Design of Learning Feedback System of Sports Training Based on Big Data Analysis

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Abstract. Due to the poor stability of the traditional sports training learning feedback system, it cannot improve the efficiency of students’ sports training learning, thus reducing the learning interest of students. Therefore, a sports training learning feedback system based on big data analysis is proposed and designed. Through the positive feedback mechanism and the negative feedback mechanism, the study feedback mechanism of sports training is analyzed. Under the big data analysis, the study feedback mechanism of sports training is used. According to the function structure of the system, the study feedback system of sports training is designed, including the system login module, the data management module and the study feedback module. The experimental results show that the application of the designed learning feedback system based on big data analysis improves the efficiency of the conventional teaching by 34%, the learning interest of students by 39%, the satisfaction of students’ learning feedback, and the stability and retrieval rate of the system.

Keywords: Big data analysis · Sports training · Learning feedback system · Feedback mechanism

1 Introduction

With the rapid development of IT technology, all walks of life are facing the pressure of massive data processing. Human intelligence alone can no longer meet the needs of massive information computing and analysis. In 2012, the Obama administration released the big data research and development initiative on the White House website, aiming to improve the ability to acquire knowledge and insights using a large number of complex data sets. Six federal government agencies agreed to invest more than $200 million in this. With the rapid development of IT technology, all walks of life are facing the pressure of massive data processing. Human intelligence alone can no longer meet the needs of massive information computing and analysis [1]. In sports training, by using the learning feedback mechanism of sports training, students can obtain certain learning
effects through their own efforts, usually in the form of teacher evaluation, examination results, student evaluation, etc. For such learning effects, they will return to the consciousness of learners, gradually form new information to regulate learning process, thus constantly learning feedback. In the learning process, a clear understanding of their own learning results will adjust the learning process of learners in a timely manner, constantly improve their enthusiasm for learning, enable them to get good grades, and promote students to increase their efforts. On this basis, students can understand their own shortcomings, so as to correct them in time. It can not only stimulate students’ interest in learning, but also strengthen learning motivation, which is the feedback effect of learning results. In the process of learning, middle school students master their own achievements, get some spiritual satisfaction, produce a kind of self-confidence, accompanied by a sense of pleasure, excitement and relaxation; at the same time, they further arouse interest in learning, show great enthusiasm for learning, and improve students’ enthusiasm and initiative in learning [2]. At present, domestic and foreign research in this area has made some achievements. Literature [3] designed an Internet-based Interactive Platform for physical education theory course information, which uses Windows Based on the web solution provided by IIS in XP, we collect all kinds of information needed by the system, use Dreamweaver, flash, ASP and other dynamic Internet development tools, integrate all kinds of physical education theory course information systems according to the needs, take the dynamic hypertext format as the basis of information platform, and provide the information of physical education theory course through the way of network information interaction Users. The research shows that the data of the platform has the characteristics of integration, control and interaction. The platform has the functions of knowledge diagnosis, online interaction, dynamic management, auxiliary teaching and network distance teaching. However, the stability of the system is poor, which can not improve the efficiency of sports training and learning, so as to reduce students’ interest in learning. Literature [4] designed a general video feedback system suitable for college physical education teaching. Based on the analysis of the challenge of college physical education teaching, based on the design theory of the feedback video system and the analysis of the application examples of the system, according to the different needs of different users, the complete functional framework of the general feedback video system is given. However, students’ satisfaction with the system is low, and the retrieval rate of learning feedback data is reduced.

To solve these problems, this paper designs a learning feedback system of sports training based on big data analysis. Big data analysis is a widely used Internet technology at present. Applying it to the feedback design research of sports training learning is conducive to the improvement of the whole sports training teaching quality.

2 Research on Big Data Analysis

Big data has the characteristics of large amount of data, complex data structure, fast data generation and low data value density, which increase the difficulty of effective analysis of big data. Big data analysis has become the core content of current exploration of big data development. Therefore, it is necessary to conduct in-depth analysis of the connotation and extension of big data analysis. Big data analysis is the product
of rethinking data science and exploring new models in data intensive environment. Strictly speaking, big data is more like a strategy than a technology. Its core idea is to manage and extract value from massive data in a much more effective way than before. Big data analysis is the core of big data concept and method. It refers to the process of analyzing massive data (i.e. big data) with various types, rapid growth, and real content, and discovering useful information such as hidden patterns and unknown correlations that are helpful for decision-making. Therefore, this paper believes that big data analysis is a data analysis process that widely collects and stores data according to the data generation mechanism, formats and cleans the data, based on the big data analysis model and supported by the integrated big data analysis platform, uses the cloud computing technology to schedule the computing and analysis resources, and finally excavates the patterns or laws behind the big data [5]. The big data analysis process is shown in Fig. 1.

![Big data analysis process](image)

**Fig. 1.** Big data analysis process

### 3 Analysis on the Feedback Mechanism of Sports Training Learning

The feedback mechanism of sports training based on big data analysis is based on cybernetics, information theory, systematology and modern teaching theory. Through information feedback as the main channel, it penetrates the classroom with active and positive learning attitude and advocates multi-directional modern teaching information transmission. It changes the single way of information transmission in traditional teaching and “imitation one” in traditional teaching Memory is a simple and inefficient learning habit. Students follow the learning activity law of “exploration, memory and creation”; with
information feedback as the main channel, in the teaching, on the basis of changing the traditional teaching, teachers master the basic knowledge, basic technology and basic skills, take teachers as the leading role and students as the main body, realize teachers’ scientific and reasonable control skills of teaching activities, and achieve the teaching purpose of cultivating students’ comprehensive quality.

In order to give full play to the overall function of the teaching system and realize the purpose of teaching and educating people, the feedback mechanism of sports training and learning always takes information feedback as the main line, regulates teaching and learning in time and strives to obtain the best teaching effect. The so-called system is an organic whole composed of several interdependent and interdependent elements for the realization of a certain function. According to the principle of system theory, teaching, as a practical activity, is a relatively independent system, which has many interrelated elements such as teachers, students, teaching materials, teaching methods, learning methods, etc. These elements are interdependent in teaching activities. Teachers can’t do without students, students can’t do without teachers, teachers and students can’t do without textbooks, without teaching methods, teachers can’t follow the rules, without learning methods, students can do twice as much as they can. At the same time, these elements are mutually restricted. Teachers can’t teach at will, and they must do according to students’ needs. Students’ learning methods can’t do at will, and they must accept teachers’ management and guidance. Teachers’ teaching methods should be based on students’ actual aptitude, and students’ learning methods should be selected according to their own characteristics. In teaching activities, these elements must cooperate with each other to achieve their overall functions and improve the quality of teaching. However, in traditional teaching, it is not conducive to give full play to the overall function of the teaching system to attach importance to the leading role of teachers, ignore the main position of students, attach importance to teaching methods and ignore learning methods. In view of these disadvantages, the feedback mechanism of sports training and learning fully mobilizes the enthusiasm of students’ active learning, guides the learning methods, and makes students’ development lively.

The learning feedback mechanism of sports training includes positive feedback mechanism and negative feedback mechanism. When students get good academic performance or get good evaluation, their enthusiasm will improve, which is a positive feedback mechanism; when students’ academic performance is not good or get bad evaluation, their enthusiasm will be low, which is a negative feedback mechanism. Many students lose confidence in learning because of their poor performance. They get feedback every time, but they don’t know how to adjust their learning state. Psychologists Rosie and Henri further showed that the feedback mechanism is particularly effective in learning, especially the daily feedback is more efficient than the weekly feedback. The learning feedback mechanism of sports training emphasizes the timely feedback and regulation of information, which is the superiority of this mechanism. The feedback is divided into three ways: pre feedback, immediate feedback and delayed feedback.
Pre feedback refers to before the implementation of teaching design. According to the feedback information of the previous teaching process, the teaching designer analyzes the teaching background, the existing level of students’ knowledge and ability, the psychological preparation of students’ learning new knowledge and other factors, so as to formulate the goals and Strategies of teaching design.

Immediate feedback is to give feedback immediately when students learn new knowledge and have some behavior changes. Because the students have fresh memories of the reaction they just made, they can strengthen the correct response and correct the wrong response in time through immediate feedback, so as to achieve the purpose of enhancing the teaching effect.

Delayed feedback is to give feedback after students have made a learning response. Experienced teachers often take a “cold treatment” approach to problems that are difficult to dredge students’ ideological understanding for a while, which is delayed feedback. This way of dealing with students left time for thinking, more conducive to the solution of the problem.

In the process of feedback teaching, teachers, students and teachers and students are constantly exchanging and feedback information. A closed feedback loop is formed between teachers and students, and the two sides influence each other. Since sports training is a bilateral activity between teachers and students, teachers should have strong professional ability to output enough information. Whether the information input by teachers can achieve the expected effect depends on the ability of students to accept the information. The difference of learning effect is accompanied by the difference of receptive ability and feedback in different ways. For information feedback from different aspects, the teacher should make use of, analyze and revise it in time, and then pass the new information to the students after completing this process. It can make the feedback information input, output and control continuously, thus forming a closed whole sports training learning feedback system [6]. Physical education teachers deepen the understanding of feedback teaching in the process of teaching. According to different learning stages, different learning bases and different course content departments, timely and accurately obtain information, carry out comparative analysis on the preparation content, and adjust and change the teaching methods accordingly. For example, when students have psychological fear difficulties in teaching, we should consider reducing the difficulty of teaching and so on. At the same time, it has significant effect to strengthen the relationship between teachers and students in teaching, to adjust the internal, to obtain positive information, and to promote feedback to develop in a positive direction. In the teaching process, the effective information exchange and timely feedback between teachers and students can not only enhance the cooperation between teachers and students, realize the mutual improvement of teaching and learning, but also effectively improve the teaching effect [7].
4 Learning Feedback Design of Sports Training Based on Big Data Analysis

4.1 Functional Structure of the System

Based on the above analysis of the learning feedback mechanism of sports training, this paper designs a learning feedback system of sports training based on big data analysis. The setting of the user’s authority of the sports training learning feedback system ensures the security of the system; the database query function enables the user to modify the data in the database directly without opening the database, which is the biggest advantage of the system. The sports training learning feedback system also has the extremely convenient database backup and recovery functions.

The functional structure of the sports training learning feedback system under big data analysis is shown in Fig. 2:

![Fig. 2. System function structure diagram](image)

4.2 System Login Module

In order to increase the security of data, the system adds a login module. Before using the system, the user must have the login permission, otherwise the system will not run, which can prevent the personnel without access to the database from modifying the data of the database. The system login interface is shown in Fig. 3.
4.3 Data Management Module

The main function of this module is to display the data, which is stored in the Microsoft SQL Server 2000 database, in the form. If necessary, you can modify the data in the form grid directly to modify the data in the database. Because of the implementation of synchronous operation, what users see is the data in the database. In addition, the system also provides modification function - through this interface, users can add data, modify data and delete data to the database.

4.4 Learning Feedback Module

Using feedback teaching to stimulate the desire for knowledge shows a positive learning motivation. Because of continuous learning feedback, information flow interacts between learners and environment, forming a loop. As shown in Table 1:

| Influence factor       | Important advice | Other |
|------------------------|------------------|-------|
| Experiences influence  | 91.7%            | 8.3%  |
| The influence of the class | 87.9%        | 12.1% |
| School attention       | 83%              | 17%   |
| Teachers influence     | 85.9%            | 12.3% |
| Sports habit           | 82.8%            | 17.2% |

The first level of feedback is mainly from classroom teaching, which is the most basic and timely information feedback. The purpose is to make teachers know more about the overall situation of students, master their physical, psychological quality, technical skills and personality differences, and improve teaching methods in time to improve the classroom teaching effect [8].
The second level feedback comes from the semester assessment. Through the assessment and inspection, it summarizes the problems in teaching in this stage, adjusts the teaching schedule and plan in time, improves the teaching method, and puts forward a reasonable and scientific teaching control plan [9].

The third level feedback mainly summarizes the effect of the implementation of the syllabus in the whole sports training through the completion examination of physical education class, finds out its shortcomings, so as to adjust the requirements and proportion of the syllabus, and puts forward more perfect contents of the syllabus, so as to implement the optimized teaching control process [10].

The fourth level of feedback mainly comes from the information feedback of students’ sports after graduation. It can feed back some knowledge that teachers are eager for in university sports training. To some extent, it guides the formulation and modification of teaching objectives and syllabus, provides reliable basis in teaching key points, and points out the direction for how to cultivate students’ sports interest and form lifelong sports concept in university stage. The learning feedback module is shown in Fig. 4:

![Learning feedback module](image)

According to the designed learning feedback system of sports training based on big data analysis. Design the learning feedback process of sports training, as shown in Fig. 5:
5 Example Analysis

In order to ensure the effectiveness of the learning feedback system based on big data analysis, it is necessary to analyze its effectiveness. In the test process, different classification detection methods are taken as the test object, and the optimization ability of detection methods is analyzed, and simulation analysis is carried out with different specifications of test objects. In order to ensure the accuracy of the experimental process, we need to set the parameters of the experiment. In this paper, the simulation test uses the test data as the test object, uses three different design methods to carry out the classified test, and analyzes the simulation test results. Because the analysis results and analysis methods obtained by different methods are different, it is necessary to ensure the consistency of test environment parameters in the test process. The test data setting results in this paper are shown in Table 2:
Table 2. Comparison of students’ physical fitness

| Group       | The experimental group | The control group |
|-------------|------------------------|-------------------|
| Leapfrog    | 9.7                    | 9.3               |
| Reverse layup | 9.6                   | 9.4               |
| Music leg go | 9.8                    | 9.5               |
| Walking     | 16.8                   | 15.8              |
| Running     | 17.5                   | 16.4              |

According to the above experimental parameters, this system is used to compare the satisfaction of students’ learning feedback with literature [3] system and literature [4] system, and the comparison results are shown in Tables 3, 4, and 5.

Table 3. A systematic comparison of students’ satisfaction with learning feedback in this paper

| Survey questions            | Satisfaction% |
|-----------------------------|---------------|
| Curriculum Provision        | 93.6          |
| The way for school          | 96.4          |
| Evaluation way              | 97.5          |
| Classroom interaction       | 91.2          |
| The teaching evaluation     | 92.8          |

Table 4. A comparison of the satisfaction of students’ learning feedback in literature [3]

| Survey questions            | Satisfaction% |
|-----------------------------|---------------|
| Curriculum Provision        | 82.6          |
| The way for school          | 80.3          |
| Evaluation way              | 84.5          |
| Classroom interaction       | 86.2          |
| The teaching evaluation     | 82.6          |

It can be seen from the table that there is a significant difference in the examination results of the experimental class and the control class after the experiment. The reason is that there are many factors affecting the sports results, such as physical fitness, the length of contact time, the exertion of technical level and so on. For college students,
Table 5. A comparison of the satisfaction of students’ learning feedback in literature [4] system

| Survey questions            | Satisfaction% |
|----------------------------|--------------|
| Curriculum Provision       | 77.2         |
| The way for school         | 76.5         |
| Evaluation way             | 72.6         |
| Classroom interaction      | 74.8         |
| The teaching evaluation    | 79.5         |

through the test before the experiment, we can see that there is not much difference in physical quality. The main reason that affects their sports performance is the sports time, sports technology and skill proficiency. And the satisfaction of students’ learning feedback using this system is higher than that of literature [3] system and literature [4] system. The application of learning feedback mechanism in sports training teaching in Colleges and universities can stimulate students’ interest in learning, arouse students’ enthusiasm in learning, and help students to increase contact time in and out of class and improve their sports performance. Through the timely feedback of information, teachers can check the completion of teaching objectives, while students can also self-examine through the feedback information in class and the feedback evaluation sheet filled in after class to find out the deficiencies so as to increase the practice time and times and improve the sports performance.

In order to further verify the effectiveness of this system, we use this system, literature [3] system and literature [4] system to compare and analyze the retrieval rate of students’ learning feedback data. The comparison results are shown in Fig. 6.

According to Fig. 6, the retrieval rate of student learning feedback data in this system is up to 75%, while that in document [3] system and document [4] system is up to 52% and 49%, respectively. The retrieval rate of students’ learning feedback data in this system is higher than that of literature method.
Fig. 6. Comparison of students’ satisfaction with learning feedback in three systems
In order to further verify the performance of this system, the stability of this system is compared with that of [3] and [4], and the comparison results are shown in Fig. 7.

(a) The stability of the system in this paper

(b) Stability of document [3] system

Fig. 7. Stability comparison of three systems
According to Fig. 7, the stability of the system in this paper is up to 88%, which is higher than that of literature [3] and literature [4].

6 Concluding Remarks

Based on big data analysis, this paper designs a study on the feedback design of sports training learning, which is conducive to improving the level of students’ sports technology, and can effectively improve students’ ability of creative thinking and observation, analysis and problem-solving. More conducive to creating a harmonious teaching environment, students help each other, exchange, and improve the teaching effect. It is conducive to the mastery of students’ theoretical knowledge and the improvement of sports skills, to fully reflect the main role of students in the classroom and the leading role of teachers, and to improve and develop students’ creative thinking, optimize teaching methods, enhance learning confidence, enrich evaluation methods, and strengthen the teaching effect.

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