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Development of Health Education Teaching Model for Highland Area Middle Schools in Honghe Prefecture

Hao Jiaqi[1], Nopporn Tasnaina[2] and Achara Soachalerm[3]
[1,2]Faculty of Sports Science and Technology, Bangkokthonburi University, Thailand
[1]E-mail: 1085504793@qq.com, ORCID ID: https://orcid.org/0009-0004-0676-472X
[2]E-mail: aipia2489@gmail.com, ORCID ID: https://orcid.org/0009-0001-6086-0657
[3]E-mail: soaamy@hotmail.com, ORCID ID: https://orcid.org/0009-0000-2897-3697

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Abstract

Background and Aim: Due to the challenging living environment, underdeveloped economic conditions, and limited educational resources in highland regions, such as the Honghe highlands, the health and well-being of young students require greater attention. Moreover, there was a noticeable gap in localized health education curricula that considered the unique cultural, environmental, and socioeconomic contexts of highland areas in Honghe Prefecture. As a result, middle school students in these regions lack the proper health knowledge, skills, and behaviors necessary to improve their overall well-being. To enhance the health levels of students in these areas, it is essential to improve health awareness, cultivate positive health behaviors, and promote a healthy lifestyle. Therefore, this research aims to develop a health education teaching model for highland area middle schools in Honghe Prefecture.

Materials and Methods: This research utilized a mixed-method approach, combining quantitative and qualitative research. To study the current situation of the implementation of health education teaching in middle schools in the highland areas, the study distributed a total of 375 questionnaires to 9th-grade students in middle schools in the highland areas of Honghe Prefecture, interviewed 7 teachers in middle schools in the highland areas of Honghe Prefecture, the students' questionnaires and interview outlines passed the IOC test of 5 experts, IOC=0.94 (0.60-1.00), IOC=0.91(0.80-1.00), and finally constructed a model of the health education curriculum in the highland areas of Honghe Prefecture. Two rounds of Delphi involved 19 experts. The focus group method was used to determine the health teaching model through 9 experts. The data obtained from the questionnaire are analyzed using the average and standard deviation. Consensus data are evaluated using the median and interquartile range, with a criterion of a median ≥ 3.50 and an interquartile range ≤ 1.50.

Results: A health education teaching model for highland area middle schools in Honghe prefecture was developed, which included 9 first-level indicators, namely, school management, program objectives, educational content, teaching methods, effectiveness evaluation, resources and materials, teacher support, implementation strategy, and student learning attitude. 24 second-level indicators and 54 third-level indicators.

Conclusion: The health education teaching model for highland area middle schools in Honghe prefecture is both innovative and valuable. This teaching model can effectively enhance students' understanding of and ability to address health challenges specific to the plateau environment, promote their physical and mental well-being, and foster healthy habits for adapting to life in high-altitude regions.

Keywords: Health Education Teaching Model; Middle School Education; Highland Area; Student Health Promotion

Introduction

In 2019, the Health China Action Promotion Committee issued the "Healthy China Action (2019-2030)" (hereinafter referred to as the "action"), action pointed out that according to the different stages of school education, set the corresponding physical education and health education courses, to the student's health behavior and lifestyle, disease prevention and control, mental health, growth and adolescent health care, safety, and safety knowledge, improve students' health literacy, actively use a variety of forms to students and parents to carry out health education. Training and training of health education teachers, to develop and expand the health education curriculum resources. General Secretary Xi Jinping once put forward the important conclusion that young people are strong, and China is strong. The development and expansion of health education courses can improve students' health literacy and provide a strong guarantee for the realization of "China's strength" (Tang and Ren, 2001).

To implement the work requirements of health education proposed by the Opinions of the CPC Central Committee and The State Council on Strengthening Youth Sports and Enhancing Teenagers' Physical Fitness, further, strengthen the work, cultivate students' health awareness and public health

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awareness, master health knowledge and skills, and promote students to develop healthy behavior and lifestyle. The Opinions on Comprehensively Strengthening and Improving School Health and Health Education in the New Era (hereinafter referred to as the Opinions) was issued, requiring the combination of health education with moral education, intellectual education, physical education, aesthetic education, and labor education into the whole process of education, teaching, management, and service. The Opinions on Comprehensively Strengthening and Improving School Health and Health Education in the New Era, issued by the Ministry of Education and five other departments in 2021, explicitly calls for the implementation of teaching time for health education in all school segments, with primary and secondary schools arranging for four health education hours per semester out of the total hours of the physical education and health curriculum. Promulgated in 2022 the compulsory education sports and health curriculum standard (2022 edition) " curriculum standards, points out that physical education and health courses cultivate students' core quality, through the course in addition to mastering and using physical and sports skills, improving sports ability, actively participating in physical exercise to form good sports character, still need to learn to use health and safety knowledge and skills, develop a healthy way of life. At the institutional level, the core literacy of physical education and health makes it clear that health education is the compulsory content of physical education and health courses in middle school. Health education in schools can effectively help students form good, healthy behavior, improve the health status of middle school students, and promote the physical and mental health of students. With the continuous improvement of people's material and cultural life quality, the academic burden of students is increasing, and students' physical fitness is declining. Under the background of the severe display, school sports for a series of reforms, the “sports” renamed “sports and health course”, from the original “physical” as the guiding ideology, to now the guiding ideology of “health first”, these reform requirements cannot sports and health course teaching only stay in the cultivation of sports skills, sports school health education means to improve students' health level is of great significance. In 2021, the Ministry of Education released the eighth national student's physique and health research results, the results show that the students’ physical and health improvements in the most significant, students’ physical health overall rise, mainly thanks to economic and social development, policies and measures, traction, home school coordination, students 'health consciousness and lifestyle improvement, etc., at the same time, found that family and school education and guidance to improve students’ health literacy plays an important role. The survey found that students’ poor vision and high rate of myopia, and some other problems to be solved in the rate of overweight and obesity. Health education is an effective way to improve the knowledge of eye health, diet, and nutrition health for middle school students (Zhao, 2022).

The average age of middle school students is 12-15 years old, which is adolescence. Middle school students undergo mental and physical changes, which are a key stage of adolescent growth and development. Compared with the primary school stage, the academic pressure of middle school students increased significantly, the study time at the desk increased, and the outdoor exercise time was reduced. The heavy workload and the changes of adolescence led to the poor health status of middle school students, which made them need the intervention of schools and parents to improve their health literacy and pass the middle school stage smoothly. China has a vast territory, and the natural environment of each region is characterized by complexity and diversity. The Honghe Hani and Yi Autonomous Prefecture, located in the southeast of Yunnan Province, is a border ethnic minority autonomous prefecture with a multi-ethnic population. Honghe Prefecture is characterized by many mountainous areas, many ethnic groups, many poor people, and a long borderline. Existing research shows that highland areas in Honghe Prefecture are characterized by poor living environments, backward economic and health conditions, and education that needs to be developed (Xie et al, 2023).In fact, given the highland areas because of its poor living environment, backward economic health conditions, and the development of education, Honghe highland areas young students health attention, improve health level of students in highland areas, need to improve cognition health, health behavior, and way of life, but southwest border highland areas of health education local curriculum development research little attention, therefore, we need to further change perspective,

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strengthen attention and attention, committed to developing and rich health education courses, improve the health education curriculum system, service students' health literacy, response to health China, education power, sports power strategy implementation.

Literature studies indicated that traditional villages in highland areas face poor lighting conditions. Rural Hani elders exhibit higher rates of alcohol consumption and follow high-fat, high-salt diets compared to Han Chinese. Additionally, there has been a notable decline in adolescents' physical fitness, particularly in lung capacity and endurance running test scores. The family environment in these regions is often limited, with low levels of family education. In response to these challenges, align with national policies and contribute to theoretical advancements in health education. This research aims to develop a health education teaching model that includes the management, instructional objectives, teaching content, teaching methods, and assessment strategies suitable for the highland area environment.

Objectives

1. To develop a health education teaching model that best suits the situation of people living in highland areas (including curriculum objectives, teaching content, teaching methods, extracurricular activities, and evaluation of effects).
2. To validate the teaching model of health education in junior high schools in ethnic minority areas of Honghe Prefecture.

Literature Review

1. School Health Education Curriculum

Compared with other disciplines, school health education in China started relatively late. The health education curriculum has gradually developed with social development and reform, and its predecessor was the earliest one developed based on the improvement of physiological health, physical health care, physical health, physical fitness, and other aspects. Before the curriculum reform in 2001, the health education curriculum had always existed as an independent curriculum system, mainly carrying out the subject curriculum with the health education content as the main body. With the further development of curriculum reform in the new century, the original independent health education curriculum has been integrated into the physical education and health curriculum, and then, the physical education and health curriculum has become the national curriculum at each section level. Since 2008, the Ministry of Education has issued the Guidelines, the guiding ideology, principles, basic contents, and the most important implementation carrier of health education in primary and secondary schools. The number of studies on school health education courses in China has increased significantly, and the exploration direction mostly focuses on the establishment of a health education index system, the influencing factors of the implementation of health education in primary and secondary schools, and the implementation status of health education in the physical education curriculum. Health is about the foundation of all-round development, and health education is the most important component of comprehensive development education, is also promotes the basic guarantee of students 'lifelong learning, students' healthy growth from their health education state, high quality and systematic health education curriculum system construction is students form health literacy, the school to improve the quality of education guarantee (Wang and Guo, 2013).

Physical education and health education is two existing differences and contact course, physical education can promote students' health, health education can make physical exercise in the process become more scientific, but the study found that the school health education in the curriculum content is not fixed, not unified, so using the Delphi method, questionnaire method constructed three level index, seven secondary index, 38 level 3 index of health education curriculum evaluation index system (Wen et al., 2012) Zhu et al. (2015) through qualitative and quantitative methods, based on Delphi method, brainstorming method to select indicators, and determine the complete index system, and arithmetic matrix to calculate the comprehensive weight of each layer index, combining several methods to build four level index, eight

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secondary index and 35 tertiary level of health school index system, for the related research index system to improve the scientific nature and rationality of reference.

The middle school stage is a key stage in the growth of students, and it is also crucial to carry out health education. Most scholars have taken secondary school health education as the object of research. Zhu (2019) explored and designed a "health sports" teaching model that integrates health education into secondary school physical education and found that the integration of health education into secondary school physical education is conducive to the promotion of students' mastery of health knowledge and the establishment of healthy behaviors and is conducive to the promotion of the improvement of students' physical fitness and health level. Zhang (2022) investigated and analyzed the current situation of health education integration in the implementation of physical education and health curriculum in Xinyang City Junior High School and put forward corresponding countermeasures. Tao (2023) conducted a study on how to improve the collective health literacy of schools and comprehensively promote the construction of healthy schools, and proposed paths to improve the collective health literacy of schools, such as improving the management system of school health organizations and constructing a school health environment. Bai (2024) constructed an integrated health education content system for physical education and health textbooks in primary and middle schools, using healthy behaviors and lifestyles, disease prevention, mental health, growth and development, adolescent health, and safety emergencies and evacuation as the framework. Zhang (2021) conducted a study on the framework of health education for junior high school students and provided insights into the positioning of the curriculum, the teacher setup, the curriculum, and the teaching methodology provided insights. Fan (2018) initially established a more standardized and practical method for evaluating and monitoring the health literacy of primary and middle school students. Cao (2021) indicates that the revised curriculum emphasizes the need for students to develop a comprehensive understanding of health education, acquire essential life skills, and cultivate a strong mental temperament, physical fitness, and psychological well-being. As a result, the teaching objectives of health education should prioritize a holistic approach to student development.

2. Health Education in Highland

The development of the local curriculum of health education is to build this bridge so that the content of students 'health education is more appropriate to the social activities that students participate in, and can adapt to the local environment, culture, education, health background, experience, and other contents, to enhance the effectiveness and pertinacity of students' health education. Local curriculum development is the intermediate link in the three-level curriculum management system in China, which is of positive significance to the implementation of national curricula and guiding the development and implementation of school-based curricula. Carrying out health education according to local conditions is the basic principle of health education and also the basis of local curriculum development of health education (Wang, 2000). Pan (2013) emphasizes the correct understanding of curriculum standards and school physical education, and health curriculum should clarify the school-based curriculum of physical education and health curriculum, truly realize the three-level curriculum management, implement the school-based physical education and health curriculum, and creatively implement the physical education and health curriculum under the guidance of curriculum standards. Xie (2009) believes that health and health education in ethnic areas should be practical to local conditions, and proposed the combination of health education, health education, and physical education in ethnic areas. Highland area schools often face specific challenges when attempting to implement local curricula. These challenges include a lack of educational resources, such as appropriate teaching materials and learning equipment. Additionally, teachers in these areas frequently do not receive adequate training to adapt health education to align with the local environment and culture. This shortage of resources and proper training results in the inefficient implementation of local curricula (Wang, 2018). Wang (2012) that with the advancement of education democratization and multicultural education concept, ethnic areas curriculum policy is changing, gradually increasing the proportion of national culture courses, and the special local knowledge integrated reflection to the curriculum of ethnic areas and form a new curriculum mode: national curriculum + national areas local

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curriculum + ethnic areas school-based curriculum. Ethnic areas have regional environmental and cultural characteristics, and the implementation of physical education and health education standards requires the process of local curriculum development. Therefore, the development of a local health education curriculum suitable for the health promotion needs of local students is a beneficial exploration.

In conclusion, the cultural beliefs and practices of ethnic groups in Honghe Prefecture significantly influence the health behaviors of students. In many ethnic communities, traditional health practices, such as the use of herbal remedies, specific dietary customs, and spiritual healing rituals, are deeply embedded in daily life. These cultural norms can shape students' attitudes toward health, nutrition, physical activity, and medical care. For instance, certain traditional beliefs might prioritize natural healing over modern medicine or influence dietary choices, leading to either positive or negative health outcomes (Zhao, 2022). Integrating traditional health knowledge and practices into the school curriculum can be highly beneficial in enhancing student engagement. By incorporating familiar cultural elements, students are more likely to connect with the material, fostering a sense of relevance and pride in their heritage.

3. Highland Ares Health Analysis

China has a vast territory, and the natural environment of each region is characterized by complexity and diversity. Honghe Hani and Yi Autonomous Prefecture is located in the southeast of Yunnan Province, which is located on the southwest border of China. The Tropic of Cancer runs across the southern part of Yunnan Province, belonging to the low-latitude inland region. Yunnan is a mountainous plateau terrain, among which the middle altitude area accounts for more than 80% of the province's land area, with an average altitude of about 2,000 meters. The climate of Yunnan belongs to the subtropical plateau monsoon climate, with many climate types, small annual temperature differences, large daily temperature differences, distinct dry and wet seasons, and obvious temperature changes with vertical changes. At the same time, Yunnan has 52 ethnic minorities, making the province with the largest number of ethnic groups in China (Xie et al, 2023).

Song (2021) investigated the dietary habits of Hani villagers in Yuanyang County, Honghe Prefecture, and found that local villagers pickle a variety of sauerkraut, which prolongs the storage time of the vegetables and allows the Hani people to add a certain number of vitamins, dietary fiber, and other nutrients during the winter months. In winter, the year-old "New Year's pigs" are killed to make smoked meat and lard, which are used to improve the family's food during the Spring Festival. Most of the villagers' home cooking by most of the use is to kill the "New Year's Eve pig" when boiling lard, but it is not enough for a family's consumption for a year, because the oil is relatively small, so the Hani people less fried, pan-fried, deep-fried and other oil-consuming cooking methods, and tempeh has also become a substitute for cooking oil to a certain degree, the home consumption of Vegetable oil is less. Although nowadays there are abundant materials and villagers can choose a variety of foods and diets, villagers' tastes are still generally spicy, and meals made with tempeh and chili peppers still occupy a special place in the diets of the Hani ethnic group. In addition, men in the villages generally like to drink alcohol. Therefore, certain aspects of the local diet may negatively impact students' health. The reliance on smoked meats and lard, coupled with limited use of vegetable oils due to scarcity, may lead to high-fat and high-sodium diets, potentially increasing the risk of conditions like hypertension or obesity over time. Additionally, the cultural preference for spicy foods and the use of fermented condiments (such as tempeh) may pose digestive challenges for some students. Moreover, the high prevalence of alcohol consumption among adult males in the community could indirectly influence students, shaping their perceptions of health behaviors and potentially normalizing alcohol use from a young age.

Qian's (2023) study showed that the Yunnan Hani ethnic group in physical morphology development just face in individual age groups has a tendency to decline, lung capacity and endurance running tests in the Hani adolescents appeared to be a substantial decline, which should attract extensive attention. Some scholars have conducted a field survey on the family education of Hani young children in the Ping area and found that the family education of young children in the Hani Qingkun area has already had a negative impact, with the gradual fading away of "nationalization", a single-family education environment, and low

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expectations of families for young children's education, which reflects the importance of school education to the poor areas. School education is crucial to the physical and mental development of Hani children in impoverished areas, and school health education is an important way to improve the health literacy of children and adolescents.

In summary, existing literature primarily focuses on theoretical research, with limited practical applications. The most effective way to evaluate students is through direct assessments. Additionally, there is a lack of research on constructing comprehensive health education index systems. In addition, literature studies have indicated that traditional villages in highland areas experience poor lighting conditions, higher alcohol consumption rates, and a greater reliance on high-fat and high-salt diets among rural Hani elders compared to Han Chinese. Additionally, there has been a notable decline in adolescent physical fitness, particularly in lung capacity and endurance running test scores. Furthermore, the family environment in these highland regions tends to be limited, with low levels of family education, which may impact students' overall development and well-being. Therefore, future scholars can explore this area further, contributing to the development of a structured health education system across different stages, thereby laying a strong foundation for its growth and implementation.

Conceptual Framework

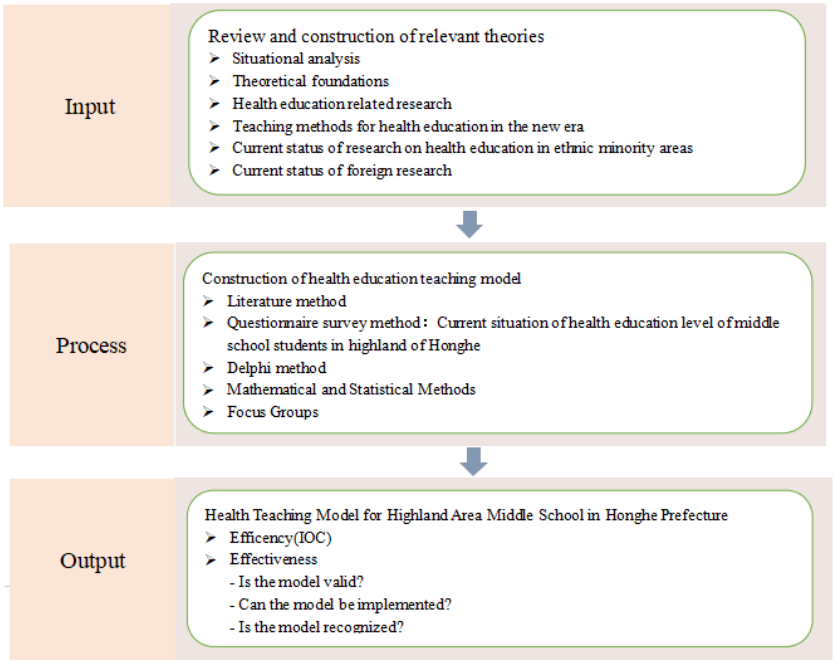

Figure 1 Conceptual framework

Methodology

1. Research Tools

The research tools used in this research are as follows:

(1) A questionnaire for students was used to collect the current status of health education for middle school students in the highland area of Honghe Prefecture. The questionnaires have passed the reliability test, IOC=0.94, Cronbach's coefficient of 0.857.

(2) A Teacher Interview outline was used to collect information on the implementation of health education in middle schools in the highland area of Honghe Prefecture and suggestions from frontline teachers on constructing the teaching model. The interview outline passed the IOC test of 5 experts, IOC=0.91.

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(3) A questionnaire for Delphi was utilized to present experts with a preliminary model of the health education curriculum and to gather their consensus. It employed a 5-point scale for evaluation. The questionnaire underwent an Item-Objective Congruence (IOC) test with five experts, IOC=0.94.

(4) The focus group expert opinion form was used to assess the satisfaction, validity, and implementation ability of the health education teaching model. It underwent an Item-Objective Congruence (IOC) test with five experts, IOC=0.95.

2. Population and sample

Yuanyang County, Luchun County, and Honghe County are the three most densely populated counties of Hani ethnicity in Honghe Prefecture, Yunnan Province, and the Hani ethnic population in the three counties accounts for more than 50% of the total population. The scope of this study was the ninth-grade Hani middle school students, front-line physical education teachers, and experts in related fields in Yuanyang, Luchun, and Honghe prefecture. There was a total of 9 middle schools in the three counties, 3 schools per county, with 6,123 ninth-grade Hani students.

Based on this, conducting a survey on the status of health education for middle school students in highland areas of Honghe Prefecture using a stratified sampling method in three counties, the questionnaire on the status of health education for junior high school students in the highland areas of Honghe Prefecture and the SF-36 Scale were distributed to 125 copies each of Hani students in the ninth grade in the three counties above, for a total of 375 copies.

Research Participation

Physical Education Teacher Interviews: Seven front-line physical education teachers were interviewed through the interview method to grasp the current situation of promoting health in the school.

Delphi method: 19 experts, including experts and research studies about the field of health education, teachers with many years of experience in teaching health education courses in colleges and universities, front-line teachers who teach physical education and health courses in middle schools, and experts in the direction of school sports. In this research, snowball sampling was used to select 19 experts.

Focus group: Nine experts will be invited to carry out appreciative validation of the draft health education teaching model.

3. Data Collection

1. Relevant studies on health education curriculum development were reviewed using content analysis.

2. A questionnaire for students was distributed to 375 students, and seven front-line physical education teachers were interviewed to investigate the current situation of health education for middle school students in the highland area of Honghe Prefecture.

3. 19 experts were invited to participate in two rounds of the Delphi consensus. After the first round of Delphi consensus, the data was collected and provided feedback the data to experts. Through the second round of the Delphi consensus, a health education teaching model for highland area middle schools in Honghe prefecture was developed.

4. 9 experts were invited to participate in a focus group discussion to confirm the health education teaching model for highland area middle schools in Honghe Prefecture and evaluate the appropriateness and usefulness of such a teaching model.

4. Data Analysis

Utilize a software package for data analysis, applying the following statistical methods:

1. Questionnaire Analysis: Data collected from the questionnaire is processed by computing the mean and standard deviation for each question after sorting.

2. Expert Interview Analysis: Interview responses are transcribed into text and systematically examined using content analysis.

3. Delphi Method: The Delphi consensus data is analyzed using the median and interquartile range, with criteria set at a median ≥ 3.50 and an interquartile range ≤ 1.50.

4. Focus Group Analysis: Data from focus group discussions is evaluated through content analysis.

Results

The results of this study are divided into the following 3 sections:

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Part 1: Results of a survey to collect questionnaires from middle school ninth-grade students and findings from interviews with nine middle school physical education teachers about the current state of health education.

Part 2: Results of collecting feedback from 19 experts by Delphi consensus

Part 3: Results of confirming the health education teaching model for the highland area middle school in Honghe Prefecture by 9 experts from the Focus Group.

Part 1: Results of a survey to collect questionnaires from middle school ninth-grade students and findings from interviews with nine middle school physical education teachers about the current state of health education.

In this study, a total of 375 ninth-grade middle school students in a highland area of Honghe Prefecture were selected to fill out the questionnaires. After collection, 361 complete and usable questionnaires were recovered, accounting for 96.26% of the total number of questionnaires.

Table 1 Feedback on the current status of students' health behaviors and lifestyles in the highland areas of Honghe Prefecture

Contents	$\bar{X}$	SD	Result
A. Healthy Behaviors and Lifestyles	3.46	0.76	Moderately
1. Familiarize themselves with the meaning of health and the factors affecting human health	3.73	0.69	High
2. You know about healthy lifestyles and behaviors	3.84	0.74	High
3. You understand the significance of adequate sleep for growth and development and the reasonable sleep time for different ages	2.70	0.77	Moderately
4. You are not picky about what you eat, do not favor one thing over another, and pay attention to nutritional combinations during meals	2.77	0.85	Moderately
5. You can eat three meals a day at a regular time	4.22	0.71	High
6. You understand the significance of scientific diet for physical growth and development	3.45	0.71	Moderately
7. You have the ability to refuse drugs	4.86	0.66	High
8. You are clear about the role of physical exercise.	3.32	0.75	Moderately
9. You can actively participate in physical education courses and extracurricular sports activities.	3.28	0.72	Moderately
10. You know to rationalize the time and method of physical activity	2.90	0.89	Moderately
11. Use scientific methods to participate in physical activities (drinking water)	2.97	0.84	Moderately

From Table 1, in the analysis of feedback on the current status of students' health behaviors and lifestyles in the highland areas of Honghe Prefecture, it was found that students had a high level of knowledge with the following contents： "Familiarize themselves with the meaning of health and the factors affecting human health"(3.73±0.69), "You know about healthy lifestyles and behaviors"(3.84±0.74), "You can eat three meals a day at a regular time"(4.22±0.71), "You can refuse drugs"(4.86±0.66). The students' mastery was at a moderate level for the following contents: "You understand the significance of adequate sleep for growth and development and the reasonable sleep time for different ages"(2.70±0.77), "You are not picky about what you eat, do not favor one thing over another, and pay attention to nutritional combinations during meals"(2.77±0.85)， "You understand the significance of scientific diet for physical growth and development"(3.45±0.71)， "You are clear about the role of physical exercise."(3.32±0.75), "You can actively participate in physical education courses and extracurricular sports activities."(3.28±0.72)， "You know to rationalize the time and method of physical

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activity"(2.90±0.89), "Use scientific methods to participate in physical activities (drinking water)"(2.97±0.84).

Table 2 Feedback on the current status of students' disease prevention in the highland areas of Honghe Prefecture

Contents	$\bar{X}$	SD	Result
B. Disease Prevention	2.50	0.72	Moderately
1.You know about the prevention of infectious diseases such as influenza, hepatitis B and AIDS	2.84	0.79	Moderately
2.You can read and understand the indicators of the health examination	1.80	0.67	Low
3.You have the ability to deal with minor injuries such as falls and bruises during sports.	3.13	0.75	Moderately
4.You understand the emergency treatment of different sports injuries such as sprains and strains	2.22	0.67	Low

From Table 2, in the analysis of feedback on the current status of students' mastery of disease prevention content in the highland areas of Honghe Prefecture, it was found that students had a moderate level of knowledge of the following contents: "You know about the prevention of infectious diseases such as influenza, hepatitis B and AIDS"(2.84±0.79), "You can deal with minor injuries such as falls and bruises during sports."(3.13±0.75). The student's mastery was at a Low level for the following contents: "You can read and understand the indicators of the health examination"(1.80±0.67), "You understand the emergency treatment of different sports injuries such as sprains and strains"(2.22±0.67).

Table 3 Feedback on the current status of Mental health in the highland areas of Honghe Prefecture

Contents	$\bar{X}$	SD	Result
C. Mental Health	2.94	0.77	Moderately
1. You have a good sense of competition and the ability to resist setbacks.	3.42	0.68	Moderately
2 You are able to regulate your emotions through physical exercise when you are depressed.	2.49	0.81	Low
3. You are able to cope with the psychological changes brought about by puberty.	2.90	0.78	Moderately
4. You are able to relieve anxiety and low self-esteem through physical exercise.	2.97	0.81	Moderately

From Table 3, in the analysis of feedback on the current status of students' mastery of mental health in the highland areas of Honghe prefecture, it was found that students had a moderate level of knowledge with the following contents: "You have a good sense of competition and the ability to resist setbacks."(3.42±0.68)," You can relieve anxiety and low self-esteem through physical exercise.."(2.97±0.81), "You can cope with the psychological changes brought about by puberty."(2.90±0.78). The student's mastery was at a low level for the following contents:: "You can regulate your emotions through physical exercise when you are depressed."(2.49±0.81).

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Table 4 Feedback on the current status of students' growth and development and adolescent health care in the highland areas of Honghe prefecture

Contents	$\bar{X}$	SD	Result
D. Growth and Development and Adolescent Health Care	3.90	0.66	Moderately
1. You understand the significance of physical exercise for physical development during the puberty stage.	3.24	0.74	Moderately
2. You understand the changes in your physical development brought about by puberty.	4.37	0.61	High
3. You recognize the risk factors for sexual abuse and have the ability to protect yourself from sexual harassment and abuse.	4.09	0.61	High

From Table 4, in the analysis of feedback on the current status of students' mastery of growth and development and adolescent health in the highland areas of Honghe prefecture, it was found that students had a high level of knowledge with the following contents: “You understand the changes in your physical development brought about by puberty.”(4.37±0.61), “You recognize the risk factors for sexual abuse and can protect yourself from sexual harassment and abuse.”(4.09±0.61). The student's mastery was at a moderate level for the following contents: “You understand the significance of physical exercise for physical development during the puberty stage.”(3.24±0.74).

Table 5 Feedback on the current status of students' security response and emergency evacuation in the highland areas of Honghe prefecture

Contents	$\bar{X}$	SD	Result
E. Security Response and Emergency Evacuation	3.91	0.71	High
1. You have the skills to escape from natural disasters such as earthquakes, floods, etc.	3.53	0.73	High
2. You have the skills to avoid accidental injuries such as fire, electrocution, traffic accidents, etc.	4.24	0.67	High
3. You have the ability to move around in fields, woods, forests or outdoors.	3.18	0.82	Moderately
4.You have the treatment and first aid for animal bites.	4.15	0.77	High
5. You have the ability to protect yourself from violence and abuse	4.46	0.58	High

From Table 5, in the analysis of feedback on the current status of students' mastery of security response and emergency evacuation in the highland areas of Honghe prefecture, it was found that students had a high level of knowledge of the following contents: “You have the skills to escape from natural disasters such as earthquakes, floods, etc.”(3.53±0.73), “You have the skills to avoid accidental injuries such as fire, electrocution, traffic accidents, etc.”(4.24±0.67), “You have the treatment and first aid for animal bites.”(4.15±0.77), “You can protect yourself from violence and abuse.”(4.46±0.58). The student's

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mastery was at a moderate level for the following contents: “You can move around in fields, woods, forests, or outdoors.”(3.18±0.82).

Table 6 Feedback on the current status of students' Issues to be emphasized in the Highlands region in the highland areas of Honghe Prefecture

Contents	$\bar{X}$	SD	Result
F. Issues to be Emphasized in the Highlands Region	**3.28**	**0.84**	**Moderately**
1. You have a harmonious relationship with your family	3.46	0.91	Moderately
2. You have the ability to refuse tobacco and alcohol.	4.65	0.93	High
3. You understand the dangers of eating raw and dried meat.	3.17	0.83	Moderately
4. Understand the common endemic diseases in Yunnan and how to prevent them.	1.83	0.68	Low

From Table 6, in the analysis of feedback on the current status of students' mastery of Issues to be emphasized in the highland areas of Honghe prefecture, it was found that students had a high level of knowledge with the following contents: “You can refuse tobacco and alcohol.”(4.65±0.93). The student's mastery was at a moderate level for the following contents: “You have a harmonious relationship with your family.” (3.46±0.91),“ You understand the dangers of eating raw and dried meat.”(3.17±0.83). The student's mastery was at a low level for the following contents: “Understand the common endemic diseases in Yunnan and how to prevent them.” (1.83±0.68).

Table 7 Feedback on the current status of school health management and curricular issues in the Highlands region in the highland areas of Honghe Prefecture

Contents	$\bar{X}$	SD	Result
G. School Health Management and Curricular Issues	2.93	0.73	Moderately
1 Your school values health education	3.12	0.72	Moderately
2 You are satisfied with the current teaching and learning facilities	2.95	0.74	Moderately
3. Currently your health education program improves your health literacy	2.76	0.75	Moderately
4. Your current school environment helps to improve your health literacy	2.98	0.72	Moderately
5. The current teaching and learning content is compatible with the highland environment	2.46	0.86	Low
6. Your teachers are health education knowledgeable	3.06	0.71	Moderately
7. The current teaching evaluations reflect your true health literacy	2.48	0.81	Low
8. You are satisfied with the teacher's teaching methods	2.89	0.73	Moderately
9. Your teacher is rich in the means of teaching health education	2.89	0.75	Moderately
10. Your parents emphasize health education	2.44	0.83	Low

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From Table 7, the feedback on the current status of health management and curricular issues in the school revealed a moderate level of student agreement with the following: "Your school values health education."(2.12±0.72), "You are satisfied with the current teaching and learning facilities."(2.95±0.74), "Currently your health education program improves your health literacy"(2.76±0.75), "Your current school environment helps to improve your health literacy"(2.98±0.72), "Your teachers are health education knowledgeable"(3.06±0.71)," You are satisfied with the teacher's teaching methods"(2.89±0.73), "Your teacher is rich in the means of teaching health education".(2.89±0.75). Students have a low level of agreement with the following: "The current teaching and learning content is compatible with the highland environment"(2.46 ±0.86), "The current teaching evaluations reflect your true health literacy."(2.48±0.81), "Your parents emphasize health education."(2.44±0.83).

Table 8 Feedback on the SF-36 questionnaire

Contents	$\bar{X}$	SD
Vitality	60.96	16.07
Physical functioning	76.24	18.04
Bodily pain	70.41	16.29
General health perceptions	59.59	18.69
Physical role functioning	72.25	19.89
Emotional role functioning	58.60	27.02
Social role functioning	82.11	15.44
Mental health	57.18	16.85

From Table 8, in the analysis of Feedback on the SF-36 questionnaire, it was found that the scores on the eight dimensions, in descending order, were: Social role functioning (82.11±15.44), Physical functioning (76.24±18.04), Physical role functioning (72.25±19.89), Bodily pain (70.41±16.29), Vitality (60.96±16.07), General health perceptions (59.59±18.69), Emotional role functioning (58.60±27.02), Mental health (57.18±16.85). Indicates that the overall health of students is poor, and mental health should be emphasized.

Expert interview results can be summarized that health education in Highland middle schools is primarily conducted through physical education and health courses, supplemented by school-wide initiatives such as class meetings, exhibitions, and health care rooms, though most schools lack dedicated health education organizations. Students face challenges related to mental health, hygiene, and dietary habits, particularly due to cultural influences and the prevalence of left-behind children. Teachers express a need for more training on endemic diseases and mental health, with suggestions for increased collaboration with hospitals and experts. Teaching methods include lectures, case studies, experiential learning, and digital tools like electronic watches for health tracking. Evaluation of health education combines process and summative assessments, incorporating participation, hygiene, and knowledge retention. Schools should enhance teacher training, establish health education committees, strengthen partnerships with health institutions, and develop a structured curriculum tailored to the highland environment, with pilot programs and systematic evaluations guiding broader implementation.

Part 2: Results of collecting feedback from 19 experts by Delphi consensus

In drafting the health education teaching model for highland area middle schools in Honghe prefecture, the researcher conducted data collection using a questionnaire and interviews. After that, the researchers invited 19 experts to participate in two rounds of Delphi consensus to develop the health education teaching model for highland area middle schools in Honghe prefecture.

After two rounds of Delphi consensus, it was found that 12 indicators did not meet the specified criteria (the criteria of median≥ 3.50 and interquartile range≤1.50) and were removed. The removed indicators were as (1) Research on health education research with hospitals and drug rehabilitation centers (first round of deletion), (2) Develop health education course syllabi and lesson plans for the Red River Plateau region

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(first round of deletion), (3) Campus Greening and Beautification (first round of deletion), (4) Oral Health (first round of deletion), (5) Alcohol, tobacco and drugs (first round of deletion), (6) Prevention of common infectious diseases (first round of deletion), (7) Prevention and response to novel coronavirus pneumonia (first round of deletion), (8) Common Adolescent Diseases (first round of deletion), (9) Prevention and treatment of social security (first round of deletion), (10) Common family changes and adaptations (first round of deletion), (11) Monthly and weekly assessments are scheduled to assess student understanding of the curriculum and to adjust instruction to accommodate each student (first round of deletion), (12) Develop a clear, specific, and actionable implementation plan for the actual pilot project. (first round of deletion). Therefore, the health teaching model for highland area middle schools in Honghe prefecture includes 9 first-level indicators, namely, school management, program objectives, educational content, teaching methods, effectiveness evaluation, resources and materials, teacher support, implementation strategy, and student learning attitude. 24 second-level indicators and 54 third-level indicators. The health education teaching model can be summarized in Figure 2.

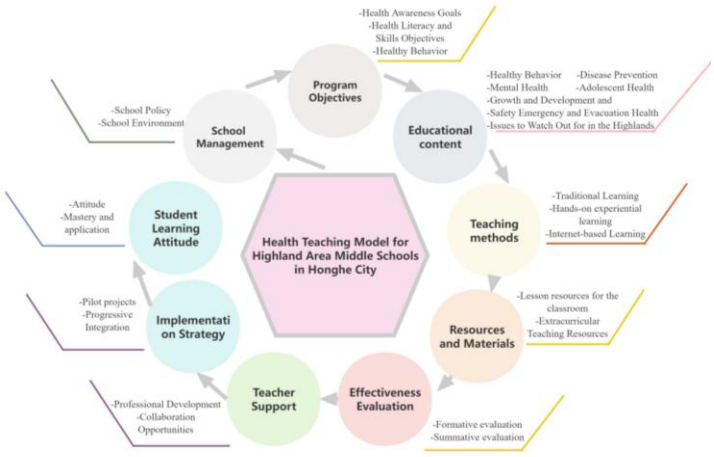

Figure 2 Health Education Teaching Model for Highland Area Middle Schools in Honghe Prefecture

Part 3: Results of confirming the health education teaching model for the highland area middle school in Honghe Prefecture by 9 experts from the focus group

The expert panel collectively affirmed the relevance and potential effectiveness of the proposed health education teaching model for middle schools in highland areas, emphasizing its alignment with current educational trends and its ability to address the unique health challenges faced by students in these regions. Experts highlighted the importance of scientific curriculum design, innovative teaching methodologies, and the integration of theory with practice through experiential learning, multimedia resources, and community collaboration. Key challenges identified include the need for specialized teacher training, resource limitations, and ensuring curriculum applicability to local conditions. Recommendations for improvement include incorporating endemic health concerns, strengthening partnerships with medical institutions, using diverse instructional strategies, and enhancing teacher support systems. Overall, the model is expected to significantly improve students' health literacy, self-care awareness, and ability to adapt to the plateau environment, provided that continuous evaluation and optimization are implemented. Moreover, in practical application, the key challenge is how to ensure that teachers have sufficient expertise. The success of the program is that it truly tailors the program to the needs of the students, provides exclusive health education for students in highland areas, improves the health of the students, and brings education closer to their lives.

Conclusion

The study found that the construction of a teaching model for the middle school health education curriculum in the highland areas of Honghe City is both innovative and beneficial. It can be targeted to improve students' understanding of and ability to cope with health problems specific to the plateau environment, promote healthy physical and mental development, and at the same time cultivate good habits

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for adapting to life on the plateau, to lay a solid foundation for students' all-round growth and lifelong learning. The health education teaching model includes all aspects of education and contains nine first-level indicators, namely school management, program objectives, educational content, teaching methods, effectiveness evaluation, resources and materials, teacher Support, implementation strategy, and student learning attitude. 24 second-level indicators, namely school policy, school environment, health awareness goals, health literacy and skills objectives, healthy behavior, disease prevention, mental health, growth and development and adolescent health, safety emergency, and evacuation, health issues to watch out for in the highlands, traditional learning, hands-on experiential learning, internet-based Learning, formative evaluation, summative evaluation, lesson resources for the classroom, extracurricular teaching resources, professional development, collaboration opportunities, pilot projects, progressive integration, attitude, mastery and application, and 54 third level indicators. The main structure of the model is shown below.

Figure 3 Health education teaching model for highland area middle schools in Honghe Prefecture

Discussion

School management: the model's school management consists of two parts: school policy and school health. The previous health education model management policies were not well set up, and there was less cooperation with off-campus units. The current health education model for highland areas requires the establishment of health education policy committees and working groups, the formulation of health education policies and work programs for highland areas, and the emphasis on promoting cooperation with hospitals and drug rehabilitation centers. Zhu (2020) argues that school health education policy is the basic guarantee and requirement for the conduct of school health education, which is consistent with the viewpoint of this research.

Curriculum objectives: The model's curriculum objectives put forward requirements for teaching health education from three aspects: health awareness objectives, health knowledge and skills objectives, and health behaviors, which is consistent with Cao's (2021) research results which indicate that the model was refined after previous teaching of health education ignored the issues to be taken care of in highland areas. The new curriculum requires students to master comprehensive and systematic health education knowledge and life skill levels and to shape good mental temperament, physical quality, and mental state, so the teaching objectives of health education should focus on the comprehensive nature of the cultivation objectives.

Instructional content: the model's instructional content frameworks are health behaviors and lifestyles, disease prevention, mental health, growth and development and adolescent health, safety, emergency and evacuation, and health issues to watch out for in the highlands. The first five of these frameworks are consistent with Bai's (2024) research result, and the issues that should be taken care of in the highland region are new additions to this model, and it is extremely important to construct a secondary

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school health education teaching model that is most suitable for the situation of the highland residents, and health education curricula that are consistent with the local context.

Teaching methods: the model uses traditional teaching methods, experiential teaching methods, and Internet-based teaching methods, which are consistent with the results of Zhang Yan and Fan Zheng's study. The original health education mainly used traditional teaching methods interspersed with experiential teaching, but this study emphasized experiential and Internet-based teaching methods. Zhang's (2021) study of health education can be taught using activities such as classroom lectures, case studies, reports, experiments, presentations, demonstrations, role-playing, visits, readings, and exhibitions. Fan's (2018) study concluded that it is important to maximize the provision of content-rich health education resources and reasonably guide primary and secondary school students to learn about health promptly through new media and self-media. The above studies are consistent with the framework of teaching methods in this study.

Recommendation

Recommendation for current research

1. The results of this research can be effectively applied to middle school health education curricula in highland areas throughout Yunnan Province.
2. The findings of this study can lay the foundation for further research on modeling local curricula for health education at various academic levels. However, as this study relies mainly on data from China, it is recommended to focus on the Chinese context for data analysis.
3. Teachers should be professionally trained in the implementation of the model on a wide scale.

Recommendation for further research

1. This study lacked a survey of parents in the health education survey, and future research should be directed toward family health education to further increase the importance of family education.
2. This study focused on the teaching of health education in secondary schools. Future studies should consider studying students at other educational levels to expand the scope of application of the local model of health education curriculum.

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