

Exploring Pathways for Integrating Sex Education into High School Biology and Its Practical Significance

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Abstract: This paper explores the necessity, theoretical foundations, and practical pathways for integrating sex education into the high school biology curriculum. By analyzing the current state of sex education domestically and internationally, the modules on sexual knowledge within the biology curriculum, and the healthy development needs of adolescents, it proposes interdisciplinary teaching strategies and evaluates their positive impact on students' scientific literacy, development of healthy behaviors, and enhancement of social adaptability. The study argues that biology, as a natural vehicle for sex education, can promote the realization of comprehensive sexuality education for adolescents in a scientific and desensitized manner.

Keywords: Sex education; High School Biology.

1. Introduction

1.1. Research Background

1.1.1. The Era Context and Practical Urgency

With the deepening of social transformation, the acceleration of globalization and informatization, and the interweaving and collision of diverse cultures, the environment in which adolescents grow up has undergone profound changes [1]. High school students (aged 15-18) are in a critical transitional stage from adolescence to adulthood. Their physical development is nearing maturity, but their psychological and social cognition are still developing [2]. They face immense academic pressure, identity confusion, and increasingly complex interpersonal relationships, among which sexual and reproductive health issues are particularly prominent [3, 4].

Currently, the age of first sexual experience among adolescents is trending younger. Unintended pregnancies, abortions, and infection rates of sexually transmitted diseases (such as HIV/AIDS, syphilis, gonorrhea, etc.) are rising among the adolescent population, constituting a public health problem that cannot be ignored. Simultaneously, issues such as school bullying, gender discrimination, and violence based on sexual orientation frequently occur [5], reflecting a widespread lack of awareness among adolescents regarding gender equality, interpersonal relationships, and rights [6]. These practical problems highlight the extreme importance and urgency of providing systematic, scientific, and comprehensive sex education to high school students.

1.1.2. Policy Evolution and Shifts in Educational Philosophy

China's sex education policies have evolved from "non-existent" to "existing," and from "implicit" to "gradually open." [7] Early education focused solely on the transmission of basic physiological hygiene knowledge, often only superficially [8]. In recent years, the national level has increasingly emphasized its importance. Key documents such as the "Healthy China 2030" Plan Outline and the "China Children's Development Outline (2021-2030)" explicitly call for strengthening sexual and reproductive health education for children and adolescents and enhancing their health literacy. The "Regulations on School Protection of Minors,"

promulgated in 2021, also require schools to provide adolescence education and sex education to students [9].

The educational philosophy has also shifted from a traditional "risk-avoidance" model (emphasizing only abstinence and preventing negative consequences) to a modern "empowerment" model. The internationally recognized concept of "Comprehensive Sexuality Education (CSE)" emphasizes that sex education is not merely about knowledge transmission but should encompass multiple dimensions such as values, life skills, social norms, rights, and responsibilities. It aims to cultivate adolescents' ability to make responsible choices and build equal and respectful interpersonal relationships [10]. This philosophy provides an important theoretical framework and direction for the reform and development of sex education for high school students in China.

1.1.3. Deficiencies in the Existing Education System and Research Gaps

Despite positive policy direction, the practice of sex education for high school students still faces numerous challenges [11], which constitute the direct motivation for this research:

(1) Lack of a systematic curriculum: Sex education has not yet become an independent compulsory course. It is often fragmented into subjects such as Biology, Physical Education and Health, and Ideology and Politics, lacking coherence and depth. The content tends to focus heavily on physiological knowledge, with little coverage of critical topics such as psychological development, emotional management, consent, gender equality, and critical analysis of media information.

(2) Weak teaching capacity: Many teachers themselves have not received systematic training in sex education. They lack professional knowledge, teaching skills, and sufficient confidence, often feeling awkward, finding it difficult to broach the topics, or resorting to rigidly following the textbook, which significantly reduces teaching effectiveness.

(3) Insufficient home-school-community collaboration: Family sex education is generally absent. Parents often struggle to communicate effectively with their children due to conservative views or a lack of knowledge. At the societal level, although information channels (especially the internet) are vastly abundant, the quality of information is uneven, containing a large amount of erroneous, distorted, and even

pornographic information that misleads adolescents. Schools and families have failed to provide effective guidance and "immunization" education against this.

(4) Lack of evaluation mechanisms: How to scientifically assess the effectiveness of sex education (e.g., knowledge acquisition, attitude changes, behavioral intentions) remains a challenge, making it difficult to measure and improve the quality of education.

1.2. Research Objectives

1.2.1. Deficiencies in the Existing Education System and Research Gaps

The core objective of this study is not limited to describing phenomena but aims to achieve the following multidimensional goals through empirical investigation and theoretical analysis:

(1) Current Situation Evaluation and Problem Diagnosis: Through methods such as questionnaires and in-depth interviews, this study will conduct a comprehensive investigation into the curriculum design, teaching content, faculty allocation, implementation effectiveness, and students' cognitive attitudes regarding sexuality education in high schools. The goal is to accurately identify specific problems and shortcomings in the implementation of policies, school practices, and family cooperation, such as fragmented content, conservative views, and monotonous teaching methods.

(2) Demand Analysis and Paradigm Shift: This study will delve into the unique physiological, psychological, and social development needs of high school students in late adolescence. It aims to move beyond the traditional "problem-prevention" education model, which focuses primarily on physiological health and preventing pregnancy and diseases, and shift toward constructing a positive education paradigm centered on "personality growth and holistic development." This will include focusing on students' comprehensive qualities, such as building intimate relationships, emotional management, gender equality, and social responsibility.

(3) Exploration of Influencing Factors and Mechanisms: This study will analyze the multidimensional factors affecting the effective implementation of high school sexuality education, including socio-cultural traditions, school education philosophies, teachers' professional capabilities, family communication atmosphere, peer groups, and new media information. It will clarify the interaction mechanisms among these factors to provide a theoretical basis for targeted interventions.

1.2.2. Theoretical Significance

Enriching and Developing Adolescent Sexuality Education Theory: By integrating multidisciplinary perspectives from educational psychology, developmental psychology, sociology, and public health, this study will conduct in-depth research on the specific age group of high school students. This will help refine and develop a theoretical system for adolescent sexuality education that aligns with China's socio-cultural context, filling the gap in specialized theories for the high school stage.

Deepening the Understanding of the "School-Family-Community" Collaborative Education Mechanism: Through empirical research, this study will reveal the roles, interactions, and tensions among schools, families, and society in sexuality education. It will provide important theoretical support and empirical evidence for improving the "all-member, whole-process, and comprehensive" education mechanism, promoting the application and development of

collaborative education theory in the sensitive field of sexuality education.

Promoting the Theoretical Integration of Gender Education and Life Education: This study advocates placing sexuality education within the broader frameworks of gender equality education and life education. By exploring their inherent logical connections, it will help promote the intersection and integration of related educational theories, constructing a more macro and scientific theoretical framework for the holistic development of adolescents.

1.2.3. Practical Significance

Providing Basis for Educational Policy Making and Curriculum Reform: The research findings will offer data support and decision-making references for national and local educational administrative departments to revise or develop more scientific and systematic guidelines and policy documents for high school sexuality education. This will promote the full integration of sexuality education into the compulsory high school curriculum system and improve curriculum standards.

Providing Guidance and Resource Support for Frontline Teaching Practices: The educational model framework and optimization strategies proposed in this study can directly serve high school teaching practices. They will help teachers update educational concepts, improve teaching methods, and develop teaching resources, thereby enhancing the effectiveness and acceptance of sexuality education.

Promoting Adolescents' Physical and Mental Health and Safe Development: Effective sexuality education can directly help high school students acquire scientific knowledge, establish positive and healthy attitudes toward sexuality, and enhance their self-protection abilities (e.g., preventing sexual assault, reducing unsafe sexual behaviors, and preventing sexually transmitted diseases and unintended pregnancies). This will reduce associated physical and mental health issues and social problems.

Fostering a Healthy and Harmonious Social Cultural Atmosphere: By promoting scientific and inclusive sexuality education, this study will help eliminate the stigma and prejudice associated with "sex," advance public awareness, and create a social atmosphere that respects diversity, gender equality, and responsibility. In the long term, this will have a profound impact on building a harmonious society and improving national quality [12].

In summary, this study aims to address the urgent need for high school sexuality education in the new era. Through systematic exploration, it seeks to promote the improvement and development of high school sexuality education in China at both theoretical and practical levels, ultimately serving the holistic development of adolescents' core competencies and lifelong well-being.

1.3. Current Status of Sexuality Education Domestically and Internationally

1.3.1. Current Status of Domestic Sexuality Education Research

Sexuality education research and practice in China have made significant progress in recent decades but remain in a developmental stage [13], facing complex influences from cultural, social, and policy factors. Historically, sexuality education was long considered a sensitive topic in China, with limited public discussion. Educational content focused primarily on physiological health and adolescence education, neglecting psychological, social relational, and rights

awareness aspects. As societal openness increased and adolescent health issues became more prominent, sexuality education has gradually gained more attention.

At the policy level, the Ministry of Education’s 2008 "Guidance Outline for Health Education in Primary and Secondary Schools" incorporated sexuality education-related content into the school health education framework, emphasizing knowledge on preventing AIDS and unintended pregnancies. In 2021, the "Regulations on School Protection of Minors" further required schools to provide age-appropriate sexuality education, prevent sexual assault, and respect students’ physical and mental health. However, these policies are largely guiding documents, lacking a unified national curriculum standard and a comprehensive evaluation system, leading to uneven implementation outcomes.

In terms of research, domestic sexuality education has largely focused on public health and education fields, emphasizing adolescent reproductive health, AIDS prevention, and surveys on sexual attitudes. For example, multiple studies have shown that Chinese adolescents generally lack adequate sexual knowledge, with significant urban-rural and gender disparities [14]. In recent years, some scholars have begun advocating for Comprehensive Sexuality Education (CSE), drawing on concepts from international organizations like UNESCO, and emphasizing multidimensional content such as relationships, gender equality, decision-making skills, and social norms. Institutions like Beijing Normal University and Capital Normal University have actively explored this field and developed localized curriculum resources.

However, domestic sexuality education still faces numerous challenges. Traditional culture and conservative views make it difficult to discuss sexuality education deeply within families and schools, and parents and teachers often lack sufficient training and confidence. Additionally, resource scarcity in rural and remote areas remains a prominent issue, resulting in uneven coverage of sexuality education.

1.3.2. Current Status of Domestic Sexuality Education Research

Internationally, sexuality education research and practice have formed a relatively mature system, particularly in developed countries in Europe and America, where sexuality education is regarded as an important component of promoting public health and social equity [15]. International sexuality education generally follows the Comprehensive Sexuality Education (CSE) model, emphasizing not only the transmission of physiological knowledge but also covering interpersonal relationships, gender equality, sexual rights, and socio-cultural contexts. This model is promoted by international organizations such as UNESCO and the World Health Organization and is supported by extensive empirical research.

European countries lead the way in sexuality education. For example, countries like the Netherlands, Sweden, and Germany have integrated sexuality education into their compulsory education systems, starting from early childhood and progressing sequentially [16]. Sexuality education in these countries emphasizes openness, inclusiveness, and scientific approaches, covering topics such as bodily autonomy, consent awareness, and LGBTQ+ issues. Research has shown that such early and comprehensive sexuality education not only helps reduce adolescent pregnancy rates and sexually transmitted infections but also promotes gender equality and reduces sexual violence.

In North America, particularly the United States and Canada, sexuality education is characterized by diversity and localization. In the United States, sexuality education has long been debated between "abstinence-only education" and "comprehensive sexuality education," with significant policy variations across states and school districts [17]. In recent years, comprehensive sexuality education has gradually become mainstream as social attitudes evolve, and many states have passed legislation requiring evidence-based sexuality education curricula. Canada adopted a national framework earlier, emphasizing respect for diversity and mental health [18].

In terms of research methods, international sexuality education emphasizes interdisciplinary collaboration, integrating public health, psychology, sociology, and education. Numerous long-term tracking studies have demonstrated that comprehensive sexuality education effectively promotes healthy behaviors and positive attitudes among adolescents, contrary to conservative concerns that it "encourages sexual activity." In 2003, Japan amended the School Health Law to add sexual violence prevention content to biology classes, and the rate of juvenile sexual crime dropped by 37% in 10 years [19]. Additionally, the application of digital technology has become a new trend, with many countries developing online sexuality education platforms and tools to enhance accessibility and interactivity.

Despite significant achievements, international sexuality education still faces challenges, including opposition from religious conservative forces, the impact of changing political environments, and adaptation issues arising from immigration and cultural diversity.

2. Conceptual Definitions

2.1. Current Status of Sexuality Education Domestically and Internationally

According to the revised International Technical Guidance on Sexuality Education (UNESCO, 2018), Comprehensive Sexuality Education (CSE) is defined as:

Table 1. Differences from Traditional Sex Education

Dimension	Comprehensive Sexuality Education (CSE)	Traditional Sex Education
Content Scope	Physiological + Psychological + Social + Rights	Focuses on basic physiological knowledge
Teaching Objective	Cultivates critical thinking and healthy decision-making	Transmits basic physiological facts
Methodology	Interactive, participatory learning	One-way, lecture-based teaching

“A curriculum-based, scientifically accurate, and progressively structured educational process that addresses cognitive, emotional, physical, and social aspects of sexuality and reproductive health. It aims to equip young people with knowledge, skills, and values to make responsible choices. Its core features include:

(1) Scientific Accuracy: All content must be evidence-based, drawing from biology, medicine, and other empirical disciplines (e.g., linking contraceptive mechanisms to reproductive physiology);

(2) Age-Appropriateness: Content is tailored to cognitive development stages (e.g., focusing on physiological changes

in middle school, and incorporating discussions on gender rights in high school);

(3) Comprehensiveness: Coverage of eight key areas, including human development, relationships, gender equality, and sexual violence prevention.”

2.2. Interdisciplinary Integration

2.2.1. Conceptual Meaning

Interdisciplinary integration refers to breaking down disciplinary boundaries to organically combine knowledge, methods, and perspectives from different fields into a coherent learning system. In the context of sexuality education, it specifically entails: Using biology as a foundational framework and integrating content from psychology (e.g. gender identity development), sociology (e.g. gender role construction), and ethics (e.g. debates on reproductive rights); Embedding sexuality education objectives into existing subject curricula (e.g. extending the "Genetics and Evolution" module in high school biology to include discussions on eugenics).

2.2.2. Implementation Levels

(1) Knowledge Level: Establishing conceptual mappings (e.g. linking "endocrine regulation" with "emotional management during puberty");

(2) Methodology Level: Adopting project-based learning (e.g. combining statistical methods when analyzing STD transmission data);

(3) Values Level: Using scientific facts to dispel cultural biases (e.g. explaining sexual orientation diversity through genetics).

2.3. Natural Alignment Between Biology and Sexuality Education

Biology courses offer unique advantages in sexuality education [20]:

(1) Demystification through Science: Using biological principles (e.g. hormonal regulation of the menstrual cycle) to explain sexual phenomena reduces shame associated with cultural taboos. Dutch studies show that science-based sexuality education delays the average age of first sexual intercourse by 1.8 years.

(2) Knowledge Coherence: From "Human Reproduction" in middle school to "Genetics and Evolution" in high school, the biology knowledge chain comprehensively covers core content of sexuality education (see Table 2).

Table 2. Potential Integration Points of Sexuality Education in Biology Textbooks

Academic Level	Chapter	Expandable Sexuality Education Content
Middle School Biology	Human Reproduction	Reproductive health, adolescent healthcare
High School Biology	Cellular Basis of Heredity	Chromosomal abnormalities and reproductive choices
High School Biology	Interactive, participatory learning	HIV transmission routes and prevention
High School Biology	Population Dynamics	Population policies and ecological implications of contraception

3. Conceptual Definitions

3.1. Urgent Needs for Adolescent Health Development

Current sexual health issues among adolescents in China are increasingly severe. Statistical data show that 35% of new HIV infections in China occur among adolescents aged 15–24, and the repeat abortion rate among adolescent abortion cases is as high as 42%. These figures expose serious deficiencies in knowledge transmission and behavioral guidance in traditional sex education. High school is a critical period for the formation of sexual awareness, necessitating the establishment of a scientific and systematic sexuality education system. As a foundational discipline for explaining life phenomena, biology naturally aligns with sexuality education content and can provide evidence-based health guidance for adolescents.

3.2. Intrinsic Demands of Disciplinary Development

Although current high school biology curricula include topics such as reproductive health and genetic variation, issues such as fragmented knowledge and insufficient applicability persist. Studies indicate that 83% of biology teachers report that existing textbooks provide overly simplified discussions on sexual health topics, failing to meet teaching needs. Specialized research can systematically organize sexuality education elements within biology curricula and develop teaching resources aligned with China’s context and adolescents’ cognitive characteristics, filling gaps in this field. This would not only enrich the content of biology teaching but also enhance the practical relevance of the discipline [21].

3.3. Inevitable Trend of Educational Reform

The new curriculum reform emphasizes the cultivation of core competencies, requiring subject teaching to focus on students’ holistic development. Integrating sexuality education into biology courses is an important way to implement this philosophy. Research shows that schools adopting interdisciplinary integration models for sexuality education significantly outperform traditional teaching groups in students’ mastery of health knowledge and development of scientific attitudes ($P < 0.01$). This teaching approach aligns with international education trends while effectively circumventing social resistance that may arise from standalone sexuality education courses.

3.4. Practical Needs of Social Development

With the explosion of online information, adolescents face increasing risks of exposure to erroneous sexual knowledge. Surveys reveal that 67% of middle school students primarily acquire sexual knowledge from the internet, much of which is misleading. Research on biology-based sexuality education can establish scientific information filtering mechanisms to help adolescents develop critical thinking. Simultaneously, such research can help break societal prejudices against sexuality education, fostering a more open and rational educational environment and laying the foundation for improving national health literacy.

4. Theoretical Foundation

4.1. Cognitive Development Theory (Piaget)

Piaget's cognitive development theory provides an important age-appropriate basis for biological sex education. This theory indicates that students at the high school level (aged 12 and above) have entered the formal operational stage, possessing abstract thinking and hypothetical-deductive reasoning abilities. This theory supports the implementation of systematic sex education in high school biology:

(1) Understanding of scientific concepts: Students can comprehend abstract physiological mechanisms such as the "hypothalamus-pituitary-gonad axis."

(2) Discussion of ethical issues: Complex topics like "gene editing and reproductive rights" can be explored.

(3) Implications for teaching practice: Instructional design should progress from the recognition of specific reproductive organs (middle school) to the analysis of systemic functions (high school).

4.2. Social Learning Theory (Bandura)

Bandura's social learning theory explains the behavioral shaping mechanisms of biological sex education:

(1) Observational learning: Establishing scientific understanding through biological experiments (e.g., microscopic observation of sperm-egg fusion).

(2) Modeling: Teachers discussing sexual topics with a professional attitude to break social stigma.

(3) Self-efficacy: Understanding the biological principles of contraception can enhance confidence in healthy behaviors. Studies show that students receiving integrated education are 2.3 times more likely to intend to use condoms.

4.3. Health Belief Model (HBM)

This model provides an explanatory pathway for the transformation of biological knowledge into healthy behaviors:

(1) Perceived susceptibility: After learning about the HIV replication cycle, 93% of students correctly identified infection risks.

(2) Perceived benefits: Understanding the mechanism of HPV vaccines increased vaccination willingness by 58%.

(3) Action cues: Biological experiments (e.g., condom permeability tests) serve as behavioral triggers.

4.4. Constructivist Learning Theory

Constructivist learning theory posits that knowledge is not passively received but actively constructed by learners based on their prior experiences through interaction with the environment. It emphasizes the initiative, social nature, and situatedness of learning, regarding "situation," "collaboration," "dialogue," and "meaning construction" as key elements of the learning environment. The role of the teacher shifts from a knowledge transmitter to a facilitator of meaning construction.

(1) Conceptual change: Correcting misconceptions (e.g., "the safe period is absolutely safe") through "cognitive conflict" strategies.

(2) Situated learning: Developing decision-making skills through "genetic counseling" simulations.

(3) Social interaction: Group discussions facilitate the construction of gender perspectives.

These theories collectively form a comprehensive supporting framework for biological sex education in high

school: cognitive development theory ensures age-appropriate content, social learning theory guides behavioral interventions, the Health Belief Model bridges knowledge and practice, and the biopsychosocial model provides a holistic perspective. The integration of theories avoids the mechanical nature of purely physiological education and prevents value-based preaching detached from scientific foundations, offering a rigorous academic basis for subsequent curriculum design.

5. Elements of Sex Education in the Biology Curriculum

According to the "Biology Curriculum Standards for Regular Senior Secondary Schools (2017 Edition, 2020 Revision)," content related to sex education is primarily concentrated in the following modules (as shown in Table 3):

Table 3. Content and modules related to sexuality education

Module	Specific Content	Sex Education Connection
Compulsory Module 1: Molecules and Cells	Cell Structure and Function	Specialized Structures of Reproductive Cells
Compulsory Module 2: Heredity and Evolution	Cellular Basis of Heredity	Meiosis and Gamete Formation
Compulsory Module 2: Heredity and Evolution	Molecular Basis of Heredity	Sex Determination Mechanisms (SRY Gene)
Compulsory Module 2: Heredity and Evolution	Human Genetic Disorders	Sex Chromosome Abnormalities
Selective Compulsory Module 1: Homeostasis and Regulation	Hormonal Regulation	Secretion and Regulation of Sex
Selective Compulsory Module 2: Organisms and the Environment	Population Characteristics	Population Growth and Reproductive Health

6. Curriculum Design Principles

6.1. Scientific Principle: Based on Biological Evidence

All sex education content must strictly align with core biological concepts. For example: When explaining contraceptive methods, the connection between hormonal contraceptives and "negative feedback regulation" (Compulsory Module 3: Homeostasis and Regulation) must be clarified. When discussing sexually transmitted infections, electron micrograph images of HIV infecting T cells (Compulsory Module 1: Cell Structure) should be presented.

6.2. Progressive Principle: Spiral Cognitive Development

Curriculum design should be student-centered, with clear objectives. It should create authentic contexts, emphasize active inquiry and collaborative learning, implement diversified assessment, and ensure the coherence of all elements to promote students meaningful construction of knowledge.

1. Vertical Articulation

2. Horizontal Layering

Three-tiered approach for the same knowledge point:

Basic Level: Objective facts (e.g., conditions for sperm-egg fusion)

Intermediate Level: Mechanism analysis (e.g., molecular signals in embryo implantation)

Advanced Level: Social applications (e.g., ethical considerations of IVF technology)

Table 4. Construct a continuous K-12 learning pathway

Stage	Biological Foundation	Sex Education Extension
Grade 7	Structure of the Reproductive System	Physical Changes During Puberty
Grade 10 (Senior 1)	Endocrine Regulation	Emotional Management and Stress Coping
Grade 11 (Senior 2)	Cellular Basis of Heredity	Chromosomal Abnormalities and Reproductive Choices

6.3. Appropriateness Principle: Aligned with Developmental Psychology

1. Cognitive Matching

Grade 10 (early formal operational stage): Focus on concrete mechanisms (e.g., physical barrier principle of condoms)

Grade 11 (mature formal operational stage): Engage in abstract discussions (e.g., ethical boundaries of gene editing)

2. Cultural Adaptability

Content Filtering Mechanism: Prioritize entry from a "disease prevention" perspective (e.g., HPV vaccines and cancer prevention); use alternative terms for sensitive vocabulary (e.g., replace "sexual activity" with "reproductive health")

Regional Differentiation:

Urban schools: Include advanced topics like "environmental estrogens"

Rural schools: Strengthen practical guidance on "menstrual hygiene management"

7. Specific Teaching Methods

Teaching methods refer to the sum of approaches and procedures employed by teachers and students during interaction to achieve instructional objectives. These include lecturing, inquiry-based learning, cooperative learning, task-driven approaches, among others. Their selection should be aligned with the learning content and student needs.

1). Experimental Inquiry Method

Extend sex education content through biological experiments:

- Sperm motility observation experiment: Allow students to observe sperm movement under different pH and temperature conditions to intuitively understand conception conditions and contraceptive principles.

- Hormone level simulation experiment: Use reagent kits to simulate hormone changes during the menstrual cycle and analyze the physiological mechanisms of contraceptive drugs.

- Microbial observation experiment: Under safe conditions, observe the morphology of common sexually transmitted disease pathogens to understand transmission routes and preventive measures.

2). Case Teaching Method

Select real-life cases for multi-angle analysis:

(1) Genetic disease cases: Analyze sexual development disorders caused by chromosomal abnormalities and discuss the biological basis of gender identity.

(2) Public health cases: Study epidemiological data on HIV

transmission and design campus HIV prevention awareness campaigns.

(3) Ethical controversy cases: Explore the boundaries of applying gene editing technology in eugenics.

3. Situational Simulation Teaching

Create realistic scenarios for experiential learning:

(1) Role-playing: Simulate doctor-patient consultations about contraceptive methods.

(2) Decision-making games: Design interactive scenarios for health risk choices during adolescence.

(3) Virtual experiments: Use VR technology to observe the structure and function of the reproductive system.

4. Issue Debate Method

Organize structured debate activities:

(1) Debate topics: For example, "Should middle school students receive the HPV vaccine?"

(2) Evidence preparation: Require the use of biological principles from textbooks.

(3) Evaluation criteria: Balance scientific accuracy and humanistic expression.

5. Project-Based Learning

Implement interdisciplinary practical projects:

(1) Campus health survey: Collect statistics on students' misconceptions about sexual knowledge.

(2) Science popularization work creation: Create short videos explaining sexual health using biological principles.

(3) Service learning: Design micro-lessons on puberty education for middle school students.

8. Conclusion and Outlook

This study systematically demonstrates the necessity and feasibility of integrating high school biology with sex education. The biology curriculum serves as a scientific vehicle for sex education, effectively addressing the sensitivity and fragmentation issues of traditional sex education. Through innovative methods such as experimental inquiry and case teaching, the organic integration of sexual health knowledge and biological principles has been achieved.

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