
Research on the Cultivation of Sports Science Literacy and Critical Thinking in Physical Education Teacher Training

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ABSTRACT:

The professional quality of physical education teachers is vital for physical education. This study explores the importance of sports science literacy and critical thinking, including sports subject knowledge, research methods, skills, and teaching abilities, and proposes cultivation strategies. Critical thinking enhances teaching reflection, innovation, and students' critical thinking. An integrated model is constructed to integrate these elements, emphasizing curriculum optimization, practical teaching, reflection mechanisms, professional development, and school-enterprise cooperation. Systematic guarantees from curriculum design, teacher support, and school management are essential for implementation. This research provides theoretical support and practical pathways for integrating sports science literacy and critical thinking in physical education teacher training, improving teaching quality. Future research can evaluate the model's feasibility and focus on continuously cultivating physical education teachers' professional qualities.

Keywords: *Physical education teacher training, sports science literacy, critical thinking, integrated model, teaching quality.*

INTRODUCTION

Sports science literacy is crucial for improving the quality of physical education teaching. Physical education teachers must possess solid knowledge of sports subjects, be familiar with sports science research methods, and master proficient sports skills and teaching abilities. Such sports science literacy helps teachers better understand and impart teaching content and promotes teachers' continuous exploration and innovation in teaching practices, thereby enhancing the overall level of physical education teaching.

Cultivating critical thinking in physical education teachers is equally important. Critical thinking helps teachers improve their teaching reflection abilities, promotes teachers' continuous optimization of teaching methods, and stimulates students' learning motivation. By guiding physical education teachers to develop critical thinking, they can analyze teaching situations from multiple perspectives, identify problems, find practical solutions, and promote innovative development in physical education teaching.

Sports science literacy and critical thinking are mutually supportive and co-develop in physical education teacher training. They can promote each other and form a positive interaction. Only by organically integrating the two and constructing a comprehensive physical education teacher training system can we cultivate outstanding physical education teachers who possess solid professional knowledge and are adept at critical thinking, thereby providing higher-quality educational services for students' comprehensive development.

Sports Science Literacy in Physical Education Teacher Training

1. The Connotation of Sports Science Literacy

1.1 Sports Subject Knowledge

The subject knowledge of physical education teachers encompasses theoretical knowledge from multiple aspects such as physical education, sports training, sports psychology, sports physiology, and health promotion. This knowledge is the foundation for the professional development of physical education teachers and a prerequisite for conducting physical education teaching activities.

Physical education teachers need to master solid theories of physical education, including the goals, principles, content, and teaching methods ^[1]. This knowledge not only helps teachers design physical education curricula better but also guides teachers in formulating targeted teaching strategies in actual teaching to improve teaching effectiveness. Physical education teachers should also be familiar with the training theories and methods of various sports, such as the analysis and training of sports skills and the scientific nature of physical fitness training, to effectively guide students in improving their sports skills and physical fitness. Furthermore, physical education teachers need to understand relevant knowledge of sports psychology and physiology to comprehend students' physical and mental development patterns and design teaching activities that better suit students' characteristics.

1.2 Sports Science Research Methods

In addition to possessing a wealth of subject knowledge in sports, physical education teachers should also be able to apply scientific research methods ^[1]. This helps teachers better understand and solve problems in teaching practices and promotes the continuous innovation of physical education teaching theories.

Physical education teachers should be familiar with standard scientific research methods, such as literature research, observation, experimentation, and survey methods, and be able to apply these methods to conduct teaching research flexibly. For example, by reviewing the literature to understand the historical development of physical education teaching or using observation methods to analyze students' learning situations in physical education classes, teachers can better understand the problems in teaching practices. Secondly, physical education teachers should also be able to use data analysis tools ^[2], such as statistical software, to scientifically analyze the collected research data and obtain objective and reliable research conclusions. Thirdly, physical education teachers should possess good logical thinking abilities, propose hypotheses based on research questions, design reasonable research plans, and provide scientific interpretations and generalizations of research results.

1.3 Sports Skills and Teaching Abilities

Physical education teachers themselves need to have excellent sports skills. Only by mastering proficient sports skills can they demonstrate movements deftly in actual teaching and provide detailed guidance according to students' actual situations. For example, suppose teachers can skillfully demonstrate basketball dribbling and shooting techniques. In that case, students will better understand and imitate, improving their sports skills. At the same time, proficient sports skills can enhance physical education teachers' professional prestige, winning students' trust and respect and facilitating positive teacher-student interactions.

Physical education teachers also need to possess excellent teaching abilities. These include the ability to reasonably design teaching objectives, scientifically formulate teaching plans, adopt appropriate teaching methods, and effectively organize teaching activities. For instance, physical education teachers can design teaching objectives that meet students' needs based on age, characteristics, and cognitive patterns and develop step-by-step teaching plans. In actual teaching, teachers can employ various teaching methods such as lecturing, demonstrations, group practice, and game competitions to stimulate students' learning motivation and enhance teaching effectiveness fully. Only by possessing these teaching skills can physical education teachers lead students to learn and improve effectively.

Here is a translation into English:

2. Strategies for Cultivating Sports Science Literacy in Physical Education Teacher Training

2.1 Optimizing the Curriculum System

Optimizing the physical education teacher training curriculum system is critical to cultivating students' sports science literacy^[3]. First, more scientific and reasonable professional courses should be set up. In addition to traditional introductory theoretical courses in physical education, elective courses such as sports psychology, sports physiology, and physical education pedagogy should be offered to enable students to master the foundational knowledge of sports disciplines systematically. At the same time, comprehensive sports science research courses can be established to cultivate students' ability to analyze and solve problems using scientific research methods.

The organic integration of theoretical courses and practical teaching should be promoted^[4]. For example, in anatomy courses, dissection experiments can be arranged to allow students to experience the process of scientific research firsthand; in physical education pedagogy courses, case-based micro-teaching sessions can be set up to enable students to apply the theoretical knowledge they have learned to teaching practice. Through the close integration of theory and practice, students can not only master solid sports knowledge but also develop the ability to solve problems using scientific methods.

The timeliness and foresight of the curriculum content should be emphasized^[5] ^[6]. Teachers should adjust and optimize the curriculum content promptly based on the latest technological developments and social trends in the field of physical education teaching, such as wearable devices, 3D printing, and generative artificial intelligence, to ensure the timeliness and cutting-edge nature of students' learning and lay a solid foundation for their future teaching practices.

2.2 Strengthening Practical Teaching

Practical teaching is an essential avenue for cultivating students' sports science literacy. The educational internship component for students should be strengthened, enabling them to apply the knowledge and methods they have learned in authentic teaching contexts to conduct teaching practices and improve their ability to analyze and solve problems scientifically through scientific reflection and summarization.

Students' opportunities for scientific research practice should be enriched^[7]. Students should be encouraged to participate in teachers' research projects or organized to research physical education teaching, using scientific research methods to analyze and explore practical

problems. Through participation in scientific research practice, students can gain an in-depth understanding of the entire research process and cultivate independent thinking and an innovative spirit.

Innovative methods of practical teaching should be adopted ^{[8] [9]}, such as simulated emergency teaching scenarios for sports injuries, flipped classroom teaching, etc., allowing students to test and reflect on their teaching behaviors in a safe and limited environment, thereby enhancing their abilities to analyze and solve problems scientifically.

2.3 Integrating Scientific Research Training

Integrating scientific research into physical education teacher training is essential for enhancing students' sports science literacy. First, in relevant professional foundation theory courses, emphasis should be placed on cultivating students' research awareness and methods, such as introducing common academic research paradigms and designs, motion data collection, and health data analysis, laying the foundation for students' future independent research.

In practical sessions, students should be given more opportunities to participate in scientific research, such as encouraging them to write papers on sports training and teaching and conducting action research in physical education teaching. Through hands-on practice, students can deepen their understanding of research methods and develop the ability to analyze and solve problems independently.

Educational institutions should establish and improve incentive mechanisms for undergraduate student research ^[10], providing funding, guidance, and other support for undergraduate students' participation in research and incorporating research achievements into the academic assessment of undergraduate physical education students, thoroughly motivating students' enthusiasm and initiative.

Cultivating Critical Thinking in Physical Education Teacher Training

1. Strategies for Cultivating Critical Thinking in Physical Education Teacher Training

1.1 Reforming Teaching Methods

In physical education teacher training, reforming teaching methods is essential for cultivating students' critical thinking ^[11]. Traditional lecture-based teaching tends to place students in a passive receiving position, making it difficult to stimulate their critical thinking. Therefore, teachers should adopt heuristic, inquiry-based teaching methods, encouraging students to participate actively, raise questions, analyze problems, and solve problems.

For example, when teaching physical education pedagogy, teachers can design group discussion sessions, allowing students to discuss and exchange specific teaching issues and present their perspectives and insights. In this process, students can gain an in-depth understanding of teaching theories and exercise their critical thinking skills, learning to analyze problems from multiple angles. Additionally, teachers can organize simulated teaching sessions ^[1], enabling students to practice and reflect on their teaching behaviors, thereby cultivating their ability to analyze critically.

1.2 Designing Teaching Contexts

Rationally designing teaching contexts is another crucial strategy for cultivating students' critical thinking ^[12]. Physical education teachers should create teaching contexts that are close

to reality and challenging, based on students' cognitive characteristics and interests, to stimulate their desire to think. For instance, when teaching soccer, teachers can design a group competition scenario, allowing students to discuss and evaluate each player's technical and tactical performance in groups and propose suggestions for improvement. Through such context design, students can apply their knowledge to analyze practical problems and cultivate critical thinking skills, learning to evaluate problems from multiple angles and propose innovative solutions. Furthermore, teachers can organize students to participate in physical education teaching research, having them collect data, design plans, and analyze data, thereby cultivating critical thinking through hands-on practice. Students' critical thinking skills can be comprehensively developed with diverse and enriching teaching context designs, laying a solid foundation for their future professional practices.

1.3 Supporting Teachers' Professional Development

In addition to reforming teaching methods and designing teaching contexts, supporting teachers' professional development is essential for cultivating students' critical thinking ^[13]. Schools should provide teachers with the necessary training resources and development opportunities, helping them continuously improve their theoretical and practical proficiency in critical thinking. On the one hand, schools should regularly organize critical thinking training for teachers, inviting relevant experts to deliver lectures, helping teachers understand the connotations and characteristics of critical thinking, and mastering specific strategies for cultivating critical thinking. On the other hand, schools should also encourage teachers to participate in teaching research, providing them with research funding and guidance support, stimulating teachers' critical thinking, and enhancing their ability to reflect on teaching practices.

Integrating Sports Science Literacy and Critical Thinking in Physical Education Teacher Training

1. Principles for Model Construction

The model's construction should adhere to the systemic principle, focusing on the overall quality improvement of physical education teachers while integrating sports science literacy and critical thinking into a systematic framework to ensure coordinated interaction among various elements. It should begin with actual teaching practices, address the problems and needs of physical education teachers, and propose targeted cultivation strategies that reflect the practice-oriented principle. Additionally, the model should be forward-looking and open to continuous optimization and improvement in line with the evolving physical education field, meeting teachers' dynamic professional growth needs and highlighting the development principle. Lastly, it should emphasize the comprehensive cultivation of theoretical knowledge, practical abilities, and thinking modes, promoting the overall enhancement of physical education teachers' professional competence and underscoring the comprehensive principle.

2. Strategies for Model Implementation

2.1 Curriculum Design and Teaching Practice

The organic integration of theoretical knowledge and practical skills should be emphasized in curriculum design. On the one hand, foundational theoretical courses in sports disciplines, such as physical education pedagogy and sports training, should be established to impart

professional knowledge systematically. On the other hand, critical thinking training courses, such as physical education pedagogy and physical education teaching research, should be offered to cultivate students' critical analysis abilities. Meanwhile, practical teaching components, such as teaching simulations and teaching research, should be incorporated into the curriculum to enable students to translate theoretical knowledge into practical skills.

In teaching practices, heuristic and inquiry-based teaching methods should be adopted to stimulate students' critical thinking. For example, in teaching soccer, group discussion sessions can be set up for students to analyze the strengths and weaknesses of specific tactical plans and propose improvements. Likewise, in physical education pedagogy courses, students can be organized to participate in teaching research, designing teaching plans, and reflecting on them through practice, thereby cultivating their critical thinking and problem-solving abilities.

2.2 Support for Teachers' Professional Development

Schools should establish a comprehensive teacher training system, regularly organizing training activities related to sports science literacy and critical thinking for teachers, inviting experts to deliver lectures and share advanced educational concepts and methods. At the same time, teachers should be encouraged to participate in teaching research and provided with necessary research funding and guidance support to promote a positive interaction between teaching practices and theoretical research.

Schools should improve teacher evaluation and incentive mechanisms, incorporating teachers' research achievements, teaching reflections, and other elements into performance evaluations and providing appropriate rewards to teachers with outstanding performance, thereby stimulating their enthusiasm for professional development. Furthermore, schools should establish professional exchange platforms for teachers, organizing activities such as collaborative lesson planning and peer observation to promote experience sharing and intellectual collisions among teachers and jointly enhance their critical thinking and problem-solving abilities.

CONCLUSION AND PROSPECTS

1. Research Conclusions

Physical education teachers' scientific literacy, including solid subject knowledge in sports, proficient scientific research methods, and excellent sports skills and teaching abilities, is crucial for ensuring the quality of physical education teaching.

Cultivating physical education teachers' critical thinking skills helps enhance their teaching reflection abilities, promotes teaching innovation, and lays the foundation for cultivating students' critical thinking.

The core elements of the integrated model include optimizing the curriculum system, strengthening practical teaching, establishing reflection mechanisms, supporting teachers' professional development, and promoting school-enterprise cooperation. Implementing the model requires comprehensive consideration of various aspects, such as curriculum design, teacher support, and school management, to form a systematic guarantee.

2. Research Limitations and Future Prospects

This research proposes an integrated model based on existing literature and theoretical analysis. However, there are certain limitations in empirical verification. Future research can conduct pilot practices in specific schools or regions to further evaluate the feasibility and effectiveness of the model, providing a basis for model optimization. Additionally, attention can be paid to the differences among various types of physical education institutions or regions, exploring more targeted cultivation strategies. Cultivating professional competence for physical education teachers is a long-term and complex process requiring continuous attention and in-depth research.

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