Research on the Computer-platform-based Procedural Management Models in Physical Education in Colleges

Yongchang Zhang

School of Information, Shijiazhuang Vocational College of Finance & Economics, Shijiazhuang 050061, China

Abstract

It’s favorable for the improvement of physical education and the physical education reform in colleges to construct a computer-aid procedural management model to facilitate the scientific management over the PE teaching, students’ PE scores, health examination data, the times and frequency of physical trainings, as well as the teaching performance of PE teachers and the training performance of athletes. Particularly, by properly connecting the Comprehensive PE Management System software with the college intranets and enabling students to take courses and check test result online, we could genuinely achieve a procedural, modern and automatic PE management in colleges.

Keywords: Computer Platform, Higher Physical Education, Procedural Management.

1. BACKGROUND

1.1 Overview

The Higher Physical Education is a discipline centered on application and practice. It consists of the development of a person’s athletic constitution, psychological quality, interpersonal communication competence and team-work capability. It requires a more relaxed environment, advanced teaching technologies and diversified teaching approaches to ensure the success of PE in colleges. This is why the research on the IT applications is so important to higher physical education (Yang, 2015). As the application of information technologies getting increasingly extensive in the education sector, more and more internet-based and multimedia teaching tools are now accessible to PE teachers to enrich their teaching aids. Unfortunately, due to the lack of systematic teaching models, the implementation of many promising PE theories is still far from effective and the improvement of education quality is still not as good as expected. Such integration and application of information technologies will first of all significantly increase PE resources. Via the internet, more advanced domestic and international teaching resources are now easily available, the PE can be based on a wider knowledge basis, and the PE students may pursuit their learning in a more active and independent way (Sun and Liu, 2015). The online PE platform will enable the PE teachers to upload teaching videos or learning materials for students to review and study. In addition, the interaction modules of the platform will enable both teachers and student to discuss problems and exchange ideas, facilitating them to carry out after class training. As we know, currently there is a number of advanced information technologies, e.g. the virtual reality (VR) technologies, can play an important role in PE courses. As a matter of fact, the VR technologies can help teachers to simulate the movement process of a sport in real environment or precisely reproduce the technical details of a movement process, so that the students may improve their skills through simulated training modules in a simulated environment.

1.2 Objectives

In recent years, the PE management in colleges has been under great pressure because it has to deal with more undergraduates coming along with the implementation of enrollment expansion policy, more learning content and more subject achievement tests resulting from the launching of curricular-variable system (Shu and Wang, 2015). The application of a well-structured comprehensive PE management system would be the best answer to these challenges and help colleges to meet the needs of providing a scientific, standardized and procedural management for physical education in the new era. According to the National Guidelines on PE Curriculum and Teaching in General Colleges and Universities, the content of a PE course should combine health improvement with cultural cultivation, selectivity with effectiveness, science with acceptability, in line with the principle of integrated in-class and after-class exercise. This puts a high requirement on the support from PE management system.
Fortunately, along with the fast development of science and technology, the computer-based IT management tools have begun playing a more important role in college PE teaching. The application of computers and network technologies has in fact significantly reduced the work load on college PE teachers and management staff, effectively improved the efficiency in general, and given a great thrust to the reform and development of college physical education (Shao, 2010). It’s therefore even more urgent for colleges and universities to maintain a scientific management over all PE-related matters with the help of well-structured comprehensive PE management software.

2. THE FUNCTIONS OF THE COMPUTER-PLATFORM-BASED COLLEGE PE PROCEDURAL MANAGEMENT MODEL

First, a database is set up to include all the basic information about all students and teachers. Then, electronic PE classes are set up to include all students taking the PE course. After that, the model will give people a very clear view about which teachers are having what classes with which students, which would not only make the day-to-day PE management more intuitive, but relief a great deal of labor for compiling teaching programs. Second, after inputting the students test results into the computer system and setting up the right proportion of different subjects, the system with the help of previously determined factors and equations will work out the PE performance scores of a student in the whole semester (Dan and Zhang, 2010). Third, the model can print out student PE score sheet by school, department or class and even produce student PE score distribution sheet by class, department, school or the whole college, making it much easier for the PE management office to provide different reports, consolidate information and archive all files. Fourth, the user may export the data of student original physical fitness test into a computer terminal for further processing. Or, if financially possible, a college may purchase special student physical fitness machines that is capable of inputting the data directly into the model. Then, the user could set up the standards of grading according to the Student Physical Health Standard and then develop an E-template of Student Physical Health Registration Card to have a clearer view over the student physical fitness data or print out the data by class, department or school to meet different needs in the overall PE management. The links in the PE teaching management is shown in Figure 1.

![Figure 1](image.png)

3. THE NECESSITY OF IMPLEMENTING PROCEDURAL PE MANAGEMENT IN COLLEGES

The extensive application of information technologies in all aspects of society has substantially advanced the development of human society. The same is true in the education sector. Nowadays, all academic departments have more or less relied on the IT to facilitate teaching reform, established a more intelligent “internet + discipline”
teaching modes, and achieved some extraordinary results (Huo and Li, 2017). In physical education field, there also have appeared many attempts to apply internet and multimedia technologies to help the PE teaching. But not all of them have achieved satisfactory results because when pushing forward the PE teaching reform, people would simply consider the IT as a supportive tool, instead of integrating the “informatization” concept into the PE teaching theories and systems. The achievement of effectiveness of PE activities results not from improving the technical level of a single teaching stage but from the synergy of the entire physical education system. The real integration of the informatization concept in PE should be one that internalizes the concepts in the PE teaching concepts and theories and can be proved by the establishment of a new innovative PE teaching system. The PE objectives will not be achieved effectively until the information begins to play an essential role in driving the coordinated operation of the entire PE system (Wang, 2013). IT-powered PE models are the embodiment of the IT-powered PE system. Using procedural PE management models, the physical educators will be able to effectively implement and use all the PE teaching concepts, resources and specific methods in line with the IT concepts to achieve the PE objectives more efficiently, that is to say, an obvious improvement in all key elements of student PE learning. The elements of contemporary learning theory are shown as follows:

![Image](image_url)

**Figure 2.** Elements of Contemporary Learning Theory

4. THE DEVELOPMENT OF COMPUTER-PLATFORM-BASED COLLEGE PE PROCEDURAL MANAGEMENT MODELS

4.1 Develop IT-powered PE models

In the past, the unfavorable objective conditions made it hard for the traditional PE to bring the best out of the practical elements of PE classes. But now, with the help of VR technologies, educators are able to create whatever competition or training environment they want, overcome the drawbacks from the unsatisfactory training resources, and provide students with more scientific and practical PE training plans and contents. The VR technologies can precisely reproduce the technical details of a sport or game and enable the trainers to take into considerations of the effects of a variety of objective factors in a simulated environment, e.g. the winds, rains, temperatures, moistures, day and night, etc. (Peng, 2016). Such training situation created with the VR technologies will enable students to achieve the training results as good as that obtained in a real situation and therefore significantly improve student competence of using what they’ve learnt in real environments. The teaching objectives of the in-class part of an IT-powered PE model will be: pass the knowledge and skills of physical exercises, sports and matches, improve the student competence of applying such knowledge and skills, and develop in them the spirit of team work and cooperation, etc. First of all, the PE teacher should give a brief explanation of knowledge to help students summarize pre-class independent learning and set up a direction for the next class teaching. The knowledge explanation shouldn’t last long. It’d be most appropriate for it to take no more
than one quarter of the total class time (Yan, 2016). Because the students have already had an understanding over the key points of these knowledge and skills, what the teacher really needs to do at this stage is to outline the knowledge. The real internalization of knowledge and skills should be achieved in the actual training or exercise stage. The application of information technologies will help educator to present or demonstrate the fundamental rules of using a kill in a more effective way. That is to say, with the help of IT, the teachers can reproduce the key moves in slow motion, 3D images or in a simulated match, and help students to have a better understanding and master the moves via both sensory experience and rational analysis. In short, these IT-powered tools will enable educators to precisely introduce a teaching item that is difficult to describe with words and students to effectively internalize it driven by stronger independent learning desire. The IT-powered teaching models are shown as follows:

![Figure 3. Learning Teaching Model Based on](image)

### 4.2 Develop IT-powered PE teaching platform

The IT application in day-to-day PE activities should be achieved via a teaching platform built online. The establishment of such online PE teaching platform is one of the most important steps in developing IT-powered PE platform. In fact, most IT-powered PE teaching activities have to be performed in an online platform (Guo, 2016). The platform should consist at least of a teaching resource module, a teaching material module and an interaction and exchange module, as well as some PE-related cultural modules and practice modules. In addition, the PE teaching platform should have a backend monitoring system that supports the user to process the data statistics over students’ browsing, operating and learning behaviors based on student accounts, and, subsequently, provides an objective reference for teachers to evaluate student learning results. The PE teaching platform could provide students with an independent learning environment for pre-class learning and present in films or footages the key learning points that are difficult to pass by speaking, and help students master the knowledge and meanings in it in a more visual or intuitive way (Hu and Wang, 2017). The physical education in the new era should switch from the knowledge-oriented teaching to developing in students the sportsmanship and improving their physical health, fitness and competence. This is not only the general direction of all PE in China, but also the constant objectives of after-class practice and exercises. The interaction and exchange module of the platform will enable the teachers to provide immediate instruction and close supervision and the students to timely consult the opinion of a teacher the minute he/she run into a difficult problem, for example, in training. Such a good after-class communication between the teachers and students will substantially improve the reach and timeliness of PE teaching. The
functions of the practice and exercise module of the platform will help the teachers to set up special modules for training a particular move or holding a simulated match, which would not only motivate students to improve their training, but also help them master the essential skills in a more effective and efficient way. In short, the PE educators could set up and continuously improve the management framework of teaching center, as shown in Figure 4.

4.3 Create VR situations for close-to-real experience

When delivering a PE class, the teachers should first of all give an outlined explanation of all the key learning points, because the theoretical knowledge is the essential components of and foundation for students to carry out learning activities. The explanation will provide students with a more specific direction to follow in the VR situation and ensure the quality, effectiveness and efficiency of VR experience (Li and Zhang, 2017). When rolling out a VR situation, the teachers should guide students into it and inspire them to proactively explore the knowledge in it. By fully mobilizing human visual, hearing and touch senses, the VR situations could help students to obtain information via their perception. In the VR situations, the students will have a more immediate experience of the difficult points of a move and therefore better understand the content that is hard to describe in words. As a matter of fact, when students are having a VR experience, there is no need for teachers to give too much instruction. This will leave them with a greater space to think over and again what they’ve just experienced, stimulate them to actively form a deeper understanding over the learning points, provide them a greater space to exert creativity, and improve their capacity of making innovation (Wang, 2017). The interaction is the key in a VR teaching activity. The first interaction appears between the students and the VR situation. A successful interaction will give students an all-inclusive and precise understanding over the content to be passed. After that, the second interaction happens between the students and the teacher, either in the form of discussion over the experience or in the form of answering students’ questions. In addition to that, the teacher could try to understand what the students really learnt from the VR experience by asking them questions and, if necessary, provide them with a more specific instruction to reinforce what they have learnt. Such two-way communications will play a very important role in enhancing and improving the results of VR teaching and enabling students to understand the real secrets of practical skills of a sport.

4.4 Improve PE performance evaluation system
The performance evaluation mechanism is an indispensable part of PE teaching system, playing a very important role in facilitating the teaching activities (Liu and Ding, 2016). In traditional teaching, the evaluation is based on the paper results and practice exam results and targeted at evaluating a student’s achievement in acquiring knowledge and skill and a teacher’s performance in delivering quality results. But such evaluation has been criticized for one-sidedness, i.e. unable to provide a comprehensive reflection of a student’s general achievements and how well his/her inner potential is developed, and sometimes, even mislead the student to a wrong learning objective. The performance evaluation mechanism in the IT-powered PE system, however, is centered on providing a clear and comprehensive reflection on a student’s performance in independent learning, in-class learning and various practice activities. Thus it will give the teachers a better understanding over a whole range of aspects of a student’s learning performance, including the student’s commitment in independent learning, the rationality behind the learning methods he/she chose, his/her awareness of innovation and team-work, as well as his/her inner potential, etc. Only by collecting, analyzing and commenting on such important information and, after that, developing and implementing more specific teaching strategies or optimizing measures can our PE activities begin to produce the talents with really extraordinary comprehensive qualities (Tang, 2017).

According to the similarity principle of group technology, the existing data and historical data of PE teaching management may be combined organically by means of data standards conversion, i.e. \( m = m' \cup m'' \), in which, \( m' \) stands for the number of the sample sets of historical data. Subsequently, we could determine the boundary control limits of \( \bar{X} - R \)control chart. Then, according to the existing and historical data of PE management quality control, we are now able to draw the \( \bar{X} \)Control Chart, with the control limits shown as follows:

\[
\begin{align*}
CL &= \bar{X} \\
UCL &= \bar{X} + A_2 \bar{R}, \\
LCL &= \bar{X} - A_2 \bar{R}
\end{align*}
\]

(1)

In which:

\[
\bar{X} = \frac{1}{m} \sum_{i=1}^{m} H_{i(n+1)}
\]

\[
\bar{R} = \frac{1}{m} \sum_{i=1}^{m} H_{i(n+2)}
\]

(2)

\[
A_2 = \frac{3}{d_2 \sqrt{n}}
\]

Based on the existing and historical data of PE management quality control, the \( R \)Control Chart is now available, with its control limits shown as follows:

\[
\begin{align*}
CL &= \bar{R} \\
UCL &= D_4 \bar{R}, \quad \text{式中：} \quad D_4 = 1 - 3 \times \frac{d_2}{d_1} \\
LCL &= D_3 \bar{R}
\end{align*}
\]

(3)

Factor \( d_2 \), \( d_1 \) is the coefficient varies with the change of sample size, \( n \).

Fixed sample volumetric method is the designated method that the US army uses to handle small volume SCP files. It aims at achieving the control over teaching management via data conversion. The more specific description has to be based on \( \bar{X} - R \)Control Chart. In terms of \( R \) Chart, if everything is normal in a teaching process,
the $LCL_4 < R < UCL_4$, i.e. in formula $D_3(n)R < R < D_4(n)R$, the $D_3(n)$, $D_4(n)$ is the constant related to the sample size $n$.

Assume $n = n_0$, then in formula $D_3(n_0) < R / R < D_4(n_0)$, the $R / R$ shall be the data conversion of statistic $R$. If $R_{3V} = R / R$, then the $R_{3V}$ Control Chart is shown as follows:

$$
\begin{align*}
CL &= 1 \\
UCL &= D_4(n_0) \\
LCL &= D_3(n_0)
\end{align*}
$$

Similarly, in terms of $R$ Chart, if everything about the management goes on normally, $LCL_5 < x < UCL_5$, i.e. $x - A_2(n_0)R < x < x + A_2(n_0)R$ $- A_2(n_0) < (x - \bar{x}) / R < A_2(n_0)$, the data conversion of statistic $\bar{x}$ is $\bar{x}_{3V} = (\bar{x} - \bar{x}) / R$. Subsequently, $\bar{x}_{3V}$ Control Chart is

$$
\begin{align*}
CL &= 0 \\
UCL &= A_4(n_0) \\
LCL &= -A_4(n_0)
\end{align*}
$$

meaning that it’s capable of delivering an overall evaluation over the procedural management models.

5. CONCLUSION

It’s obvious that the establishment of a PE management database and the achievement of computer-based procedural PE teaching management system can help colleges and universities effectively improve their PE teaching management level, push forward PE reform, and eventually bring the overall college management to a higher level. When connected with college intranet, they could play an even greater role in promoting resources sharing and boosting the development of a more standardized, scientific and modernized college PE management.

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