

Research on the Practical Framework and Strategies of College Physical Education Classroom Teaching from the Ecological Perspective

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ABSTRACT With the implementation of quality education, physical education has become an important component of campus teaching activities and plays a key role in improving students' physical quality and mental well-being. However, many college physical education classrooms remain homogeneous, lack innovation, and fail to fully achieve the goals of physical strengthening and psychological engagement. Based on ecological theory, this paper explores the practical framework and teaching strategies for college physical education classrooms. Through literature review and questionnaire survey, the study identifies the main components of a physical education classroom ecosystem, including teachers, students, classroom environment, and classroom evaluation and feedback. Teachers function as producers who provide instructional energy and professional guidance; students act as consumers and feedback providers; the classroom environment forms the spatial and material support system; and evaluation and feedback mechanisms maintain dynamic circulation and regulation. The proposed framework emphasizes teacher professional competence, student participation, diversified sports environments, and continuous feedback. The study provides an ecological teaching perspective for improving classroom vitality, optimizing teaching interaction, and promoting sustainable development of college physical education.

INDEX TERMS ecological perspective, college physical education, classroom ecosystem, feedback mechanism, teaching strategy

I. INTRODUCTION

EDUCATIONAL activities are the core project to promote social development and the most important way for the country and society to cultivate talents. Under the influence of quality education concept, school education pays more and more attention to the physical and mental health development of students. Therefore, strengthening the classroom construction of physical education has become an essential task in teaching activities of colleges and universities. Based on the perspective of ecological theory, this paper analyzes the components of the physical education classroom ecosystem, and explores the practical framework and strategies of college physical education classroom teaching. The purpose is to promote the improvement and innovation of college physical education classroom construction, realize the development of student-centered classroom activities, build a dynamic physical education classroom ecosystem, and provide some reference for classroom construction of other disciplines.

II. ECOLOGICAL THEORY

A. CONCEPT OF ECOSYSTEM

Ecosystem refers to the unity of organism and environment in a certain space of nature [1]. In this unified whole, organism and organism, organism and environment interact and restrict each other, and the ecosystem is in a relatively stable dynamic equilibrium state in a certain period of time. The ecosystem is open and exchanges energy and material with the outside world all the time, circulates continuously to maintain the stability of the system.

From the analysis of ecosystem components, its components include producers, consumers and decomposers [2]. Producers are the producers of energy in the ecosystem, and also the source of all material circulation; consumers take producers as energy directly; decomposers, also known as reducers, digest and decompose the complex organism into the material and energy that can be absorbed and utilized by producers again, and are important components of maintaining the dynamic balance of the ecosystem.

B. COMPONENTS OF PHYSICAL EDUCATION CLASSROOM ECOSYSTEM

Based on the ecological theory, the college physical education classroom is structured as a complex ecosystem. This study moves beyond metaphorical labeling by applying the principle of ‘Ecological Niche’ to define the functional position of each entity. Teachers, as producers, do not merely ‘produce’ knowledge but manage the ‘energy flow’—the transition of physical skills and motivation—to students. Students, acting as consumers, transform this instructional energy into physical outcomes. The depth of this application lies in the ‘Trophic Level’ interactions, where the efficiency of energy transfer determines the classroom’s productivity and stability; the system also requires a comprehensive Regulation and Feedback Mechanism. From this perspective, student feedback on classroom results acts as a regulatory signal to teachers, thereby promoting the energy and material circulation of the physical education ecosystem and creating dynamic classroom activities [3].

According to the principle of energy transfer and exchange in the ecosystem, teachers and students, teachers and teaching environment, students and students, students and teaching environment interact and restrict each other. In order to maintain the continuity of the classroom, it is necessary to respect the students’ subjectivity in the physical education classroom teaching, and constantly improve the classroom teaching environment, so as to truly realize the significance of the physical education classroom.

III. RESEARCH METHOD

A. LITERATURE REVIEW

In order to ensure scholarly rigor, a systematic search was conducted using professional academic databases, including CNKI and Web of Science, utilizing keywords such as ‘ecological pedagogy,’ ‘physical education,’ and ‘classroom ecosystem.’ A total of 152 initial records were retrieved. Following a strict screening process based on criteria such as peer-review status, relevance to higher education, and publication within the last ten years, 69 high-quality articles were selected for deep integration. There are four indicators of classroom environment, including the fun of sports, equipment, sports venues and sports duration. There are three indicators of student’s role, including physical condition, personal interest and favor for teachers [4].

B. QUESTIONNAIRE SURVEY

In order to increase the authenticity of this study and to further judge the above-mentioned indicators, the author conducted a questionnaire survey at a representative provincial comprehensive university (selected as a pilot case for ecological teaching reform). Informed consent was obtained from all participants. The questionnaire took the above-mentioned 3 primary indicators and 10 secondary indicators that affect the physical education classroom as the acceptance survey, and provided subjective supplementary

options as the indicators that affect other aspects of this study.

This study investigated 18 PE teachers and experts, and 100 students. This study investigated 18 PE teachers and experts and 100 students using a stratified random sampling method to ensure representativeness across different athletic levels. The questionnaire was validated for internal consistency, yielding a Cronbach’s alpha of 0.86, indicating high reliability. Data were analyzed using SPSS 26.0, employing descriptive statistics and Chi-square tests to verify the significance of the findings. The acceptance degree of the indicators was found to be above 70%, with a p-value < 0.05, confirming the statistical significance and credibility of the selected framework. While this sample provides intensive localized insights, it is acknowledged as a limitation; future research should expand the sample size across diverse geographical regions to enhance the generalizability of these ecological findings. In addition, the investigators provided an important primary indicator in subjective options: classroom evaluation and feedback, which can be divided into three secondary indicators: classroom harmony, student engagement and classroom significance [5]. From the perspective of ecology, the indicator of classroom evaluation and feedback also acts as decomposers and plays an important role in improving the quality and significance of physical education classroom. Only by giving full play to the role of classroom evaluation and feedback system can the whole ecosystem generate continuous power and maintain the dynamic balance [6]. As a result, the indicators that affect the physical education classroom ecosystem are more comprehensive and tend to be stable, including the primary indicator of teachers, and the secondary indicators are respectively professional accomplishment, guiding methods and personality charm; the primary indicator of classroom environment, and the secondary indicators are the fun of sports, equipment, sports venues and sports duration; the primary indicator of students, their secondary indicators are respectively physical condition, personal interest and favor for teachers; the primary indicator of classroom evaluation and feedback, while the secondary indicators include classroom harmony, student engagement and classroom significance, as shown in Figure 1.

IV. PRACTICAL FRAMEWORK OF COLLEGE PHYSICAL EDUCATION CLASSROOM TEACHING

According to the principles of ecology, the premise of promoting the energy and material circulation in the ecosystem is that each system component continuously fulfill its obligations to ensure the continuous energy exchange. Therefore, in college physical education classroom, teachers, students, teaching environment, classroom evaluation and feedback system must maintain dynamic communication, so as to continuously improve the classroom quality and achieve the effect of enhancing physical fitness and pleasant body and mind.

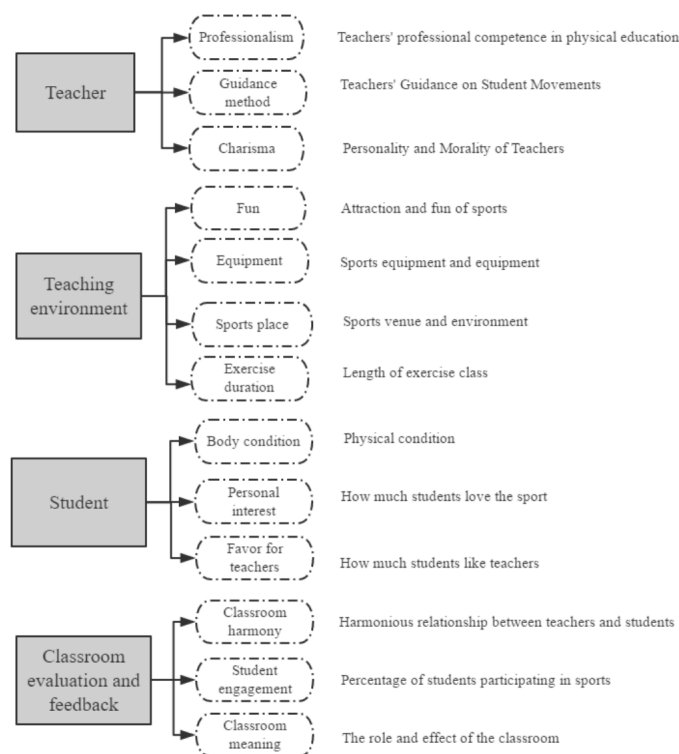


FIGURE 1. Indicators Affecting Physical Education Classroom

A. TEACHERS-PRODUCERS

Teachers are engineers of human souls and play a vital role in the culture transmission, so the requirements for teachers in colleges and universities are particularly high [7]. According to relevant data and investigations, the main indicators of teachers in college physical education classroom are professional accomplishment, guiding methods and personality charm. Teachers' professional accomplishment refers to teachers' professional ability and professional ethics in teaching. As PE teachers, they should have sports-related professional knowledge, understand the overall content of the teaching items, and have a broad knowledge vision based on mastering the teaching items. They can not only teach specific sports items to students, but also help students broaden their knowledge [8]. In addition, as teachers, their moral self-restraint must also be paid attention to. Teachers are the guides of students. Only teachers with noble moral sentiments are qualified. In terms of teachers' guiding skills, they are required to have good guiding ability, be able to teach students according to their aptitude, and adopt different teaching methods for different students, so as to achieve the goal of comprehensively improving students' participation and quality [9]. Finally, the teacher's personality charm is operationally defined as a composite of professional ethics, instructional enthusiasm, and interpersonal humor, measured through student-perceived rapport scales, such as increasing sense of humor, in order to activate the atmosphere of physical education classroom and attract students' attention, so as to enable students to

participate in the classroom. In the ecosystem, producers are the source of all energy, so teachers are required to keep their responsibilities in mind and learn for life in order to master professional knowledge, develop a broad teaching vision, cultivate noble moral sentiments, train professional guidance skills and develop a sense of humor and harmony in the classroom, as shown in Figure 2.

B. STUDENTS-CONSUMERS AND DECOMPOSERS

Students are the learning subject in classroom activities. According to the concept of quality education, students should give full play to their learning subjectivity, have independent learning will that will not be transferred by the will of teachers [10]. In the classroom activities, the main factors that affect the students' sense of classroom experience are physical condition, personal interest and favor for teachers, etc. Healthy body is the premise of sports. Only when students have good physical quality can they carry out sports better. When the body is trouble, students lack the enthusiasm and desire to participate in sports. Therefore, in the sports classroom ecosystem, students should strengthen physical exercise, improve physical quality, so as to better carry out sports. Secondly, just as thousands of people have thousands of faces, each student may have different hobbies in sports. When assigning a sport, some students may not be able to devote themselves to it, which requires continuous improvement of the classroom richness to adapt to the interests of different students [11]. Similarly, 'favor for teachers' refers to the student's emo-

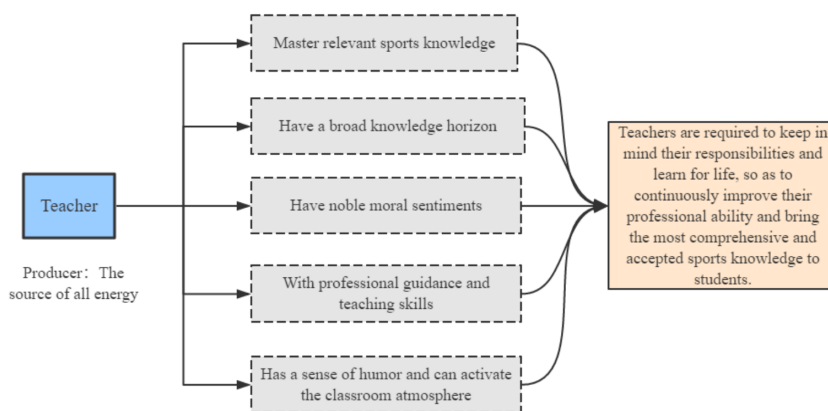


FIGURE 2. Teachers-Producers

tional resonance and subjective willingness to cooperate, which is assessed based on the frequency of positive teacher-student interactions and classroom atmosphere ratings. This operationalization ensures that these qualitative traits can be reliably assessed across different teaching environments, so teachers are required to properly activate the classroom atmosphere to ensure that most of the students can really integrate into it. Students' role as decomposers in the PE classroom ecology has the function of information feedback to the role of producers. Students' feelings, likes or dissatisfaction with physical education classroom should be timely recommended or affirmed to teachers to promote teachers' adjustment of the classroom; while the role of consumers of students represents the implementation and refinement of classroom instructions sent by teachers, and students should abide by classroom discipline, follow teachers' guidance, complete classroom tasks, and actively cooperate with the orderly development of the classroom, as shown in Figure 3 [12].

C. CLASSROOM EVALUATION AND FEEDBACK-REGULATION AND FEEDBACK SYSTEM

Classroom teaching evaluation is a crucial measure to test the classroom quality. The implementation of classroom evaluation and feedback system plays an essential auxiliary role in teachers' evaluation of students' mastery of knowledge and skills and the later improvement of curriculum setting. In addition, it is of key significance for students to exert their learning subjectivity, give feedback on classroom experience and strive for better classroom resources [13]. Therefore, in the physical education classroom, as decomposers, the classroom evaluation and feedback system can ensure the energy circulation of the ecosystem by sending out new information after teachers receive information feedback [14].

There are many components involved in classroom evaluation and feedback, as shown in Figure 4: from the perspective of teacher evaluation, it mainly includes students' two major performances in class and after class. The performance in class includes students' classroom behavior

performance, students' enthusiasm, students' engagement and students' homework completion. The performance after class is the acquisition results obtained by the students at a certain stage, which can be judged from three aspects: skill evaluation, physical fitness evaluation and theoretical evaluation. From the perspective of student feedback, it refers to the students' acceptance degree of sports classrooms or sports events, including feedback on classroom facilities, feedback on classroom design, feedback on teachers' skills, etc. [15]. Teachers should always pay attention to the improvement and adoption of classroom evaluation and feedback system, the decomposers that constantly stimulate energy regeneration.

D. CLASSROOM ENVIRONMENT

Due to the particularity of sports, the classroom is basically carried out outdoors, so the construction of classroom environment is particularly important [16]. The construction of physical education classroom environment mainly includes the fun of sports events, equipment, sports venues and sports duration, as shown in Figure 5. First of all, the attraction of sports events to students is the most direct part that affects students' enthusiasm in classroom. Colleges and universities should carry out a variety of sports events, in addition to regular running and playing balls, they can carry out sports with competition and unity, such as sprint competitions and relay competitions, and set up awards to increase interest and innovate basic sports events [17]. Secondly, the new or old and diversity of equipment in physical education classroom are the conditions for judging whether the classroom resources are sufficient. Teachers and universities should maintain sports equipment in time and change the old into new ones in time. Thirdly, the selection of sports venues with wide field and good environment will also affect the effect of physical education classroom. Therefore, teachers should fully consider the importance of the sports environment before class and select suitable venues for different projects [18]. Finally, as each student's physical condition is different, and the duration of each sports event is different, teachers should weigh the two in

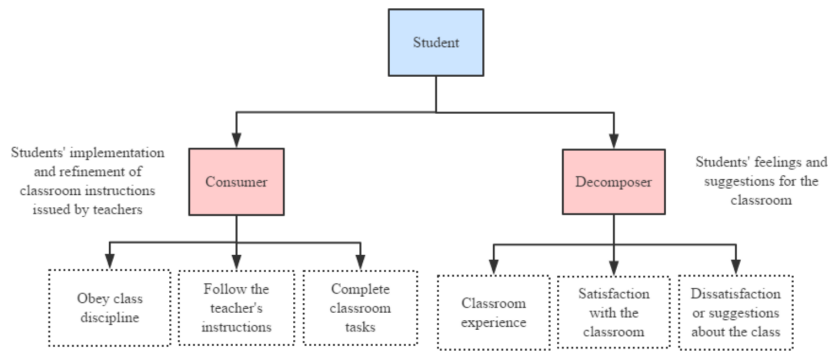


FIGURE 3. Students-Consumers and Decomposers

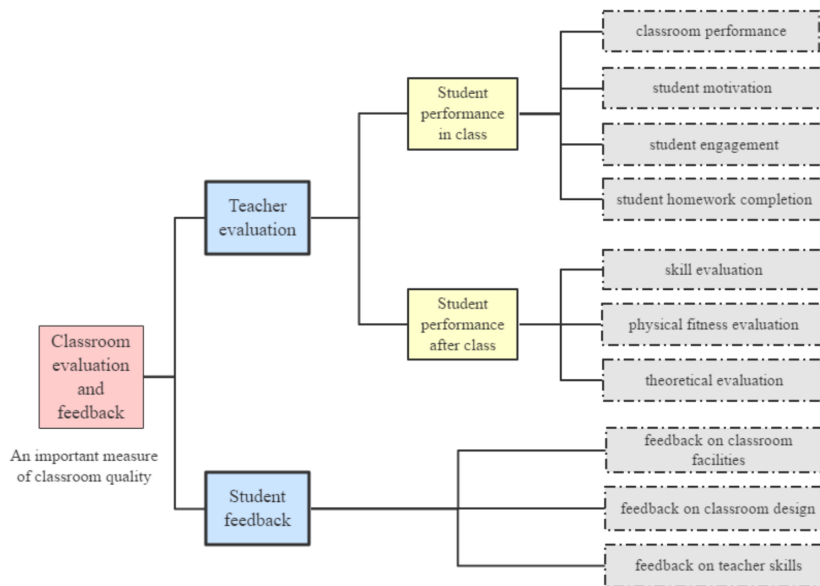


FIGURE 4. Classroom Evaluation and Feedback-Decomposers

carrying out activities to master the appropriate exercise duration, so as to avoid the students' body reaching the bearing limit.

E. PHYSICAL EDUCATION CLASSROOM-ECOSYSTEM

The premise of ecosystem circulation and operation is that each component of the system performs its own obligations, and endlessly alternates between material and energy inside and outside the system. The construction of the practical framework of college physical education classroom teaching is the operation of the ecosystem, as shown in Figure 6. In this physical education classroom system, teachers, students, classroom evaluation and feedback, classroom environment should always play the role of their own system components. Teachers should constantly improve their professional accomplishment, optimize classroom resources, innovate classroom settings, and cooperate with the school in the maintenance of physical education facilities, implementation of classroom evaluation and feedback system; students should actively participate in the classroom, cooperate with

teachers to carry out activities, and actively put forward classroom-related suggestions; in addition, colleges and universities should improve the environment of campus activity venues, to create more beautiful sports venues for students [19]. Only when the components of the system maintain the mutual information transmission can the ecosystem circulate in an orderly way.

V. RESEARCH ON STRATEGIES OF COLLEGE PHYSICAL EDUCATION CLASSROOM TEACHING

In the college physical education classroom, teachers, students and classroom are the main components of its ecosystem. In order to strengthen the classroom vitality, colleges and universities can improve the classroom quality and effect from the following points:

1 Optimize the 'Ecological Niche' of the teaching staff by focusing on the 'energy output' capability of teachers, ensuring their professional evolution matches the dynamic needs of the classroom ecosystem.

2 Enhance Environmental Niche Suitability by aligning

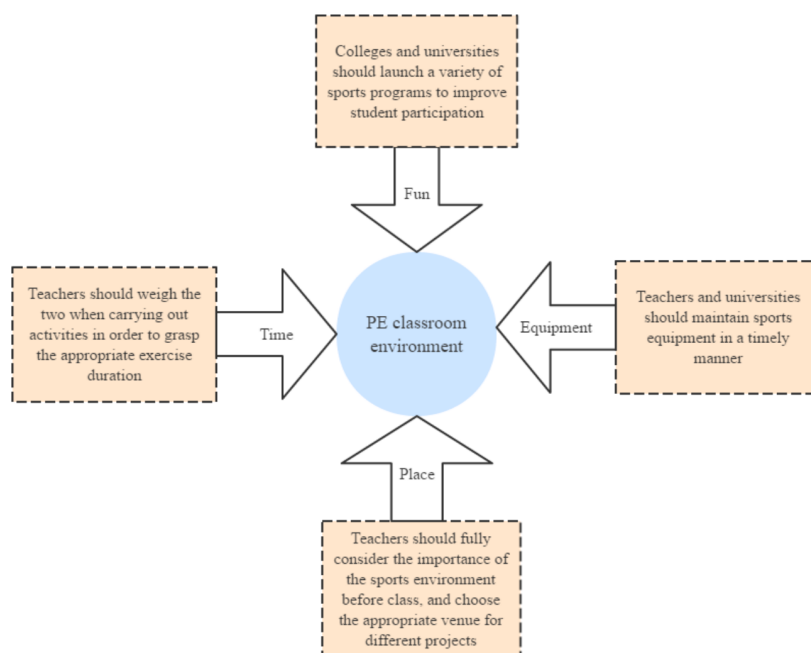


FIGURE 5. Physical Education Classroom Environment

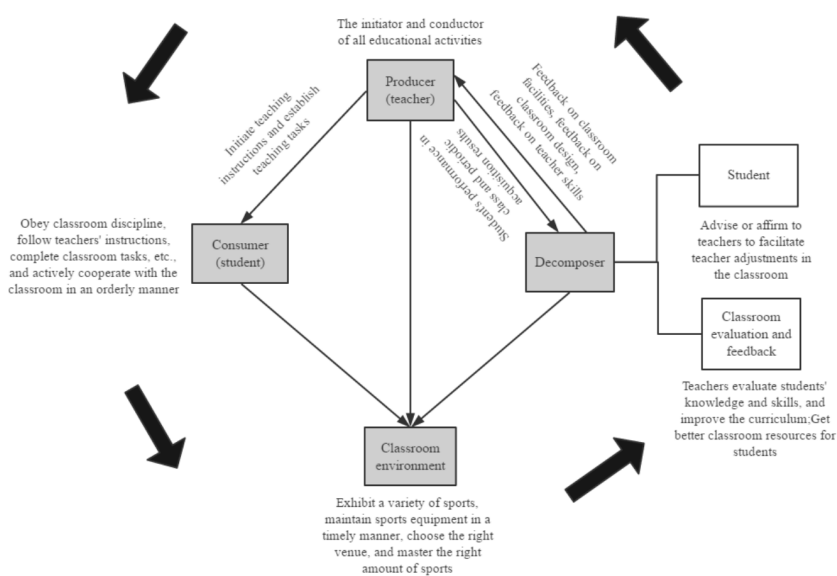


FIGURE 6. College Physical Education Classroom-Ecosystem

the physical and cultural ‘habitats’ of the sports venues with the specific physiological and psychological demands of the students to minimize ‘energy waste’ during teaching activities.

3 Facilitate Multi-directional Information Cycling by encouraging students to act as active nodes in the system, ensuring that feedback loops are closed and the ecosystem remains in a state of ‘climax equilibrium’.

4 Encourage students to bravely put forward relevant suggestions and opinions on classroom construction.

Starting from the above direction, strive to build a dy-

namic physical education classroom, maximize the enthusiasm of students to participate in, and ensure the classroom effect [20].

VI. CONCLUSION

Physical education is a unique and important lesson in higher education. The research on the practice framework and strategies of classroom teaching is based on the ecological theory, giving full play to the roles of teachers, students and classroom, so as to promote the infinite circulation of classroom energy and material. Colleges and universities

should attach importance to the cultivation of students' physical quality, according to the functions of various components in the system, take students as the core of education, create physical education classroom activities that conform to the concept of quality education, thus promoting the vitality circulation of college physical education classroom.

AUTHOR CONTRIBUTIONS

Hongwei Wang designed, collected and analyzed the data, and drafted the manuscript. Hongwei Wang conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Hongwei Wang participated fully in the work, take public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICTS OF INTEREST

The author declares no conflict of interest.

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