Student-centered reform of college sports physiology teaching

Wang Lei[1, a, *], Xue Lili[2, b],

[1]Yao Lake Campus, Jiangxi Normal University No. 99 Ziyang Avenue, Nanchang City, Jiangxi Province, 330022, China
[2]Qianfoshan Campus, Shandong Normal University No. 88 Wenhua East Road, Jinan City, Shandong Province, 250014, China
a.wanglei_383dfh@163.com,b.lili_xue_2950@gmail.com
***Corresponding Author**

Abstract: This study focuses on the reform of teaching models for Exercise Physiology in higher education institutions, guided by the student-centered philosophy. In light of the drawbacks inherent in traditional teaching models such as teacher dominance, the disconnection between theory and practice, and the singularity of assessment methods and in consideration of the actual needs of contemporary college students, disciplinary development trends, and the feasibility factors including advances in educational technology and the enhancement of teacher and student competencies, this paper proposes multi-dimensional reform strategies. These strategies encompass the following aspects: First, innovating teaching methods by adopting models such as project-based learning, flipped classrooms, and collaborative group learning to stimulate students' learning motivation. Second, optimizing course content by selecting and integrating knowledge according to professional characteristics, introducing cutting-edge theories, and strengthening practical components to inject momentum into student learning. Third, refining the scientific assessment system by employing diversified assessment agents, combining process-oriented and summative evaluation, and diversifying assessment content to comprehensively measure students' learning and growth trajectories. The aforementioned reform strategies aim to enhance teaching quality and cultivate high-quality sports talents capable of meeting societal demands.

Keywords: Student-Centered, Exercise Physiology, Teaching Model Reform, Higher Education

1. Introduction

In the current context of rapid development and transformation in higher education, Exercise Physiology, as a core course for sports-related majors in universities, directly impacts the cultivation of students' professional competencies. However, traditional teaching models have gradually revealed numerous drawbacks under the backdrop of the new era, making it difficult to meet the needs of student growth and disciplinary development. Therefore, exploring student-centered teaching model reform holds urgent and significant practical importance, aiming to open a new chapter for Exercise Physiology instruction in higher education and promote the excellence in cultivating sports talents. This paper provides an in-depth analysis of the existing problems in current Exercise Physiology teaching in universities and proposes targeted reform strategies based on the student-centered teaching philosophy, with the expectation of driving continuous innovation and development in physical education.

2. Current status of exercise physiology teaching in higher education

2.1. Characteristics of traditional teaching models

Traditional teaching of Exercise Physiology in higher education is centered on instructor lectures, with teachers occupying a dominant position in the classroom and systematically imparting knowledge according to the sequential order of textbook chapters. Students primarily remain in a passive state of listening, taking notes, and memorizing knowledge points, with limited opportunities for active questioning, participating in discussions, or engaging in practical operations. This results in a scarcity of interactive communication between teachers and students as well as among students themselves, making it difficult for students'

https://doi.org/10.62852/css/2026/272

subjective initiative and creativity to be fully realized. Textbook content is typically organized according to the disciplinary system of Exercise Physiology, proceeding from basic physiological functions of the human body such as cellular physiology and muscular physiology to the responses and adaptations of various systems during exercise [1]. While this presentation emphasizes the systematic and comprehensive nature of theoretical knowledge, it may suffer from a disconnect between theory and practice, with insufficient coverage of how to apply theoretical knowledge to practical scenarios such as athletic training and sports rehabilitation. Furthermore, teaching evaluation relies primarily on examination scores, with an emphasis on the memorization of theoretical knowledge through formats such as term explanations, short-answer questions, and essay questions. This approach fails to comprehensively assess students' learning processes, including their learning attitudes, degree of effort, practical operational abilities, teamwork capabilities, and innovative thinking, easily leading students to focus solely on examination scores while neglecting the improvement of their comprehensive competencies [2].

2.2. Problems existing in traditional teaching models

On the one hand, the singularity of teaching methods leads to a dull classroom atmosphere; students remain in a passive receptive state for extended periods, easily generating feelings of boredom. On the other hand, if course content fails to closely connect with students' actual life experiences and future career needs, students will struggle to recognize the value of Exercise Physiology knowledge, thereby lacking intrinsic motivation for learning. In Exercise Physiology instruction, the proportion of laboratory courses and practical components is relatively low, and some institutions suffer from insufficient experimental equipment and facilities, making it difficult to meet students' practical needs. Meanwhile, practical teaching content consists predominantly of verification experiments, with a deficiency in design-oriented and innovative experiments; students merely follow predetermined procedures, making it challenging to cultivate independent thinking and the ability to solve practical problems [3]. Furthermore, the assessment methods for practical teaching are also inadequate, with evaluations of students' practical operational skills and laboratory reports lacking comprehensiveness and objectivity.

3. Necessity and feasibility of teaching model reform for exercise physiology

3.1. Necessity of exercise physiology teaching reform

3.1.1. Adapting to student development needs

In the contemporary era, college students' thirst for knowledge is no longer confined to passive reception; they increasingly expect to exercise subjective initiative in their learning. Exercise Physiology, as an important foundational course for sports majors, encompasses numerous abstract theoretical concepts and complex physiological mechanisms. A student-centered teaching model can provide diverse learning pathways tailored to individual differences among students, such as athletic interests, physical conditions, and learning styles. For instance, students interested in athletic training can be guided to analyze, from an Exercise Physiology perspective, the impact of training methods on bodily functions; while students inclined toward sports rehabilitation can be encouraged to focus on the application of Exercise Physiology in injury recovery [4]. This model also emphasizes cultivating students' autonomous learning abilities, innovative thinking, and practical competencies, enabling graduates to better adapt to the evolving demands of various professional domains, including physical education teaching, athletic training, and sports rehabilitation.

3.1.2. Aligning with disciplinary development trends

As a discipline deeply intersecting and integrating with life sciences, medicine, sports science, and other multidisciplinary fields, Exercise Physiology is currently in a stage of rapid development, with new knowledge, technologies, and methodologies continually emerging. Traditional teaching models, constrained by fixed teaching content and methods, make it difficult for students to timely understand and grasp cutting-edge developments in the discipline. In contrast, a student-centered teaching model encourages students to actively engage in independent exploration and research. By cultivating their literature retrieval capabilities, students can independently access the latest academic materials. By

https://doi.org/10.62852/css/2026/272

enhancing their data analysis competencies, students can process and interpret research data. By developing their scientific thinking abilities, students can better comprehend and evaluate new research findings, proactively keeping pace with disciplinary advancements and gaining insights into the latest research achievements and application prospects in the field of Exercise Physiology.

3.1.3. The need for enhancing teaching quality

In traditional Exercise Physiology instruction in higher education, prominent issues such as low student learning enthusiasm and weak practical teaching severely constrain the enhancement of teaching quality. A student-centered teaching model employs diversified instructional methods, such as problem-based learning and project-based learning, to stimulate students' learning interest and initiative. For example, when explaining the effects of exercise on the cardiovascular system, questions such as "How to formulate a reasonable exercise program based on individual cardiovascular function" can be posed, allowing students to solve problems through literature review and group discussion, thereby achieving a deeper understanding of relevant knowledge [5]. Simultaneously, strengthening practical teaching components by increasing the proportion of experiments, internships, and practical projects—such as having students personally design and implement exercise intervention experiments, collect and analyze data—enables students to better apply Exercise Physiology theoretical knowledge to practice, thereby effectively improving teaching quality.

3.2. Feasibility of exercise physiology teaching reform

3.2.1. Support from educational technology

With the advancement of the times, the widespread proliferation of the Internet has brought forth a wealth of online resources. Open courses and academic lecture videos from renowned universities at home and abroad have opened broader learning windows for students, while professional forums provide platforms for exchange and interaction. Students are able to autonomously select learning content according to their own needs and interests. Furthermore, the continuous enrichment of multimedia teaching methods enables the transformation of abstract knowledge in Exercise Physiology—such as the mechanisms of physiological changes in the human body during exercise—into visual formats including images, animations, and videos, allowing students to comprehend and assimilate concepts more intuitively. Meanwhile, the advancement of technologies such as virtual laboratories and simulation software has addressed the challenges of insufficient equipment and limited conditions in actual experiments. Students can engage in experimental design, operation, and data analysis within virtual environments, such as simulating experiments on the cardiovascular system's response to different exercise intensities in a virtual setting, thereby effectively enhancing students' practical competencies.

3.2.2. Enhancement of teacher competencies

Universities are attaching increasing importance to faculty training and development. Through organizing various teaching seminars, workshops, and training courses, teachers have more opportunities to engage with advanced educational philosophies and teaching methods, and to apply them in instructional practice. Meanwhile, teachers themselves actively pursue learning and research, continuously enhancing their professional competencies and teaching capabilities. For example, drawing upon their own research experience, they can guide students in conducting research projects or participating in research studies. In the field of Exercise Physiology, teachers can guide students to investigate topics such as the effects of exercise on specific physiological indicators, thereby cultivating students' research abilities and innovative thinking, and better facilitating students' autonomous inquiry and collaborative learning.

3.2.3. Students' needs and adaptive capacities

Contemporary college students have grown up in the information age; they are adept at utilizing the Internet and information technology to acquire information, possess strong self-awareness and self-management capabilities, and demonstrate high receptivity to new teaching models with robust adaptive capacities. They expect to exercise subjective initiative in their learning and to enhance their comprehensive competencies through interactive communication with teachers and peers. A student-centered teaching model precisely aligns with these student needs, capable of stimulating their learning motivation and potential. For example, in the study of Exercise Physiology, students can

https://doi.org/10.62852/css/2026/272

autonomously select physiological phenomena of personal interest for in-depth investigation, and share their findings through exchanges with teachers and fellow students, thereby continuously enhancing their own capabilities through autonomous learning and practice.

4. Reform strategies for exercise physiology teaching

4.1. Stimulating learning and internalizing knowledge

4.1.1. Project-Based learning

Design challenging and engaging projects that integrate the key knowledge points and practical applications of Exercise Physiology. For example, for students majoring in athletic training, design a project titled "Developing a Personalized Exercise Training Program and Evaluating Its Effectiveness," requiring students to formulate training programs based on factors such as different athletes' physical conditions and athletic goals, and to assess the program's effectiveness through experimental testing and data analysis. During the project implementation process, teachers serve as facilitators and coordinators, guiding students in project planning, task division, data collection and analysis, promptly addressing problems encountered by students, and ensuring the smooth progress of the project.

4.1.2. Flipped classroom

University instructors can produce high-quality instructional videos covering foundational knowledge such as basic concepts, principles, and experimental procedures in Exercise Physiology. Simultaneously, they can provide learning resources including relevant reading materials and online quizzes to help students clarify learning objectives and priorities, and to guide their autonomous learning. In the classroom, instructors organize activities such as group discussions, experimental operations, and case analyses, encouraging students to share questions and insights from their pre-class learning to deepen their understanding and application of knowledge. Instructors provide focused explanations and guidance in response to student questions, lead students in in-depth exploration, and assign post-class assignments and extended learning tasks requiring students to apply acquired knowledge to solve practical problems—such as writing short papers on Exercise Physiology-related topics or analyzing physiological phenomena in athletic training—thereby further consolidating and expanding students' knowledge.

4.1.3. Collaborative group learning

When forming groups, it is necessary to comprehensively consider multiple factors such as students' learning abilities, interests, and personality traits to ensure diversified group composition that encompasses students at different levels, thereby achieving complementary advantages among students. Specifically, the grouping principle of "homogeneity between groups and heterogeneity within groups" can be followed, ensuring that each group maintains relatively balanced overall strength while group members possess distinctive characteristics and strengths, to promote broader academic exchange and collaboration [6].

4.2. Aligning with professional needs and frontiers

4.2.1. Content selection for knowledge construction

For students in different majors, such as Physical Education, Athletic Training, and Sports Rehabilitation, the content of Exercise Physiology textbooks should be selected and integrated accordingly. For instance, for Sports Rehabilitation majors, emphasis should be placed on the application of Exercise Physiology in rehabilitation therapy, including content such as muscle strength training and cardiopulmonary function rehabilitation; for Physical Education majors, the focus should be on the application of Exercise Physiology in physical education teaching, such as how to formulate teaching plans based on students' physiological characteristics. Meanwhile, the original chapter sequence of textbooks should be broken, and a systematic knowledge framework should be constructed according to the logical structure of Exercise Physiology knowledge and students' cognitive patterns, integrating and connecting related knowledge points to enable students to better understand and grasp the core content of Exercise Physiology. Furthermore, cases and practical problems closely related to daily life and sports activities should be introduced, such as the

https://doi.org/10.62852/css/2026/272

principles and methods of exercise-induced weight loss, and the generation and recovery of exercise fatigue, to enhance students' recognition of the practicality and interest of Exercise Physiology.

4.2.2. Research-Based learning and disciplinary trends

University instructors should promptly track the latest research achievements and development trends in the field of Exercise Physiology, and understand cutting-edge disciplinary dynamics through attending academic conferences and reading professional literature, integrating such insights into teaching content. For example, introducing the latest research findings on the application of exercise genetic testing in personalized athletic training, and the impact of exercise on gut microbiota. Meanwhile, inviting experts and scholars in the field of Exercise Physiology to deliver lectures at the university can provide students with introductions to frontier knowledge and research methodologies in the discipline; through face-to-face exchanges with experts, students can gain understanding of the latest development directions of the discipline and broaden their academic horizons. Furthermore, encouraging students to participate in instructors' research projects or to independently conduct research-based learning enables students to engage with and apply frontier knowledge in practice, thereby cultivating students' innovative thinking and research capabilities.

4.2.3. Expanding labs and practical bases

Experimental courses in Exercise Physiology at higher education institutions should be reasonably scheduled to ensure students have sufficient time for hands-on experimental operations. In addition to foundational experimental projects, comprehensive and design-oriented experiments should be increased, enabling students to integrate and apply acquired knowledge during experiments and thereby enhancing their experimental skills and scientific thinking abilities. Meanwhile, students should be organized to participate in extracurricular practical activities, such as sports testing and assessment, athletic training guidance, and sports rehabilitation services, allowing students to apply theoretical knowledge to actual work and strengthening their practical competencies and problem-solving capabilities. Furthermore, collaborative relationships should be established with sports clubs, sports rehabilitation institutions, and research institutes to jointly construct practical teaching bases, providing students with stable practical venues and opportunities.

4.3. Building a Scientific Assessment Feedback Loop

4.3.1. Diversified assessment agents

In assessing students, instructors should comprehensively consider multiple dimensions such as students' classroom participation, project execution effectiveness, and examination performance to thoroughly and deeply evaluate students' learning processes and outcomes. In this process, instructors should emphasize guiding students to conduct self-assessment, encouraging students to deeply reflect on their learning attitudes, methods, and achievements, thereby self-identifying strengths and weaknesses, and accordingly clarifying their personal growth directions. Furthermore, instructors should actively organize peer assessment activities, including mutual evaluation among group members and cross-group evaluation between different teams. Such peer assessment mechanisms help students learn to appreciate others' strengths and draw valuable suggestions from peer feedback, thereby promoting self-growth and progress, and fostering a positive, interactive, and productive learning environment.

4.3.2. Process and summative assessment integration

Process-oriented assessment emphasizes comprehensive tracking of students' learning processes. In Exercise Physiology instruction, attention should be paid to students' daily classroom participation, such as their willingness to actively answer questions about exercise physiological phenomena and their enthusiasm for participating in classroom discussions. Emphasis should also be placed on students' performance in laboratory courses, including the proficiency of their experimental operational skills and the accuracy of their experimental data recording. Meanwhile, attention should be given to students' contributions in group projects, such as assessing their task completion and teamwork capabilities in projects involving the formulation and analysis of how athletic training plans affect physiological indicators. Summative assessment is conducted through methods such as final examinations; however, examination content must

https://doi.org/10.62852/css/2026/272

be comprehensive and application-oriented, assessing not only basic concepts and principles of Exercise Physiology but also students' ability to apply acquired knowledge to analyze physiological problems in actual sports scenarios, such as analyzing the physiological fatigue recovery mechanisms of athletes after high-intensity training.

4.3.3. Diversification of assessment content

First, assessment of knowledge mastery: through examinations, assignments, and classroom questioning, evaluate students' grasp of foundational Exercise Physiology knowledge such as energy metabolism during human movement and muscle contraction principles. Second, assessment of learning capabilities: observe students' performance in autonomous and research-based learning, such as in research-oriented learning investigating the impact of certain exercise interventions on physiological indicators of specific populations, evaluating students' abilities in literature review, experimental design, data collection and analysis, and drawing conclusions. Third, assessment of practical competencies: evaluate students based on their performance in laboratory courses and extracurricular practical activities, such as in sports rehabilitation practice, assessing whether students can apply Exercise Physiology knowledge to formulate reasonable exercise programs for rehabilitation patients.

5. Conclusion

In conclusion, the reform of student-centered teaching models for Exercise Physiology in higher education is imperative. From the perspective of necessity, the urgent demands of adapting to student development needs, aligning with disciplinary development trends, and enhancing teaching quality call for reform. From the perspective of feasibility, educational technology, teacher competencies, and student characteristics provide solid support for reform. Through the implementation of strategies such as multidimensionally stimulating learning motivation, optimizing content to align with professional frontiers, and constructing scientific assessment feedback loops, it is expected to comprehensively improve teaching effectiveness and cultivate high-quality sports talents possessing both theoretical knowledge and practical skills, innovative thinking and collaborative spirit, thereby injecting new vitality into the sustainable development of Exercise Physiology instruction in higher education.

6. References

[1] Zhang J, Wu J H. Reflections on the teaching reform of Exercise Physiology courses for sports majors [J]. Sports Science and Technology, 2023, 44(2): 126-128.

[2] Wang Z J, Wang J, Cai H Y, et al. Practical teaching reform and exploration of Exercise Physiology [J]. Basic Medical Education, 2019, 21(8): 624-627.

[3] Dai C, Yan W G. Constraints on the curriculum reform of Exercise Physiology in higher education institutions [J]. Contemporary Sports Technology, 2020, 10(21): 13-15.

[4] Hu J F. Analysis of research and practice on the teaching reform of Exercise Physiology courses for physical education majors in universities [J]. Contemporary Sports Technology, 2020, 10(15): 122-123.

[5] Shi K X, Hou L J. Exploration and practice of blended teaching in ability-oriented Exercise Physiology courses [J]. China Medical Herald, 2023, 20(19): 73-76.

[6] Yu L, Zhou Y, Zhao L, et al. Curriculum ideology and politics in "Exercise Physiology": Significance, design, and practice [J]. Journal of Beijing Sport University, 2022, 45(6): 48-59.

https://doi.org/10.62852/css/2026/272