

# ***Digital Education Technology and Innovation Ability: Reforming the Teaching Model for Postgraduates in Physical Education***

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**Abstract:** With the fast-paced development of digital education technology, the transformation and upgrading of the teaching model for physical education major has ushered in an opportunity. The original classroom teaching mode was based on the real world, resulting in problems such as single teaching process, insufficient teaching resources and inability to update the teaching environment in time. On this basis, digital education technology and physical education classroom teaching were integrated in this paper, and then the connotation and characteristics of digital education technology were analyzed; this paper constructed a new model of digital education technology empowering the teaching of physical education major from four aspects: classroom teaching process, teaching subjects, teaching resources and teaching environment; it also put forward current practical pathway to enhance students' innovation ability by means of digital education technology.

## **1. Introduction**

What is a university? It is the platform of knowledge dissemination, the main body of knowledge innovation, and the training base of high-caliber innovative talents. One of the main tasks and objectives of postgraduate education in higher education is to cultivate and improve the innovation ability of postgraduates; meanwhile, one of the important indicators to measure the level of teaching and scientific research in colleges and universities is the quality of postgraduate training [1]. As the highest level of national education system, postgraduate education should take the cultivation of innovative ability as its core goal and run through the whole process. As we all know, physical education is a highly practical discipline. Vigorous development of postgraduate education in this discipline is not only the need of the times, but also the key to the accomplishment of high-caliber talent training in physical education [2]. The innovation ability of the postgraduates majoring in physical education has a direct impact on the level of the knowledge innovation of physical education. More importantly, their innovation ability is related to the scientific and technological innovation ability of the country, which has a significant effect on the national economic development and people's health. However, a large number of surveys and statistical results show

that the current postgraduates trained by universities and colleges are not innovative enough to meet the demand of society for innovative talents.

Today, digital education technologies represented by artificial intelligence, Internet of Things, and meta-universe are developing by leaps and bounds. It has been widely applied in education and teaching, greatly promoting the transformation of educational and teaching models. But frankly speaking, there are few applications about research and training in physical education. Thus, it is a significant and urgent issue, that is, how to apply digital education technology to improve classroom teaching, build an efficient and innovative teaching cultivation model, and enhance the quality and innovation of teaching.

## **2. The development and application of digital education technology**

### **2.1. Development of digital education technology**

Modern digital education technology refers to education technology that uses modern digital education theory and learning theory as the foundation and modern technology as primary means [3]. Alternatively, modern digital education technology refers to the theory and practice of designing, developing, utilizing, managing, and evaluating learning resources through the use of modern educational theory, learning theory, and information technology in teaching. The United States is the country with the earliest and rapid development of modern information technology in the world. The Watson Research Center of IBM in the United States developed the first computer-aided education system, marking the entry of humanity into the information age of computer education; hence, how to make good use of network technology and make it function as education and teaching in the whole society is the goal pursued by the American education technology community at present. The research on E-learning and the internet as learning environments in the field of teaching applications has become the mainstream while pure multimedia technology research is no longer a focus. The applications of media technologies are all centered on web technologies in an integrated form for teaching and learning [4, 5]. Japan is also one of the developed countries that promote digital education. Its main measures included the development of the "Post 2005 IT Strategy Action Plan" by the Japanese IT Strategy Headquarters, including the establishment of a rational university structure in a developed information society, as well as the promotion of communication of arts and sports by information technology; meanwhile, the establishment of campus information networks, including communication satellites, the Internet, and computer-assisted teaching systems, was also a major digital education reform in Japanese universities [5,6]. In conclusion, the common features of the development of digital technology in education in most developed countries are: (1) Government strongly support modern digital technology-assisted education by providing the necessary hardware facilities and software environment; (2) Governments and the education departments attach great importance to the IT training of instructors and the cultivation of students' innovative spirit; (3) Governments encourage university instructors to use modern digital technologies in classroom teaching; (4) The application of information technology in teaching has achieved significant outcomes.

Digital education technology in China started late, but developed fast. The publication of Education Informatization 2.0 Action Plan in 2018 marked the upgrading of China's education informatization. In 2021, the Ministry of Education (MOE) developed the Medium- and Long-term Development Plan for Education Informatization (2021-2035) and the 14th Five-Year Plan for Education Informatization to plan the direction of technology-induced changes in education teaching and learning [7]. In addition to planning the future through policies, the MOE also selected experimental zones for "new teaching and learning models based on teaching reform and integration of information technology" and experimental zones for smart education. Furthermore, a pilot zone

for digital transformation of education was set up in Shanghai, new infrastructure for education was deployed, and activities such as the promotion of the online learning spaces application and the application of "Three Classrooms" (Special Delivery Classroom, Famous Teachers Classroom and Famous School Network Classroom) and "Blended Classroom" were carried out. All these moves were to promote information technology to revolutionize the outside-in oriented education and teaching, to create changes in teaching structure and ecology, thus promoting the digital transformation of education.

## **2.2. The application of digital education technology in physical education**

Digital education technology is being applied in physical education majors in higher education institutions thanks to the rapid development of modern information technology and the deepening of China's educational reform. At present, three main aspects of digital education technology are integrated: teaching models, teaching tools and learning models [8]. In terms of teaching models, considering the diversity and uniqueness in pedagogical innovation, multiple different models need to be used and addressed with each other in order to better enhance the quality and process of pedagogical innovation. The five main models are educational games, virtual laboratories, collaborative learning, immediate formative assessment, and the combination of technology and curriculum. When it comes to teaching methods, literally, it is virtual reality technology: on the one hand, with the help of mobile learning terminals, digital teaching resources are effectively acquired to build digital learning platforms; on the other hand, the e-book schoolbag is used as an information learning material throughout the learning sessions of the physical education class type, including preparing for the class, taking classes, doing exercises and taking tests. As for learning modes, it is focused on online learning, open educational resources and MOOC.

In a word, information technology education in higher education is growing in a new way and at a high speed. However, in reality, the development of information technology in China is more from the perspective of assisting students' learning, lacking the cultivation of innovation and exploration. Second, the authorities and educators do not know enough about information education without real reform. Moreover, there are not many applications about the combination of digital education technology and innovative education, and little attention is paid to postgraduates, which also limits the high-level development of the physical education to some extent.

## **3. Innovation capacity enhancement and digital classroom teaching**

### **3.1. The connotation and characteristics of digital education technology**

Digital education technology is a new technology system based on "Internet+", which integrates digital technology and education technology. Digital technology focuses on information processing, while education technology focuses more on how to assist teaching and learning, both of which aim to improve the efficiency of teaching and learning. Digital educational technology is a technology system formed by the integration of digital technology and educational technology after they have developed to a certain stage. It has the characteristics of two technologies and the new features generated by their fusion, greatly expanding the depth and breadth of education technology applications [9]. Figure 1 is a conceptual diagram of the characteristics of digital education technology.

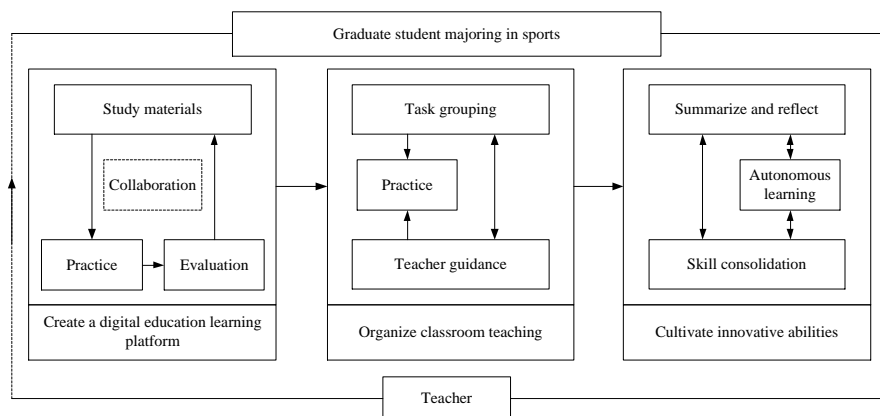


Figure 1: Conceptual diagram of the characteristics of digital education technology

### 3.2. Digital education technology and teaching elements of physical education classroom

The digital and intelligent features of digital education technology manage to discover, acquire and process knowledge. It is found that the integration of digital educational technology and physical education classroom teaching is mainly reflected in four aspects: classroom teaching process, teaching subjects, teaching resources and teaching environment [10, 11]. The frame diagram is shown in Figure 2. When digital intelligence technology is used in classroom teaching, knowledge management and question answering can be accomplished. In terms of teaching subjects, digital intelligence technology can improve the efficiency of interactive activities among teaching subjects. For instance, instructors are able to efficiently give students intelligent tutoring and explanation during pre-class preparation, in-class study and after-class review. At the same time, digital intelligence technology can introduce new teaching subjects, such as virtual assistants and remote teaching teams [12], thus easily achieving intelligent transformation and upgrading of the entire classroom teaching. In the case of teaching resources, digital intelligence technology has greatly enriched teaching resources and their types, prompting the transformation of teaching resources from the original, limited physical resources to digital resources. In the aspect of teaching environment, digital intelligent technology also contributes to the expansion and innovation of teaching environment in time and space. Specifically, in the time dimension, digital intelligence technologies are utilized to construct a digital environment for classroom teaching and simulate the scene where the teaching object is located. In terms of spatial dimensions, virtual reality and simulation technologies represented by VR and AR generate digital spatial environments [13], delivering the migration and expansion of classroom teaching environments.

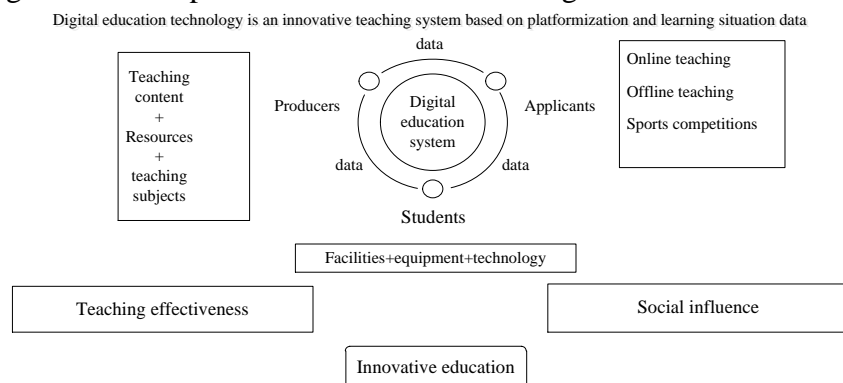


Figure 2: Integration map of digital education technology with the teaching elements in physical education classroom

### **3.3. A digital classroom teaching model for enhancing innovation ability**

On the basis of the original classroom teaching model, this study built a classroom teaching model of digital technology empowered innovation ability around four aspects: classroom teaching process, teaching resources, teaching methods and evaluation methods [14]. First, the teaching process of physical education is a purposeful and organized educational process conducted according to certain plans and curriculum standards. The teaching of physical education involves both instructors and students. Its mission is to impart physical education knowledge, techniques and skills to students, enhance their physical fitness, and develop their morality, will and quality. As such, classroom teaching emphasized student-centered approach, changing the traditional single process of instructors speaking and students listening. Secondly, teaching resources shifted from offline to blended online-and-offline teaching, with existing textbooks and physical teaching aids being generated into online resources through VR/AR technology [15]. Meanwhile, digital intelligence technology was utilized to achieve the coordination and sharing of teaching resources, comprehensively improving the effectiveness of classroom teaching. The teaching environment was a virtual teaching scene built with digital intelligence technology, and this online platform and virtual classroom learning scene provided students with a better learning experience. More importantly, it focused on setting up problems and building an environment to stimulate students' knowledge exploration, which effectively enhanced the learning effect and stimulated students' innovation ability. Third, as for the teaching methods, students' independent learning and group learning were the main ones, supplemented by instructors' guidance. These three approaches carried out the entire teaching activity, with the instructor playing a leading role in the teaching process while the students playing the main role.

Instructors need to change their mindset and understand that students are the main subject of the classroom and that they need to help students develop in a comprehensive and positive way. The instructor, as a guide, has to play a full role and enables students master the knowledge and skills, and become interested in learning through proper guidance. After independent learning, students are able to deepen their understanding and quickly acquire knowledge and skills when discussing and communicating with group members. What's more, they can improve their creative abilities. Fourth, the evaluation method was composed of pre-class evaluation, in-class evaluation and after-class evaluation. Pre-class evaluation consisted of platform evaluation and instructor evaluation. In other words, students were evaluated based on the completion rate of the online videos they watched, the percentage of questions they answered correctly on the online videos, and the number of times they participated in discussions. The in-class evaluation had two parts: instructor evaluation and students' mutual evaluation. As the name implies, it was the teacher and the rest students who evaluated the student according to his learning and performance in class. The teacher and others in the group evaluated the students based on his proficiency in completing movement techniques and his ability to explain and demonstrate. The after-class evaluation included instructor evaluation and evaluation of the digital learning platform. The time and number of times students logged into the review videos of Chaoxing Learning APP and answered the questions raised by the instructor were used as the basis for evaluation.

### **4. The practical pathway of digital education technology empowering the cultivation of innovation ability of postgraduates in physical education**

The ultimate goal of digital education technology empowering the teaching mode of postgraduates majoring in physical education is to get practice and promotion in classroom teaching. To this end, this paper put forward the practical pathway of transformation and upgrading of teaching reform from top-level design, teaching subject coordination, basic resource development

and open environment construction. Then, this paper discussed the challenges or problems that might be faced in practice.

#### **4.1. The practical application of the smart classroom teaching model requires a sound top-level design as a guide**

Colleges and universities should incorporate the training of information education technology into the system and guide instructors to take an active part. In response to reality, schools can carry out various forms of training, such as on-campus training, off-campus training, observation and learning, etc. Alternatively, a mix of training methods can be adopted, including face-to-face instruction, remote web-based guided learning, and self-learning.

#### **4.2. Teachers, students and other teaching subjects need to pay more attention to digital education technology**

Instructors are encouraged to use modern education technology to fully reflect the superiority of modern information technology-assisted teaching. Schools can implement an effective incentive mechanism by making the results of training and assessment or the application of modern IT-assisted teaching a condition for instructors' promotion. In addition, schools can provide material or moral rewards to instructors who have made outstanding achievements in research and development of volleyball courseware, stimulating instructors to "recharge their motivation".

#### **4.3. Reasonably utilizing teaching resources and strengthening the management of student network applications**

It is a must to strengthen online ideological education. Through education on students' worldview, outlook on life and values, we strive to improve their identification and self-control abilities, strengthen mental health education, and minimize the problem of internet addiction among students. What we need to do is to cultivate students' ability to learn independently, innovatively and inquiringly, so that they can become real learners, consciously resist the interference of undesirable information and make full use of online resources.

In summary, the teaching concept of modern digital education technology is not only the update of teaching equipment, but also the healthy development of teaching concept. As a result, it is necessary to keep learning new concepts and knowledge and improve personal quality. A network learning support service system that can handle learning processes, teaching resources, teaching methods, and evaluation methods should be established in a network environment. By doing so, it will strengthen the management and supervision of the learning process and promote the application and development of modern education technology. On top of that, it is essential to focus on cultivating students' innovation abilities and ensuring the quality of desirable talents in physical education.

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