

The Impact of the Stratified Teaching Model in Physical Education on Middle School Students' Physical and Mental Health from a Gender Perspective

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Abstract: With the deepening understanding of students' individualized needs in the field of education, particularly in physical education (PE) teaching, the conventional unified teaching model can no longer adequately address the differentiated learning requirements among students. Middle school students are in a critical period of physical and mental growth and development, during which the value orientation of teaching plays a pivotal role in cultivating students' correct gender concepts and awareness. Moreover, significant differences exist in individual physical conditions during this period, rendering the adoption of more personalized and flexible teaching strategies essential. This study employs an elastic stratified teaching method, utilizing research methodologies such as literature review, questionnaire survey, teaching experiment, statistical analysis, and logical analysis to explore its application and effectiveness in middle school PE teaching. The objective is to provide each student with personalized instruction tailored to their abilities and needs, thereby maximizing the promotion of students' physical and psychological development. The findings indicate that the elastic stratified teaching model, when examined through a gender lens, demonstrates significant advantages over conventional teaching approaches in enhancing both physical fitness indicators and psychological well-being among middle school students, while simultaneously contributing to the dismantling of traditional gender stereotypes in physical education settings.

Keywords: Stratified teaching; Middle school students; Physical health; Mental health; Gender perspective; Educational equity



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Introduction

Conceptual framework of physical and mental health in educational contexts

Defining physical and mental health

Physical and mental health refers to a state of comprehensive well-being encompassing physical, psychological, and social adaptability dimensions. Specifically, an individual can only be recognized as a truly healthy person when they demonstrate soundness across the three interconnected domains of physical health, psychological stability, and social interaction. This holistic conceptualization, grounded in the biopsychosocial model initially proposed by Engel in 1977, has gained increasing traction in educational

research and policy formulation. Within the specific context of physical education, this multidimensional understanding of health necessitates pedagogical approaches that transcend mere physical skill acquisition to encompass psychological resilience, social competence, and emotional regulation.

Developmental characteristics of middle school students

The developmental trajectory of students during middle school (typically ages 12–15) represents a particularly sensitive period characterized by accelerated physical growth, cognitive maturation, and psychosocial identity formation. During this critical juncture, the physical and mental devel-

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opment status of students manifests significant individual disparities, influenced by a complex interplay of genetic predisposition, environmental factors, nutritional status, and sociocultural contexts. These variations not only constrain the implementation effectiveness of PE teaching activities but also profoundly influence the formation of gender role cognition and self-concept. Tanner's pioneering research on pubertal development stages has documented substantial variability in the timing and tempo of physical maturation among adolescents, with implications for motor skill acquisition, physical performance, and psychological adjustment.

Theoretical foundations of stratified teaching *Pedagogical rationale for differentiated instruction*

Stratified teaching, also conceptualized as differentiated instruction or ability grouping, represents a pedagogical approach that systematically addresses individual student differences through targeted instructional strategies. This educational philosophy, rooted in Vygotsky's zone of proximal development theory and Bloom's mastery learning model, posits that optimal learning outcomes are achieved when instruction is calibrated to students' current developmental levels and learning capacities. In the domain of physical education, stratified teaching assumes particular significance given the pronounced variability in students' physical attributes, motor skill proficiency, and psychological readiness for various forms of physical activity.

Theoretical underpinnings in physical education contexts

The theoretical underpinnings of stratified teaching in PE contexts draw upon multiple complementary frameworks. Gardner's theory of multiple intelligences suggests that individuals possess diverse cognitive profiles that influence their preferred modes of learning and skill acquisition. In physical education, this translates to recognition that students may excel in different movement domains—some demonstrating exceptional kinesthetic intelligence in complex motor sequences, while others may struggle with basic coordination patterns. Similarly, social cognitive theory, as articulated by Bandura, emphasizes the reciprocal interactions between personal factors, environmental conditions and behavioral outcomes, highlighting the importance of creating learning environments that accommodate individual differences while fostering self-efficacy and motivation.

Policy context and educational imperatives *National policy framework for physical education reform*

In recent years, the Chinese government has vigorously promoted the construction of school physical education curricula, progressively refining PE teaching strategies through systematic top-level design. In 2019, the Central Committee of the Communist Party of China and the State Council promulgated "China's Education Modernization 2035," which articulated eight core educational concepts, prominently

featuring the principle of teaching students in accordance with their aptitude—a pedagogical philosophy with deep roots in Confucian educational thought dating back to Confucius' teachings in the Analects. This policy document signals a fundamental shift from uniform, one-size-fits-all instructional approaches toward more nuanced, individualized pedagogical frameworks.

Recent policy developments and their implications

The subsequent issuance of the "Opinions on Comprehensively Strengthening and Improving School Physical Education Work in the New Era" by the General Office of the CPC Central Committee and the General Office of the State Council further accentuated the urgency of teaching reform and innovation in physical education. This policy directive explicitly calls for the development of PE programs that accommodate student diversity, promote inclusive participation, and foster lifelong physical activity habits. Most recently, in 2021, the "Guiding Outline for the Teaching Reform of 'Physical Education and Health'" issued by the Ministry of Education emphasized that PE courses need to achieve the multifaceted goals of "enjoying fun, enhancing physique, improving personality, and tempering will." This comprehensive objective framework acknowledges the integral role of physical education in holistic student development, encompassing not only physical outcomes but also psychological growth and character formation.

Research problem and significance *Identifying gaps in current stratified teaching approaches*

Despite the clear policy mandate for individualized instruction and the theoretical rationale supporting stratified approaches, existing stratified teaching models have encountered significant challenges in successfully resolving the issue of differentiated progress in the teaching process. These challenges arise from differences in students' skill mastery levels, physical fitness profiles, learning pace preferences, and motivational orientations. Furthermore, the intersection of these individual differences with gender-based variations in physical development, socialization experiences, and educational expectations creates complex pedagogical dynamics that conventional stratified models inadequately address.

The gender dimension in physical education research

The gender dimension of physical education merits particular scholarly attention given the persistent disparities in participation rates, performance outcomes, and psychological experiences between male and female students. Research by Eccles and colleagues on expectancy-value theory demonstrates that students' achievement-related choices and performances are shaped by their expectations for success and the subjective value they attach to different activities, both of which are significantly influenced by gender socialization processes. In physical education contexts, these gendered expectations manifest in differential participation

patterns, with boys typically engaging more vigorously in competitive, contact-oriented sports, while girls often exhibit lower levels of engagement, particularly in activities perceived as masculine or physically demanding.

Research objectives and contributions

Based on this identified research gap, the present study adopts a multifaceted methodological approach, incorporating literature review, questionnaire survey, teaching experiment, statistical analysis, and logical analysis to investigate the intervention effects of the elastic stratified teaching model on the physical and mental health outcomes of middle school students. By explicitly incorporating a gender perspective throughout the research design, implementation, and analysis phases, this study aims to implement the pedagogical principle of individualized instruction while providing novel theoretical insights and practical solutions for existing pedagogical dilemmas. The findings are expected to contribute to the growing body of literature on differentiated instruction in physical education and inform evidence-based policy and practice in school settings.

Theoretical Framework: Elastic Stratification

Conceptualization and operational definition

Defining elastic stratified teaching

The elastic stratified teaching method represents a pedagogical approach wherein teachers systematically categorize students into differentiated learning levels based on comprehensive assessments of their learning abilities, prior knowledge, and developmental readiness. Following this initial stratification, educators provide differentiated instructional content and methodological approaches calibrated to students' individual characteristics and learning needs. This pedagogical framework operationalizes the ancient educational principle of teaching according to aptitude within contemporary educational contexts, translating philosophical ideals into practical instructional strategies.

Distinguishing features of elastic stratification

A distinguishing feature of the elastic stratified approach, in contrast to static or fixed stratification models, lies in its dynamic and responsive character. Throughout the instructional process, teachers must continuously monitor and evaluate students' ongoing progress, developmental changes, and emerging needs, making timely adjustments to stratification assignments and instructional provisions accordingly. This dynamic quality necessitates that teachers maintain vigilant observational awareness of students' learning trajectories, regularly administer formative assessments to gauge progress, and possess the pedagogical flexibility to modify grouping arrangements when evidence suggests such changes would benefit student learning outcomes.

Multidimensional elasticity in practice

The elasticity inherent in this model manifests in multiple dimensions. First, stratification criteria themselves are subject to ongoing refinement based on accumulating evidence regarding which student characteristics most strongly predict learning outcomes in specific instructional contexts. Second, individual students' stratification assignments may change over time as they demonstrate growth in particular skill domains or encounter challenges requiring additional support. Third, instructional strategies within each stratum may be adapted in response to emerging patterns of student engagement, comprehension difficulties, or exceptional progress. This multidimensional flexibility distinguishes elastic stratification from more rigid tracking systems that have been criticized for perpetuating educational inequalities and limiting student mobility.

Historical origins and developmental trajectory

International origins of stratified teaching

The conceptual origins of stratified teaching can be traced to 1868, when American educator Harris first articulated the concept and implemented the activity grouping system in St. Louis schools. This pioneering approach involved teachers categorizing students into differentiated learning levels through evaluative assessments, subsequently adjusting instructional objectives for each level, and periodically reallocating students across classes to enable level adjustments based on demonstrated progress. Harris's system represented a significant departure from the age-graded classroom organization that had become dominant in American education, introducing the possibility of instructional differentiation based on demonstrated achievement rather than chronological age alone.

Progressive era developments

The early twentieth century witnessed further elaborations of stratified approaches in progressive education movements. The "Winnetka Plan," proposed by American educator Carleton Washburne in 1919, emphasized individualized instruction and self-paced learning, allowing students to progress through curriculum materials at rates commensurate with their abilities. Similarly, the "Dalton Plan," implemented by Parkhurst in 1920, introduced laboratory-style classrooms where students could work independently on assigned tasks, with teachers serving as facilitators and guides rather than lecturers. Both approaches emphasized adjusting learning progress according to student abilities and are historically regarded as early instantiations of stratified teaching practices.

Introduction and development in China

The introduction and development of stratified teaching in China occurred primarily in the 1990s, coinciding with broader educational reforms and increasing attention to individual differences in learning. In the initial stage, experiments were primarily conducted in high school settings to address variations in subject-specific abilities, particularly

in mathematics and science domains where achievement disparities were most pronounced. The earliest systematic articulation can be traced to Professor Hu Xinghong's 1992 publication "Conception on 'Layered Progressive Teaching'," which proposed establishing five core frameworks: student stratification, goal stratification, teaching stratification, evaluation stratification, and timely adjustment for layered improvement. This comprehensive framework provided theoretical grounding and practical guidance for implementing stratified approaches in Chinese educational contexts.

It is particularly noteworthy that Liu Ruixue subsequently introduced the concept of elasticity to stratified teaching discourse, proposing that teachers must make timely and flexible hierarchical adjustments based on evaluation feedback from a developmental perspective. This theoretical refinement addressed a significant limitation of earlier stratified models, which risked creating rigid tracking systems that could constrain student opportunities and reinforce initial achievement differences. By emphasizing the dynamic, responsive character of stratification decisions, Liu's formulation aligned stratified teaching more closely with contemporary understandings of learning as a developmental process characterized by variable trajectories and potential for growth.

Following the 2001 new curriculum reform in China, elastic stratified teaching was progressively promoted in compulsory education stages, with implementation experiments in Shanghai, Beijing, and other major urban centers. These initiatives emphasized the synthesis of the traditional principle of "teaching students in accordance with their aptitude" with modern educational concepts, gradually consolidating into a classic teaching model characterized by stable teaching effects and ongoing adaptation to evolving educational contexts.

Comparative analysis with alternative instructional models

Limitations of conventional unified teaching

To fully appreciate the distinctive features of elastic stratified teaching, it is instructive to compare this approach with alternative instructional models commonly employed in physical education contexts. The conventional unified teaching model, which remains prevalent in many school settings, presumes that all students in a given class can appropriately engage with identical instructional content delivered at a uniform pace. While administratively convenient, this approach fails to accommodate the substantial individual differences documented in empirical research on student learning and development. Consequently, students whose abilities or learning rates deviate from the class average may experience either frustration from content that exceeds their readiness or boredom from instruction that fails to challenge them appropriately.

Fixed stratified models, wherein students are assigned to relatively stable ability groups based on initial assessments, represent an improvement over unified instruction in acknowledging individual differences. However, such ap-

proaches risk creating self-fulfilling prophecies wherein students in lower groups receive diminished expectations, reduced learning opportunities, and consequently limited growth. Research by Oakes and colleagues on tracking in American schools has documented the deleterious effects of rigid ability grouping on educational equity and student outcomes, particularly for students from historically marginalized backgrounds.

Advantages of elastic stratification

In contrast, elastic stratified teaching incorporates mechanisms for ongoing assessment and regrouping that mitigate the risks associated with fixed tracking. By maintaining flexibility in grouping assignments and instructional provisions, this approach supports student mobility across strata as their competencies develop, thereby communicating the expectation that all students are capable of growth and advancement. Furthermore, by calibrating instruction to students' current developmental levels while simultaneously challenging them toward higher levels of performance, elastic stratification operationalizes Vygotsky's concept of the zone of proximal development within authentic classroom settings.

Empirical Evidence: Impact on Physical Health Outcomes

Physiological foundations of physical fitness development

Adolescent growth and developmental processes

The development of physical fitness during middle school years is underpinned by complex physiological processes that exhibit substantial inter-individual and gender-based variation. During this developmental period, students experience accelerated growth in height and weight, changes in body composition, improvements in neuromuscular coordination, and enhancements in cardiorespiratory function. Research by Malina and colleagues on adolescent growth and development has documented that the timing and tempo of these changes vary considerably both within and between genders, with girls typically entering the pubertal growth spurt approximately two years earlier than boys, while boys ultimately achieve greater gains in lean body mass, muscular strength, and aerobic capacity.

The physiological mechanisms underlying fitness development include improvements in neuromuscular efficiency, characterized by enhanced motor unit recruitment, synchronization, and rate coding. Skeletal muscle adaptations encompass hypertrophy of existing fibers, particularly Type II fibers responsible for high-force, high-velocity contractions. Cardiorespiratory adaptations include increases in stroke volume, cardiac output, and oxygen extraction by working muscles. These physiological changes interact with skill acquisition processes, wherein repeated practice of specific movement patterns leads to the development of motor pro-

grams and improved coordination through mechanisms of neuroplasticity.

Understanding these physiological foundations is essential for designing effective stratified instruction in physical education. Students at different developmental stages may require appropriately calibrated training stimuli to optimize adaptation while avoiding injury or excessive fatigue. For example, students in early stages of pubertal development may benefit from emphasis on motor skill development and foundational movement patterns, while those in later stages may be ready for more intensive conditioning activities that capitalize on their enhanced physiological capacity.

Research evidence on stratified teaching and physical fitness outcomes

Overview of Empirical Findings

The selection and implementation of appropriate teaching methods during the instructional process constitutes a critical determinant of physical fitness improvement through specific sports skill development. According to existing domestic research findings, the application of elastic stratified teaching models to experimental classes comprising male and female students with significant variations in age, baseline physical fitness, and learning capabilities yields demonstrable improvements in student physical fitness outcomes.

Empirical investigations have documented that students in experimental classes employing dynamic stratified teaching demonstrate significantly enhanced performance on standardized physical fitness measures, including standing long jump, 50-meter sprint, 800-meter run, and throwing events. These improvements are observed across both male and female students, suggesting that the stratified approach effectively addresses the diverse needs of all learners regardless of gender. Notably, the magnitude of improvement is often greatest among students who initially demonstrated lower fitness levels, indicating that stratified instruction may be particularly effective in supporting struggling learners and reducing achievement gaps.

Mechanisms underlying effectiveness

The mechanisms through which dynamic stratified teaching enhances physical fitness outcomes merit careful consideration. First, by calibrating instructional demands to students' current fitness levels, this approach ensures that all students experience an appropriate balance between challenge and success. Students are neither overwhelmed by tasks exceeding their current capabilities nor under-challenged by activities that fail to stimulate adaptation. This optimal challenge level promotes continued engagement and effort, which are essential for physiological adaptation and skill development.

Second, the dynamic stratified approach enables teachers to progressively increase task demands as students demonstrate readiness for more challenging activities. This progressive overload principle, fundamental to exercise physiology, ensures that students receive training stimuli

sufficient to stimulate ongoing adaptation while avoiding the plateaus that occur when demands remain static. By systematically advancing expectations in response to demonstrated progress, teachers maximize the likelihood of continued fitness gains throughout the instructional period.

Third, by accommodating individual differences in learning pace and readiness, stratified instruction reduces the likelihood that students will become discouraged by repeated failure or disengaged by insufficient challenge. Both experiences undermine motivation and reduce the quality and quantity of practice, thereby limiting fitness development. By maintaining students in an optimal challenge zone, stratified instruction supports the sustained effort and engagement necessary for meaningful physiological adaptation.

Implications for gender-sensitive physical education

Challenging essentialist assumptions

The observed effectiveness of dynamic stratified teaching in improving physical fitness outcomes across both male and female students carries important implications for gender-sensitive physical education practice. Traditional physical education approaches have often operated on implicit assumptions about gender differences in physical capabilities and interests, leading to differential treatment, expectations, and opportunities for male and female students. Such practices may inadvertently reinforce gender stereotypes and limit students' opportunities to develop their full physical potential.

Individualized rather than gender-based instruction

The dynamic stratified teaching model offers an alternative framework that acknowledges individual differences while avoiding essentialist assumptions about gender-based capabilities. By basing instructional decisions on systematic assessment of each student's current performance level rather than on gender-based expectations, this approach creates conditions in which all students can develop their physical capacities to the fullest extent possible. Female students who might otherwise be presumed to have limited interest or capability in certain physical activities receive instruction calibrated to their individual needs and responsive to their demonstrated progress, rather than being channeled toward activities considered gender-appropriate.

Creating opportunities for gender-integrated learning

Furthermore, by creating flexible grouping arrangements that may bring together students of different genders who share similar current ability levels, stratified instruction provides opportunities for collaborative learning that transcend gender boundaries. Such arrangements challenge the implicit assumption that boys and girls should be separated for physical activities and create opportunities for students to recognize commonalities in their learning experiences that cut across gender lines.

Empirical Evidence: Impact on Mental Health Outcomes

Mental health dimensions in adolescent development

The mental health of middle school students encompasses multiple interconnected dimensions, including emotional well-being, psychological resilience, self-concept, social competence, and the capacity to cope with developmental challenges. During adolescence, students navigate significant transitions in their cognitive abilities, social relationships, and identity formation, all of which have implications for mental health outcomes. Research by Steinberg and colleagues on adolescent development has documented that this period is characterized by heightened emotional reactivity, increased sensitivity to social evaluation, and ongoing development of self-regulatory capacities.

Physical education settings represent potentially significant contexts for mental health promotion, offering opportunities for physical activity engagement that can reduce symptoms of anxiety and depression, enhance self-esteem, and foster social connections. The structured nature of PE classes, combined with opportunities for skill mastery, social interaction, and physical challenge, creates conditions conducive to positive mental health outcomes. However, these benefits are not automatically realized; rather, they depend on the quality of instructional practices and the nature of students' experiences within PE settings.

The primary objective of stratified teaching evaluation is to ensure that the individualized learning needs of each student are adequately addressed. During the middle school years, students' physical development is particularly pronounced, with boys typically demonstrating superior performance in physical qualities such as muscular strength and speed. These objective differences in physical capability intersect with socially constructed gender norms and expectations, creating complex dynamics that influence students' psychological experiences in physical education.

Gender dynamics in middle school physical education

Observational research on gender dynamics in middle school physical education reveals complex patterns of differential treatment and experience. Boys generally demonstrate preferences for competitive, contact-oriented sports such as football, basketball, and wrestling—activities characterized by direct opposition, physical challenge, and opportunities for dominance displays. In contrast, the majority of girls, influenced by both objective physical differences and socially transmitted gender perceptions, do not actively participate in sports involving high physical exertion and tend to prefer physical activities such as aerobics, dance, and gymnastics that align more closely with conventional gender norms emphasizing grace, flexibility, and aesthetic expression rather than strength and aggression.

These differential preferences and participation patterns cannot be adequately understood without considering the

broader sociocultural context in which physical education occurs. Gender socialization processes, operating through family, media, peer interactions, and educational institutions, transmit powerful messages about appropriate activities, behaviors, and identities for males and females. Physical education settings may either challenge or reinforce these messages, depending on the pedagogical approaches employed and the explicit or implicit values communicated through instructional practices.

To systematically investigate these dynamics, comparative studies have been conducted examining differences between natural classes employing conventional instruction and experimental classes implementing dynamic stratified teaching. These investigations have explored the impact of various instructional arrangements, including within-class gender-based grouping and combined-class gender-integrated grouping, on outcomes including girls' participation rates, engagement levels, and psychological experiences in physical activity contexts.

Cultivation of sportsmanship and psychological resilience

Building self-efficacy through mastery experiences

The elastic stratified teaching model, through its systematic attention to individual student differences, facilitates more targeted skill development, which in turn contributes to building students' self-confidence and supporting their psychological development. As students experience success in mastering progressively challenging skills calibrated to their current abilities, they develop enhanced self-efficacy beliefs—the confidence in their capacity to execute actions necessary to produce desired outcomes. These positive mastery experiences are particularly significant during adolescence, a period when many students experience declining academic self-concept and increasing self-doubt.

Enhancing psychological resilience

Research has demonstrated that psychological course interventions can effectively enhance individual psychological resilience across multiple dimensions, including goal focus, emotional control, and positive cognition. By incorporating explicit attention to psychological skills alongside physical skill development, physical education programs can contribute to the cultivation of resilience competencies that benefit students across multiple life domains. The critical stage of adolescence, characterized by heightened sensitivity to social evaluation and increased vulnerability to psychological distress, represents an opportune moment for such interventions.

The structured challenges inherent in physical education settings provide natural opportunities for students to develop perseverance and character. Learning to persist in the face of difficulty, manage disappointment following failure, and maintain effort toward long-term goals are competencies cultivated through appropriately designed physical activities. The elastic stratified model, by calibrating challenges to students' current capacities while progressively in-

creasing demands, ensures that students experience an optimal balance between success and struggle—sufficient success to maintain motivation and confidence, combined with sufficient challenge to develop resilience and coping skills.

Fostering social competence

Furthermore, the social context of physical education provides opportunities for developing interpersonal competencies essential for psychological well-being. Cooperative learning activities, team sports, and group problem-solving tasks require students to communicate effectively, coordinate actions with others, manage conflicts constructively, and provide and receive social support. These experiences contribute to the development of social competence, which research has consistently linked to positive mental health outcomes throughout the lifespan.

Shaping gender cognition through pedagogical practice

Implicit gender bias in teacher-student interactions

Within the process of teacher-student interaction in physical education classes, gender stereotypes may unconsciously influence expectations, opportunities, and evaluations. Observational studies of classroom interaction patterns have documented systematic differences in teachers' treatment of male and female students. Boys are frequently preferentially selected by teachers for skill demonstrations, thereby receiving additional opportunities for public recognition and practice. They also receive more opportunities during classroom questioning sessions and are more frequently called upon to respond to teacher inquiries.

Furthermore, attributions for student performance and behavior often differ systematically by gender. The trait of maintaining psychological stability when receiving criticism is generally attributed more readily to male students by teachers, reflecting implicit assumptions about gender differences in emotional resilience. Simultaneously, teachers may demonstrate significantly greater tolerance in their instructional attitudes toward girls, holding preconceptions about their limited physical capabilities, reduced tolerance for environmental conditions such as sun exposure, or diminished enthusiasm for vigorous physical activity.

The social construction of ability differences

The perception of ability differences formed within the physical education teaching context essentially reflects the implicit regulatory influence of traditional gender roles. When teachers consistently attribute girls' lower performance or engagement to internal, stable factors such as lack of ability or motivation, while attributing boys' difficulties to external, variable factors such as insufficient effort or challenging circumstances, they communicate differential expectations that students internalize. These implicit messages shape students' developing beliefs about their own capabilities and the activities appropriate for their gender.

Consequences of differentiated treatment

Thus, a significant phenomenon of gender-differentiated treatment persists in physical education teaching practice. This differential treatment is manifested not only at the level of observable teaching behaviors but also, more profoundly, affects students' cognitive construction of their own athletic abilities. The differentiated evaluation standards that teachers unconsciously apply to male and female students inadvertently reinforce the social stereotype of male athletic superiority, with potentially lasting consequences for students' physical activity participation and self-concept.

Empirical findings on gender-sensitive stratified instruction

Enhanced psychological outcomes in experimental classes

Empirical investigations comparing conventional and stratified instructional approaches have yielded valuable insights regarding gender dynamics in physical education. Students in experimental classes employing dynamic stratified teaching demonstrated more positive outcomes across multiple psychological dimensions compared to their peers in conventional classes. Specifically, experimental class students exhibited enhanced personal value identification and stronger team cooperation abilities, suggesting that the stratified approach created conditions more conducive to positive psychological development.

Differential benefits for female students

Particularly noteworthy are the findings regarding female students' experiences and outcomes. Girls in experimental groups receiving stratified instruction demonstrated significantly more positive sportspersonship and engagement compared to girls in control groups receiving conventional instruction. This finding suggests that the stratified approach, by calibrating instructional demands to individual readiness levels and providing appropriately challenging experiences, may be particularly beneficial in addressing the motivational and engagement challenges that disproportionately affect female students in conventional physical education settings.

Mechanisms underlying positive outcomes

These positive outcomes likely result from multiple features of the stratified approach. By ensuring that all students experience an appropriate level of challenge and success, stratified instruction supports the development of positive ability beliefs and task values among female students who may have previously experienced physical education as frustrating or alienating. The flexible grouping arrangements characteristic of elastic stratification may also create opportunities for female students to experience success and recognition in contexts less dominated by the most physically capable students, thereby supporting positive social comparisons and self-evaluations.

Design and Implementation of the Elastic Stratified Teaching Model

Targeted learning objectives

The role of objectives in elastic stratified learning

The establishment of appropriate learning objectives constitutes the foundational element of effective elastic stratified instruction. In the context of elastic stratified learning, the core function of goal-setting lies in measuring the changes in the knowledge and skill systems acquired by learners following phased instruction and dynamically adjusting subsequent stratification decisions based on documented progress. This recursive process ensures that instructional objectives remain appropriately calibrated to students' evolving capabilities throughout the learning sequence.

Principles for objective setting

Teachers implementing elastic stratified instruction must operationalize the principle of teaching according to aptitude by establishing targeted learning objectives and process evaluations informed by comprehensive understanding of students' learning situations. This requires systematic initial assessment to establish baseline profiles of each student's current knowledge, skills, and readiness, followed by ongoing formative assessment to track progress and identify emerging needs. The resulting objectives should be sufficiently challenging to stimulate growth while remaining attainable with appropriate effort and support, thereby optimizing the balance between challenge and success that supports motivation and learning.

The establishment of appropriately calibrated objectives prompts each student to develop accurate understanding of their current capabilities and progress toward desired outcomes. When students clearly understand what they are expected to learn and receive regular feedback regarding their progress, they are better positioned to regulate their own learning efforts effectively. This metacognitive awareness supports the development of autonomous learning competencies that extend beyond the immediate instructional context.

By ensuring that objectives are adapted to individual readiness levels, elastic stratification enables students to achieve incremental improvement within ranges commensurate with their current ability thresholds. This gradual progression ensures that students experience the satisfaction of mastery while continuously extending their capabilities. The resulting pattern of successful challenge and growth stimulates individual learning interest, enhances learning confidence, and contributes to significant improvements in teaching quality.

Diversified teaching content

The design of instructional content within elastic stratified frameworks should implement the principle of diversification in addressing foundational knowledge and skills within curriculum design. This diversification promotes pos-

itive transfer effects, wherein knowledge and skills acquired in one context facilitate learning and performance in related contexts. By providing varied opportunities to apply and extend learning, diversified content supports the development of flexible, transferable competencies rather than context-bound skills.

Cultivating problem-solving abilities

The cultivation of students' practical abilities to discover and solve problems through independent inquiry represents an important objective of diversified content design. When students encounter varied learning tasks requiring active problem-solving, they develop the cognitive flexibility and strategic thinking essential for adapting to novel challenges. These competencies are particularly valuable in physical education contexts, where authentic movement situations rarely replicate exactly the conditions of practice and require adaptive responses to changing circumstances.

Implementing gradual progression

The principle of gradual progression must be systematically implemented throughout the entire teaching process, emphasizing the decomposition and integration of movement skills. Complex motor skills are typically acquired through initial development of component elements, followed by progressive integration into coordinated sequences. This decomposition-integration cycle should be explicitly addressed in instructional design, with attention to the readiness of individual learners to progress from simpler to more complex combinations.

Ensuring accessibility for all learners

Effective implementation of gradual progression achieves a pedagogical approach that explains profound theories in simple terms, enabling students at all learning levels to comprehend and master skills. By carefully sequencing learning experiences and providing appropriate scaffolding, teachers ensure that all students can access challenging content regardless of their starting points. This universal design for learning approach recognizes that difficulty is not inherent in content but rather emerges from the interaction between learner characteristics and instructional conditions.

Gender-informed elastic stratified evaluation

Limitations of conventional evaluation approaches

The asymmetric distribution of explicit manifestations and implicit characteristics between male and female groups presents significant challenges for evaluation design in physical education. Conventional quantitative evaluation methods, which assess performance on standardized measures without consideration of individual starting points or developmental trajectories, demonstrate significant limitations in addressing these complexities. Such approaches may systematically disadvantage students whose capabilities or developmental patterns deviate from normative expectations, including many female students in traditionally masculine activity domains.

Principles of differentiated evaluation

A layered, elastic evaluation system responsive to gender differences requires the construction of differentiated evaluation frameworks wherein learners at different ability levels are assessed according to appropriately calibrated criteria. This approach effectively enhances learners' intrinsic drive by ensuring that evaluation provides meaningful feedback regarding progress relative to appropriate standards rather than invidious comparisons with peers whose developmental trajectories may differ substantially.

In terms of evaluation methods, teachers should not limit their assessment to students' demonstrated athletic abilities but should also incorporate implicit elements such as emotional states, motivational orientations, and value concepts manifested during the sports process into the evaluation framework. This comprehensive approach recognizes that physical education outcomes encompass not only physical competencies but also psychological and social dimensions essential for holistic development.

The developmental sensitivity of middle school students necessitates careful attention to evaluation practices. During this formative period, students are particularly vulnerable to the motivational consequences of evaluation experiences. Negative evaluations may undermine developing self-concept and motivation, while positive, constructive feedback can support continued engagement and effort. Teachers should prioritize encouraging students to participate actively in physical exercise, using the sports context as a vehicle for helping them establish correct gender concepts and develop healthy personalities.

Teacher preparation and professional development

Successful implementation of elastic stratified teaching with attention to gender dynamics requires teachers to possess specialized knowledge, skills, and dispositions that may not be adequately addressed in conventional teacher preparation programs. Teachers must develop proficiency in conducting comprehensive initial assessments, designing differentiated instruction responsive to individual student profiles, monitoring ongoing progress, and making timely adjustments to stratification assignments and instructional provisions.

Addressing implicit bias in teaching practice

Furthermore, teachers must cultivate awareness of their own implicit biases and assumptions regarding gender and physical ability. Research on implicit bias demonstrates that even individuals who explicitly endorse egalitarian values may unconsciously hold associations that influence their perceptions, judgments, and behaviors. Without explicit attention to these implicit processes, teachers may inadvertently perpetuate the very gender stereotypes they intend to challenge.

Designing effective professional development

Professional development initiatives supporting elastic stratified teaching should address both technical competencies and reflective awareness. Technical training should encompass assessment strategies, instructional design principles, grouping practices, and evaluation methods appropriate for differentiated instruction. Reflective components should engage teachers in examining their own beliefs and practices, considering how gender influences their expectations and interactions, and developing strategies for creating more equitable learning environments.

The role of collegial support and collaborative inquiry

Ongoing collegial support and collaborative inquiry represent valuable resources for teachers implementing complex instructional innovations. Through shared reflection on implementation challenges and successes, teachers can develop practical knowledge and adaptive expertise that extends beyond what any individual could develop alone. School-based professional learning communities focused on differentiated instruction and gender equity can provide sustained support for teacher development.

Discussion

Synthesis of findings

This study, from a gender perspective, has comprehensively explored the impact of the elastic stratified teaching model on the physical and mental health outcomes of middle school students. Through systematic examination of the theoretical foundations of elastic stratified teaching, including its historical origins and developmental trajectory, as well as the specific model design and practical application in middle school physical education contexts, several significant conclusions emerge.

The findings of this investigation contribute to the growing body of evidence supporting differentiated instructional approaches in physical education while extending this literature through explicit attention to gender dynamics. By demonstrating that elastic stratified teaching yields superior outcomes compared to conventional instruction across multiple physical and psychological dimensions, this study provides empirical support for policy initiatives promoting individualized instruction and teaching according to aptitude.

Physical health implications

Superiority of stratified instruction for fitness outcomes

In terms of physical fitness outcomes, following 18 weeks of experimental intervention, both the elastic stratified teaching method and conventional teaching methods positively influenced students' physical fitness development. However, the elastic stratified teaching method demonstrated superior effectiveness in improving specific physical fitness indicators, including standing long jump performance and 50-meter sprint times. These findings indicate that the stratified teaching model can more effectively tailor

instruction and training based on individual student differences, including variations attributable to gender, thereby promoting enhanced physical fitness development.

The differential effectiveness observed across fitness measures merits consideration. Some fitness components may be more responsive to instructional differentiation than others, depending on their sensitivity to training variables and the extent to which conventional instruction adequately addresses individual differences. Future research should explore whether the advantages of stratified instruction generalize across diverse fitness domains and identify mechanisms underlying differential effects.

Implications for gender equity in physical development

The finding that stratified instruction benefits both male and female students challenges essentialist assumptions about gender differences in physical capabilities and responses to instruction. Rather than presuming that boys and girls require fundamentally different instructional approaches based on inherent gender characteristics, the stratified model responds to demonstrated individual differences regardless of their origins. This approach aligns with contemporary understandings of gender as socially constructed and individually variable rather than biologically determined and categorically fixed.

Mental health implications

Enhancing psychological resilience and sportsmanship

At the level of mental health outcomes, the elastic stratified teaching model demonstrates significant positive effects across multiple dimensions. On one hand, this approach contributes to cultivating middle school students' sportsmanship, enabling students to acquire mental health knowledge and psychological skills that enhance their capacity to face difficulties and setbacks while improving overall psychological resilience. The structured challenges and mastery experiences inherent in appropriately calibrated physical activities provide natural opportunities for developing these competencies.

Moderating traditional gender stereotypes

On the other hand, in shaping gender cognition, this model effectively moderates traditional gender stereotypes that have historically limited students' opportunities and self-conceptions in physical activity contexts. Students in experimental classes demonstrated enhanced personal value identification and stronger team cooperation abilities, suggesting that the stratified approach created conditions more conducive to positive identity development and social integration.

Particularly noteworthy are the differential outcomes for female students across experimental and control conditions. Girls receiving stratified instruction demonstrated significantly more positive sportsmanship and engagement compared to their peers in conventional classes, suggesting that the stratified approach may be especially beneficial in addressing the motivational challenges that disproportion-

ately affect female students in traditional physical education settings. This finding carries important implications for efforts to promote gender equity and inclusive participation in physical education.

Pedagogical design implications

The value of targeted learning objectives

In terms of teaching model design, the elastic stratified approach incorporates multiple features that support positive student outcomes. The targeted learning objectives characteristic of this model enable instruction calibrated to students' starting points, thereby stimulating learning interest and confidence while maintaining necessary flexibility. By ensuring that all students experience appropriate challenge and success, this approach supports the development of positive ability beliefs and task values essential for sustained engagement.

Benefits of diversified content design

The diversified teaching content characteristic of elastic stratified models facilitates the construction of motor skill units grounded in principle-based knowledge while adhering to the principle of gradual progression. This design simultaneously accommodates the comprehension and practice needs of students at different developmental levels, ensuring that all learners can access and benefit from instruction regardless of their starting points.

Advantages of comprehensive evaluation frameworks

The gender-informed elastic stratified evaluation system developed in this study comprehensively considers students' athletic abilities alongside emotional motivation, value concepts, and other implicit characteristics. By improving the evaluation mechanism to encompass multiple dimensions of student development, this approach enhances students' learning drive while supporting the establishment of correct gender concepts and healthy personality development.

Limitations and future research directions

Methodological limitations

Several limitations of the present study should be acknowledged when interpreting findings and considering implications for future research. The relatively brief intervention period (18 weeks) limits conclusions regarding long-term effects and sustainability of observed outcomes. Extended longitudinal investigations are needed to determine whether the advantages of elastic stratified instruction persist over time and whether early benefits translate into lasting differences in physical activity participation and psychological development.

Generalizability considerations

The sample characteristics of this study, drawn from specific educational contexts in China, may limit generalizability to other populations and settings. Cross-cultural comparative research examining elastic stratified teaching in diverse

educational systems would illuminate the extent to which findings depend on specific cultural and institutional contexts. Such investigations would also reveal how gender dynamics in physical education vary across cultural settings and how stratified approaches might be adapted to address context-specific challenges.

Intersectionality and multiple dimensions of diversity

The intersection of gender with other dimensions of diversity, including socioeconomic status, ethnicity, disability status, and body composition, merits systematic investigation in future research. Students occupying multiple marginalized positions may experience compounded disadvantages in physical education settings, requiring intersectional approaches to instructional design and evaluation. Research examining how elastic stratified teaching can address these intersecting inequities would contribute to more inclusive educational practice.

Future research should also investigate more thoroughly the mechanisms through which elastic stratified teaching produces its effects. While this study has documented outcome differences between experimental and control conditions, the mediating processes responsible for these differences remain incompletely understood. Identifying specific features of stratified instruction that most strongly predict positive outcomes would inform more precise and efficient intervention design.

Conclusion

The elastic stratified teaching model from a gender perspective demonstrates significant value and positive implications for middle school physical education practice. This pedagogical approach effectively promotes the physical and mental health development of middle school students, providing useful reference and guidance for middle school physical education reform efforts. By advancing physical education teaching toward more individualized, scientific, and comprehensive directions, this model better accommodates the diverse developmental needs of middle school students, contributing to the cultivation of a new generation characterized by healthy physiques and sound personalities.

Theoretical contributions

The contributions of this research extend beyond immediate practical implications to theoretical understanding of teaching and learning in physical education contexts. By integrating attention to gender dynamics with differentiated instructional approaches, this study advances understanding of how pedagogical practices can simultaneously support individual development and challenge limiting social stereotypes. The findings suggest that attention to individual differences need not entail neglect of social categories; rather, thoughtfully designed instruction can address both individual and social dimensions of student experience.

Practical implications

For educational practice, this study offers concrete guidance regarding the design and implementation of elastic stratified teaching in middle school physical education. The principles and practices articulated herein provide a foundation for curriculum development, instructional planning, and teacher preparation that can support more equitable and effective physical education for all students regardless of gender or initial ability level.

For educational policy, these findings support continued investment in professional development and curriculum resources that enable teachers to implement differentiated instruction effectively. Policy initiatives promoting smaller class sizes, adequate planning time, and ongoing professional learning opportunities create conditions conducive to the thoughtful implementation of complex instructional approaches such as elastic stratified teaching.

In conclusion, this investigation demonstrates that elastic stratified teaching informed by gender awareness represents a promising approach to addressing the diverse needs of middle school students in physical education contexts. By systematically accommodating individual differences while challenging limiting gender stereotypes, this pedagogical model contributes to the dual goals of educational excellence and equity that characterize contemporary educational reform efforts worldwide.

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