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Exploration of the "U-shaped" Integration Model for the Integrated Development of Physical Education Curriculum in Primary and Secondary Schools and Universities

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Abstract: The physical education curriculum plays an important role in school education and has a positive impact on students' physical quality and comprehensive development. However, the traditional decentralized physical education curriculum model has limitations that make it difficult to meet the diversified needs of students and the requirements for developing comprehensive abilities. This study adopts the methods of literature review and case study analysis to conduct an in-depth discussion on the "U-shaped" integration model for the integrated development of physical education programs in primary and secondary schools and universities. Through the collection of relevant literature and actual cases, we analyze the implementation, teaching content and effects of the model, as well as its impact on the comprehensive development of students. The "U-shaped" integration model can provide diversified learning opportunities and comprehensive training to promote the all-round development of students. It not only focuses on the development of physical education skills, but also integrates organically with other disciplines and promotes comprehensive interdisciplinary learning.

1. Introduction

The traditional physical education curriculum tends to decentralize different programs, which makes it difficult for students to develop holistically as they are exposed to a limited number of programs in a limited period of time. At the same time, the fragmentation between disciplines also limits the integration of physical education with other disciplines. Therefore, there is a need to explore a more integrated and diversified physical education curriculum model that enables students to acquire a wider range of sports experiences and knowledge and promotes integrated learning among disciplines.

This paper adopts the methods of literature review and case study to study the "U-shaped" integration model. The literature review will sort out and analyze the related literature to understand the theoretical basis, implementation and related research results of the model. The case study will

be conducted to understand the application and effect of the model in actual teaching through the observation and analysis of actual cases. By synthesizing the literature and case studies, we can get a comprehensive understanding of the characteristics, advantages and challenges of the "U-shaped" integration model, and provide useful references for the reform of physical education.

This paper will be divided into three parts. First, the paper will introduce the concept and background of the "U-shaped" integration model, and describe the problems of the traditional physical education curriculum model and the demand for integrated development. Secondly, this paper will discuss the significance and effect of the "U-shaped" integration model in the integrated development of physical education curriculum through the methods of literature review and case study. Finally, this paper will summarize the results of the study and put forward the outlook for the future development of the model, with a view to providing reference and inspiration for the improvement of physical education in universities, schools and colleges.

2. Related Work

Many people have researched on integrated physical education teaching, Duan Hongmei took the local boxing as the research object, took the school curriculum reform as the opportunity, centers on the same source of teaching materials, teaching conspiracy, resource sharing, etc., carried out the research on the integrated development mode of physical education curriculum in universities, middle schools and elementary school [1]. Wang Xi conducted a study on the development path of the integration of ideological and political education in university physical education courses in the new era, using four logical mainlines: "why teach", "what to teach", "how to teach", and "how's the teaching going". He clarified the ideas for the development of the integration of ideological and political education in university physical education courses in the new era, and analyzed the specific path of the development of integration construction[2]. Yu Sumei proposed the construction of an integrated physical education curriculum system with the basic connotations of vertical articulation, horizontal consistency, internal unity, and formal union, which would make physical education classroom teaching more scientific and standardized, and would make the content and form of the large classroom activities more focused [3]. Zhang Jichen focused on the important role of Chinese sportsmanship and sports training, comprehensively promoted the integration of sports courses in primary and secondary schools and universities, to promote the construction of sports courses to better play the function of educating people, and to promote the physical and mental health of students [4]. Fan Jianwei found that the construction of physical education curriculum integration can prompt teachers to rearrange the objectives of the physical education curriculum, effectively improve the quality of teaching; the content of the physical education curriculum can pay more attention to the articulation and adaptability to the law of development of students [5]. Opstoel K provided an overview of the existing literature on the personal and social development of school-aged children and adolescents in the context of physical education and sport [6]. Demchenko I aimed to scientifically prove the theoretical and methodological foundations, develop and experimentally validate methods of training future physical education teachers for professional activity in conditions of inclusive education [7]. Bores-Garc á D conducted a systematic review of collaborative learning research in sport over the last 5 years (2014-2019) [8]. Ross R examined the relationship between exercise behaviors (physical activity, sedentary behaviors, sleep and all behaviors) and several health outcomes [9]. Obidovna D Z analyzed the data of modern scientific literature on issues of maintaining health [10]. This paper will focus on the "U-shaped" integration model and explore its significance and effectiveness in the development of an integrated physical education program.

3. Method

3.1 Overview of the "U-shaped" Integration Model

The "U-shaped" integration model is a model used to promote the integrated development of physical education curricula in primary and secondary schools and universities. The core idea of the model is to integrate the physical education curricula of primary and secondary schools and universities with each other to form a unified and coherent teaching and learning system, so as to provide richer and more diversified contents of physical education as well as more targeted learning experiences. The name of the model comes from the "U"-shaped trajectory of its integration path, indicating that at the beginning of the integration stage, the physical education programs of each section gradually merge to form a whole; and then in the intermediate stage, the differences between sections are reasonably retained and developed [11-12]; finally, at the senior level, integration is again done to create a more integrated, advanced physical education curriculum. The implementation of this model requires consideration of the integration of curriculum content, teaching methods and assessment methods, as well as support for teacher training, textbook development and management mechanisms. By adopting the "U-shaped" integration model, it is possible to realize the organic articulation and synergistic development of physical education curricula in primary and secondary schools, improve the cultivation of students' physical education literacy and comprehensive abilities, and promote the realization of comprehensive health education. The model has important theoretical and practical significance for promoting educational reform and improving the quality of physical education.

3.2 Steps and Methods of Model Implementation

We take the education system of a region as an example of the integrated development of physical education programs in schools and colleges. First, we conduct a needs analysis to understand the characteristics and current situation of the physical education curriculum in each school section, as well as the interests, needs and ability levels of students. Table 1 shows the characteristics and current situation of the physical education curriculum in each school section:

Table 1: Characteristics and current status of physical education programs at various academic levels

Educational Stage	Characteristics and Current Situation of Physical Education Curriculum	Student Interests, Needs, and Skill Levels
Primary School	Emphasis on cultivating basic physical skills and overall physical literacy.	Curious about diverse physical activities and enjoy participating in group activities.
Middle School	Introduction of advanced sports techniques and strategies, fostering students' competitive abilities and teamwork spirit.	High interest and demand for personal skill development and team collaboration.
High School	Emphasis on specialization and specialized development, providing better opportunities for students interested in pursuing a career in sports.	Strong interest and ability to engage in in-depth study and exploration in specific sports or areas.

Determining the goals and key indicators of integration through communication and research

with education departments, teachers and students. Based on the results of the needs analysis, integration strategies and plans were developed. Considering the differences and characteristics of different students, we decided to adopt a progressive integration approach [13-14]. First, at the elementary school level, the interface between the primary and junior secondary school physical education curricula is gradually realized by revising and updating the standards of the elementary school physical education curriculum and introducing a portion of the physical education content at the secondary school level. Then, at the junior secondary level, the integration of the physical education curricula at the secondary and senior secondary levels will continue with the introduction of more advanced techniques and strategies. Finally, at the high school level, integration is again carried out to connect the high school physical education curriculum with the college-level physical education program to provide better development opportunities for students who aspire to delve into the field of physical education. The development of teaching materials and integration of resources is carried out according to the integration strategy and plan [15-16]. Colleges and universities develop a uniform set of physical education textbooks, covering different sections of the content, to ensure the consistency and progress of the content. At the same time, integrating the resources of teachers from all sections of the school system, conduct training and exchanges, and improve the overall quality and teaching ability of teachers. A resource-sharing platform has been established to enable teachers to share lesson plans, teaching resources and experiences, and to promote cross-section collaboration and interaction. In the implementation stage, teaching of physical education courses is carried out according to the integration strategies and teaching plans. Teachers design and organize instruction based on textbooks and teaching guides, focusing on student participation and interaction. At the same time, an assessment system is established to evaluate students' learning outcomes and competencies to monitor integration effects and guide improvement. The assessment can include various aspects such as classroom performance, program grades and comprehensive evaluation [17-18].

3.3 Application of the Model to the Development of an Integrated Physical Education Curriculum for Schools and Universities

The physical education curriculum in primary and secondary schools can be reconstructed and integrated using a ‘U' ‘integration model’. By identifying the core concepts and skills, the content in physical education in different grades can be linked organically to form a coherent curriculum system. At the Junior High School level, there can be an appropriation of some of the specialized knowledge and skills of the Senior High School, laying the foundation for further development of students. When integrated using the integration model, the teacher should adopt an integrated approach to teaching and learning to facilitate articulation of the school segments. Teachers will be encouraged to share their teaching plans, teaching resources, and teaching experiences, and design cross-grade instructional activities together such as cross-grade sports competitions or programs. The innovation of teaching methods will also be encouraged for the purpose of meeting the needs of the interests of the students in different school segments as well. In order for this model to be implemented successfully, the necessary teacher training and support mechanisms will need to be provided. The teacher should understand the concepts and implementation of the Integrated model, be a master of the relevant teaching strategies and assessment methods, and organize their teaching through the integration teaching standards. There needs to be teacher training, which can be given in the way of special lectures, seminars or model course to improve the overall quality and improve the professional fluency of the teacher.

3.4 Implementing the "U-shaped" Integrated Model of the PE Curriculum

Based on the core concepts and skills, a coherent curriculum should be designed to connect the PE contents of different levels of schooling to ensure that students can develop and learn the relevant skills and concepts in depth at different levels of schooling. Some specialized knowledge and skills from senior secondary school can be introduced at the junior secondary level to lay the foundation for further development of students. Consistent teaching methods are used to facilitate articulation between school segments. Teachers can share lesson plans, teaching resources and experiences and collaborate to design cross-curricular teaching activities [19-20]. Innovative teaching methods are used to design diversified teaching strategies, such as group work, project learning and problem solving, according to the needs and interests of students in different sections of the school year, as well as to develop unified physical education teaching materials that cover the content of different sections of the school year and ensure the consistency and progression of the content. Teaching materials may include teaching guides, lesson plans and learning materials. A resource-sharing platform has been set up so that teachers can share teaching resources and experiences and promote cross-sectoral cooperation and interaction.

4. Results and Discussion

The performance and effect of the "U-shaped" integration model in the integrated development of physical education programs in schools and colleges were verified through experiments. Firstly, the accuracy and mean value of the model are calculated as follows:

$$A = \frac{TP + TN}{TP + TN + FP + FN} \tag{1}$$

$$\mu = (\Sigma x) / n \tag{2}$$

μ denotes the mean value, Σx denotes the sum of all data values, and n denotes the number of data. The model performance can be understood after the calculation. Comparing the performance of the experimental group and the control group, we hope to understand the impact and differences of the physical education program using the "U-shaped" integration model on the students. Two classes of 30 students each will be selected, and the experimental group will adopt the "U-shaped" integration model for the integration of the physical education curriculum, while the control group will continue with the traditional decentralized physical education curriculum. After one semester of teaching, the experimental group and the control group were tested for physical fitness, in which the elementary school students were tested for 50m sprinting, the secondary school students for long jumping, and the college students for pull-ups, in order to understand the effect of the "U-shape" integration model in the development of physical education curriculum integration of universities and primary and secondary schools, through comparing the performance of physical fitness of the experimental group with that of the control group, and the classes were assigned to the experimental and control group by using randomization. Randomized grouping was used to assign classes to the experimental and control groups in order to reduce the bias of the experimental results.

4.1 Fifty-Meter Dash

Sprinting is a basic sport in physical education, which is indicative of assessing students' fitness level in terms of speed, explosive power and coordination. Through the performance of primary school students in the 50-meter sprint, we can have a preliminary understanding of their explosive power and speed performance, as well as their mastery of the skills of starting, accelerating and

finishing sprints, etc. Figure 1 shows the results of the test:

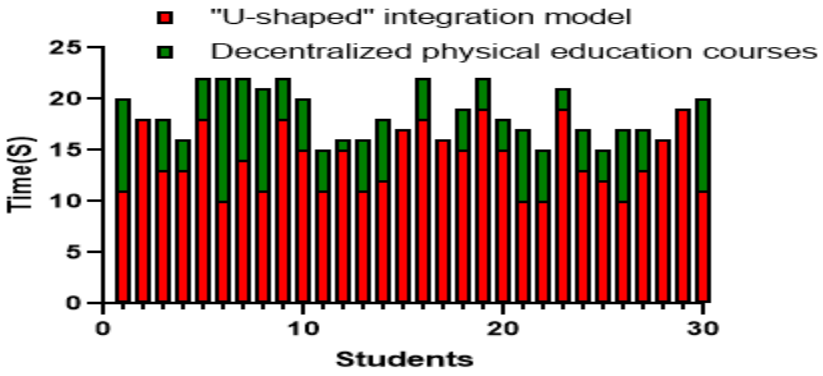

Figure 1: 50m test

In the 50m test, the U-integrated model physical education curriculum integrated development of the class, 30 students between 10-19s, and the control group using decentralized physical education curriculum class between 14-22s, through the experiment know that the experimental group method in this paper can improve the 50m sprinting ability of the students.

4.2 Long Jump

Long jump is an important track and field event, which requires athletes to have good explosive power and coordination, as well as mastery of jumping, aerial posture and landing skills. The performance of secondary school students in long jump can initially reflect their level of explosive power and coordination, as well as their ability to understand and apply the technical elements of long jump. Better long jump performance implies that the students possess a high level of basic physical fitness and athletic potential. Figure 2 shows the test results:

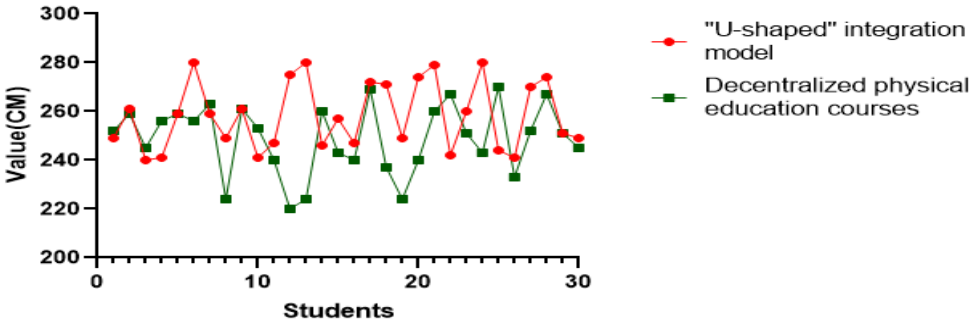

Figure 2: Long jump test

In the long jump test, the long jump performance of the class with the integrated development of the U-integrated model physical education curriculum was 2.4-2.8 m, and that of the class with the decentralized physical education curriculum was 2.2-2.7 m. The experimental composition and the higher is due to the fact that the physical education curriculum of the U-integrated model provides more comprehensive training opportunities that cover different sports and skills. This comprehensive training promotes the overall development of students' physical fitness, including the explosive power, coordination and flexibility required for long jump.

4.3 Pull-Ups

Figure 3 shows the results of the pull-up test:

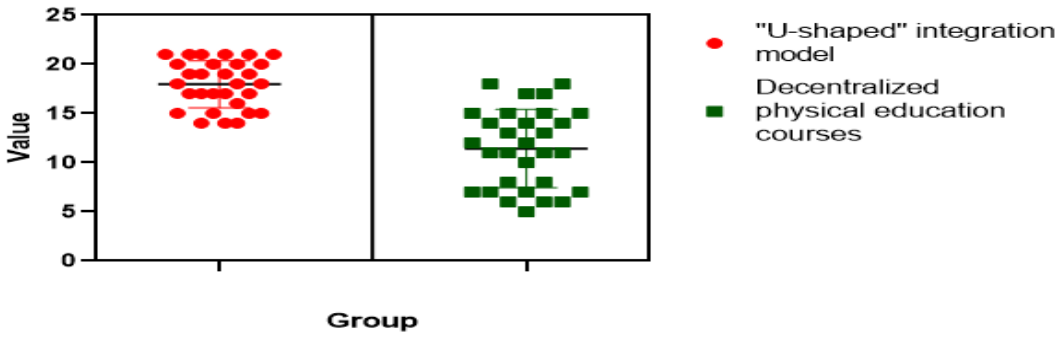

Figure 3: Pull-ups

In the pull-up test, students in the experimental group in this paper could do a maximum of 22 pull-ups and a minimum of 14. Students in the control group could do a maximum of 18 and a minimum of 4. A physical education program in the U-integrated model might include pull-ups as one of its focuses and schedule training time and instruction accordingly. Students have more opportunities to practice pull-up techniques and movements and receive specialized instruction and feedback.

5. Conclusion

The "U-shaped" integration model has the advantage to provide (richer and varied learning opportunities) and comprehensive training. Compared to the traditional physical education relying on one sport and decentralized, sports integrated with the "U-shaped" model allows students to master a variety of different sports, providing valuable skill development opportunities. Providing these multiple learning opportunities is advantageous to promote the growth of a person as a whole. For students, these different opportunities are ways to build physical fitness, coordination, flexibility, and a variety of other skills in addition to athletic skills. As a result, physical education programs are more than just motor development and can support integration with other disciplines. Through combining physical education with STEM, arts, and other subjects, students will learn more knowledge and skills about physical activities, and develop interdisciplinary comprehensive competencies. This model emphasizes individual differences and personalizes instruction. Each student might have unique interests, capabilities, and developmental rates in sports, hence the "U-shaped" integration approach will meet individual students' needs and potential better through individualized instruction and coaching. This will help to stimulate students' interest and motivation, increase participation, and increase achievement in physical education.

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