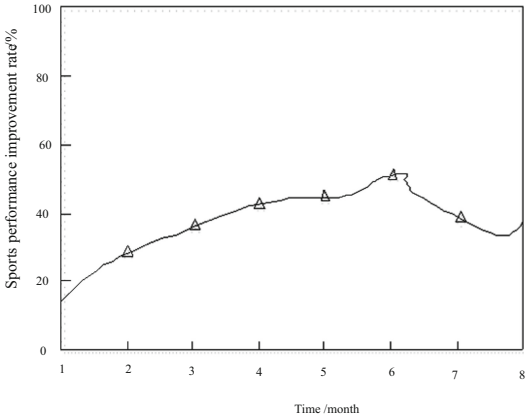


(a) The promotion rate of sports achievement in Web System

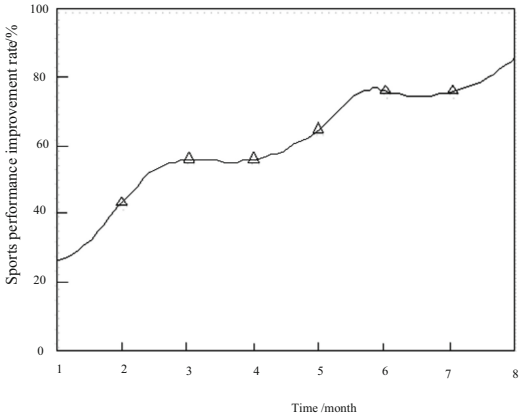


(b) Sports achievement promotion rate of configuration software system

Fig. 4. Experimental results of teaching effect comparison



(c) The promotion rate of sports performance in human computer interaction system



(d) Improving the rate of improvement of physical education achievement of machine learning system

Fig. 4. (*continued*)

4.2 Experimental Analysis

The experimental results of the comparison between the traditional online physical education micro class system and the online physical education micro class system based on improved machine learning are shown in Fig. 4.

According to the experimental results of teaching effect comparison in Fig. 4, the performance improvement rate of web-based teaching system is not higher than 50%. The improvement rate of teaching system based on configuration software is less than 40%. Based on the human-computer interaction teaching system, the improvement rate is less than 58%. Based on the improvement of machine learning, the highest improvement

rate of online physical education micro class system is 83%. Its teaching effect is better than the traditional online physical education micro class system, and the improvement of learning performance is obvious.

5 Conclusion

In view of the problem that the teaching effect of online physical education micro course system is not ideal, this paper proposes an online physical education micro course system based on improving machine learning. By improving the system of machine learning design, the online interaction between teachers and students can be realized effectively, the learning effect of students can be detected in time, and the teaching effect can be improved. After verification, the teaching effect of the system is better than the traditional system, which is conducive to the improvement of the online teaching system of micro courses.

References

1. Demir, M.: Using online peer assessment in an Instructional Technology and Material Design course through social media. High. Educ. **75**(3), 399–414 (2018). https://doi.org/10.1007/s10734-017-0146-9
2. Veiga, N., Luzardo, F., Irving, K., et al.: Online pre-laboratory tools for first-year undergraduate chemistry course in Uruguay: student preferences and implications on student performance. Chem. Educ. Res. Pract. **20**(1), 229–245 (2019)
3. Park, H.S., Cheong, Y.F.: Correlates of monotonic response patterns in online ratings of a university course. High. Educ. **76**(1), 101–113 (2018). https://doi.org/10.1007/s10734-017-0199-9
4. Goodfellow, I., McDaniel, P., Papernot, N.: Making machine learning robust against adversarial inputs. Commun. ACM **61**(7), 56–66 (2018)
5. Muggleton, S.H., Schmid, U., Zeller, C., et al.: Ultra-Strong Machine Learning: comprehensibility of programs learned with ILP. Mach. Learn. **107**(7), 1119–1140 (2018). https://doi.org/10.1007/s10994-018-5707-3
6. Nalmpantis, C., Vrakas, D.: Machine learning approaches for non-intrusive load monitoring: from qualitative to quantitative comparation. Artif. Intell. Rev. **52**(1), 217–243 (2019). https://doi.org/10.1007/s10462-018-9613-7
7. Lei, Z., Zhou, H., Hu, W., et al.: Modular web-based interactive hybrid laboratory framework for research and education. IEEE Access **20**(6), 152–163 (2018)
8. Jin, D., Shi, S., Zhang, Y., et al.: A complex event processing framework for an adaptive language learning system. Future Gener. Comput. Syst. **92**(10), 857–867 (2019)
9. Merayo, N., Ruíz, I., Debrán, J., et al.: AIM-Mobile Learning Platform to enhance the teaching-learning process using smartphones. Comput. Appl. Eng. Educ. **26**(5), 1753–1768 (2018)
10. Wei, X., Gu, Q., Luo, Y., et al.: The reform of computer experiment teaching based on O2O model. Comput. Appl. Eng. Educ. **27**(1), 102–111 (2019)